special lecturer for physical chemistry, and very often a professor for organic and another for inorganic chemistry, beside numerous lecturers on different branches of the subject.

The German nation, which has placed its primary and technical education on a sound basis, has been richly rewarded. In 1897 the total production of the German chemical works was 47,391,132*l.* Within the last twenty years many new and flourishing industries have been started, the foundation of which has been entirely due to the results of chemical research. Again, one has only to glance at the appended list, which shows the dividends of some of the larger chemical works, all of which employ a large staff of fully trained chemists, to recognise that science and successful commerce go hand-in-hand :—

Name of works	Dividends 1893 Per cent.	1896 Per cent.	1899 Per cent.
Höchst Colour Works ..	28	28	26
Baden Aniline and Soda Works	27	26	24
Elberfeld Colour Works	18	18	18
Schering and Co., Berlin	19	11	12
Nobel and Co., Hamburg	21½	13	18
Munich Paper Works	15	16	18
Rositz Sugar Works...	3	12	13

In this country the Government relies too much upon private initiative and individual generosity. Because nearly all the pioneering labour and many of the most brilliant scientific results of the past century have, so far as this country is concerned, been conducted by private individuals who were fired with the restless and resistless energy of genius, the Government and the manufacturers wrap themselves in an impenetrable armour of self-complacency and blind optimism. Our forefathers, they say, had practically no scientific education, and see how they excelled in invention and obtained the control of the commercial world. Let them, however, remember that in those days the Germans had also practically no scientific education, neither was their empire consolidated as it is at the present moment. So long as the Government refuses to recognise the needs of science, and manufacturers, with fatuous obstinacy, refusing to learn from the experience of other nations, look upon chemists as expensive luxuries, so long will chemical trade remain in the hand of our rivals.

F. MOLLWO PERKIN.

THE GEOLOGICAL SURVEY OF THE UNITED STATES.

IN NATURE for December 27, 1900, we noticed the first and sixth parts of the Twentieth Annual Report of the United States Geological Survey. We have now received the remaining volumes. Part ii., comprising "General Geology and Palæontology," consists of 953 pages with 193 plates. It includes a brief article on the geology of the Philippine Islands, by Mr. G. F. Becker; but as we have since received the full report (noticed further on), we may pass on to the next paper by Mr. J. Nelson Dale, a study of Bird Mountain, Vermont. This mountain, the summit of which is 2200 feet high, lies in the Taconic Range, and consists of about 500 feet of Ordovician grit and conglomerate interbedded with muscovite-schist, and underlain by similar schist with beds of quartzite. The author discusses the origin of the mountain, the features of which have been largely sculptured by glacial action. The Devonian fossils from south-western Colorado, constituting the fauna of the Ouray Limestone, are described by Mr. George H. Girty. Although by some authorities regarded as Carboniferous, Mr. Girty considers that the fauna indicates late Middle or early Upper Devonian. Varieties of *Spirifer disjunctus* occur, together with numerous other fossils.

A preliminary paper on the geology of the Cascade Mountains in Northern Washington is contributed by Mr. Israel C. Russell. The rocks comprise granite, various schists, greenstone and serpentine of unknown age, and also a great extent of slightly altered and unaltered sedimentary strata, mainly Cretaceous and Tertiary, with some possibly of Jura-Trias age. The granites and allied rocks are usually jointed in a conspicuous manner. The influences of these joints on the rugged spires and cathedral-like forms resulting from weathering are among the most characteristic details in the magnificent scenery of the Cascade Mountains. The structure of the range is highly complex. This is briefly described, and fuller particulars are given of the striking effects of glaciation.

Mr. Lester F. Ward is the author of an elaborate essay on the older Mesozoic floras of the United States, Triassic and Jurassic; and Mr. David White deals with the stratigraphic succession of the fossil floras of the Pottsville formation in the southern anthracite coal-field of Pennsylvania. The plants of this Carboniferous formation exhibit a rapid development, and a series of changes or modifications, which are considered of high stratigraphic value.

Part iii. deals with the "Precious-metal Mining Districts." The Bohemia mining region of western Oregon is described by Mr. J. S. Diller. It is situated at an altitude of between 4000 and 6000 feet above the sea, along the crest of the Calapooya Mountain, and upon both slopes. The mountain is composed of lavas like those of the Cascade Range. Generally the sheets of lava are very irregular. The lava filling the throat of a once active volcano has in the case of the Cougar Rock made a prominent peak, while in Bear Bones Rock it presents a conspicuous columnar structure. The streams have cut deep, narrow valleys, approaching canyons in character. These expose rocks to a depth of more than 2000 feet—comprising lavas (chiefly andesites), vein matter and stratified fragmental volcanic material. It is probable that volcanoes were active in Eocene times, and continued so during the Miocene period. The veins lie along narrow, irregular joint-planes in which there has been much crushing of rock material. The principal gangue is quartz, containing at a depth much pyrites and other sulphides in which gold occurs; while near the surface the gold is native, finely filamentous and distributed through iron-stained quartz. The output in this region has been chiefly from one mine during the last few years. Mr. F. H. Knowlton contributes an account of the Miocene plants of the Cascade Range.

The gold and silver veins of Silver City, De Lamar, and other mining districts in western-central Idaho are reported on by Mr. Waldemar Lindgren. The area includes four types of scenery: (1) the Snake River valley, extensive arid plains underlain by Neocene lake-beds with intercalated flows of basalt, which are cut into to a depth of from 400 to 1000 feet; (2) the Owyhee Range, a steep granite ridge covered by broad areas of Neocene lavas; (3) a great central granite region north of the Snake River, with bordering sedimentary rocks, probably Palæozoic, showing extensive contact metamorphism: the whole described as a veritable labyrinth of ridges and peaks separated by sharply-cut canyons, the higher ridges attaining elevations of 12,000 feet, and evidently an old plateau with an intricate and deeply-cut drainage system; and (4) a more recent plateau of the Columbia lava flows, of Miocene age.

The mineral deposits of the great granite area are fissure veins, containing gold and silver in a quartzose gangue. The adjoining sedimentary areas carry either veins or contact deposits of irregular shape, generally containing silver, lead, zinc and copper. The Tertiary volcanic rocks contain in places gold and silver veins

of peculiar character. Considerable amounts of placer deposits are found in the gravels associated with the Neocene lake-beds. It is considered that some of the mineral veins may be of Cretaceous or Eocene age, some may be older, and others are post-Miocene.

Mr. W. H. Weed describes the geology of the Little Belt Mountains, Montana, an elevated and eroded plateau region. Gneisses and schists form a central core, upon which rest a great variety of sedimentary rocks, penetrated by igneous rocks, which appear as dykes, sills and laccolites. Silver-lead ores, gold, iron ores and sapphire mines are described. The petrography of the igneous rocks is dealt with by Mr. L. V. Pirsson, who describes syenite, monzonite, shonkinite (a basic granitoid rock) and many other rocks. The rock in which the sapphires occur is allied to the minettes and shonkinite, and it appears to have derived its alumina from clay-shales through which it was intruded; the molten rock on its way incorporating shale-fragments in its mass. The many subjects dealt with in this elaborate memoir are fully illustrated with views, diagrams and plates of microscopic sections of rocks.

Part iv., on "Hydrography," deals with stream measurements and reservoir sites, and there is a special article on Nicaragua. The volume is well illustrated with views and diagrams. Part v. is on "Forest Reserves," and has excellent maps, views of scenery and woodland, and notes on soils and timber-trees. Part vii., "Explorations in Alaska," is a volume of more than 500 pages, profusely illustrated, and dealing with the topography, geology, agriculture, game, and inhabitants.

Mr. George H. Eldridge gives an account of a reconnaissance in the Sushitna Basin and adjacent territory. Here the geological formations include granite, schists and slates, and a series of conglomerates and sandstones of undetermined age; also sandstones and shales with coal-seams belonging to the Eocene; and sundry Drift deposits. Traces of gold occur in the pyritiferous quartz of the slate series, but elsewhere in placer deposits. The coal is a low-grade lignite.

Mr. J. E. Spurr deals with south-western Alaska, and his report is accompanied by a coloured geological map showing gneiss and schists, Silurian, Carboniferous-Devonian, Jurassic, Cretaceous, Eocene and later deposits, as well as Tertiary intrusive and volcanic rocks. He describes as fully as possible the sedimentary and eruptive rocks, and with regard to the latter employs the name Alaskite group for certain quartz-alkali-felspar rocks, and Belugite group for rocks transitional between the diabasic and dioritic families.

Mr. W. C. Mendenhall describes the country from Resurrection Bay to the Tanana River; Mr. F. C. Schrader deals with a part of Prince William Sound and the Copper River district; and Mr. A. H. Brooks with the White and Tanana River basins.

One general conclusion is that Alaska is eminently not the place for the haphazard or untrained prospector; and that in the long run only those who have the intelligence, training, and patience to study the conditions of the occurrence of gold can hope to succeed.

We have received the first and sixth parts of the Twenty-first Annual Report. In Part i. the director, Mr. Charles D. Walcott, refers to the reorganisation of the geological branch which came into effect in July 1900. The need was felt of closer and permanent supervision in scientific lines, and the Geological Survey was subdivided and each division placed in charge of a specialist as follows:—Areal Geology (stratigraphy, structure and pre-Pleistocene physiography), Bailey Willis; Pleistocene Geology, T. C. Chamberlin; Palæontology, T. W. Stanton; pre-Cambrian and Metamorphic Geology, C. R. Van Hise; Mining and Mineral Resources (distribution and production of economic minerals), D. T. Day; Economic Geology (metalliferous ores), S. F. Emmons (non-metalliferous deposits, &c.), C. W. Hayes; Physical and Chemical Research, G. F. Becher. Accompanying this volume is an obituary notice of Prof. O. C. Marsh, prepared by Mr. Arnold Hague.

Part vi. consists of two volumes, dealing with mineral resources. The great demand for mineral products led to an increase in 1899 over 1898 of more than 10 per cent. in output and of more than 39 per cent. in value. Nearly every important "mineral" participated in this increase, notably pig iron, copper, coal, natural gas, petroleum, cement and stone. Lead showed a decline. The value of grindstones was large and that of oilstones and whetstones the largest on record. Pigments, again, were in great demand. Fuller's earth was produced in less quantity and more was imported; it is used partly for decolorising vegetable oils.

We have also received a reprint from the Twenty-first Annual Report, Part iii. (1901)—a Report on the Geology of the Philippine Islands, by Mr. George F. Becker, with notes on the Tertiary fossils, by Mr. K. Martin. In these islands schists and massive crystalline rocks occur, together with diorites, diabases, and gabbros. Of newer volcanic rocks there are basalt, andesite, dacite, and probably trachyte and rhyolite. A considerable number of volcanoes have ejected ash and lava recently, or since the occupation of the country by the Spaniards. Tertiary strata from Eocene upwards are well developed in the islands, but have been imperfectly studied. Of mineral resources there is a brown coal of Tertiary age, while gold-mining is an ancient industry. Even the tricks of the trade are not unknown to the natives, and they "nearly succeeded in inducing some American officers to take an interest in gravel salted with brass filings." The auriferous deposits include veins, placers, and river sands. The occurrence of copper, argentiferous lead-ore, and magnetic iron-ore is noticed.

In addition to the Reports already mentioned, we have received Nos. 163 to 176 of the *Bulletin* of the United States Geological Survey, all published in 1900. These deal with a variety of subjects, and not the least useful is that by Mr. F. B. Weeks (No. 172)—a bibliography of American geology for 1899, in which 799 articles are listed and indexed.

Of purely geological articles we have a reconnaissance in the Rio Grande coal-fields of Texas (No. 164), by Mr. T. V. Vaughan. Although the State is by far the largest in the Union, embracing a quarter of a million square miles of territory, it stands low in the scale of coal producers. The coals occur in strata of Upper Cretaceous and Eocene age, and they vary in thickness from a few inches up to 7 feet. Details are given of the strata and their fossils, and it is remarked that there are not yet sufficient data to trace accurately the boundary between the Cretaceous and Eocene. The Cretaceous coals of the Eagle Pass coal-field are regarded as of anthracitic type, and as by far the best fuel in America except the true anthracites of Pennsylvania. The Eocene coal is strictly speaking a lignite. Mr. E. C. E. Lord contributes a report on the igneous rocks of the San Carlos coal-field. These rocks indicate late Cretaceous or early Tertiary lava flows, and comprise rhyolite breccia, quartz-pantellerite, and basalt.

Contributions to the geology of Maine are made (in No. 165) by Mr. H. S. Williams and Mr. H. E. Gregory. Mr. Williams deals with the Silurian and Devonian faunas, and enters into a discussion of the characters and evolution of the Rhynchonellas. He remarks that there is no question as to the great importance of internal characters for purposes of determining the genetic relationship of organisms; but it is also a fact that the external characters do not cease to be of similar value. He points out that the taxonomic rank of characters rests

primarily upon their relative fixity, and not upon their supposed importance in the individual economy of the organism. Generic characters to be of taxonomic value must be distinguished from varietal and specific characters by their greater fixity, or what may be defined as their more exact reproduction or transmission in generation. He further remarks that the attempt closely to correlate specimens with some particular species diverts the attention from the evolutional laws which the evidence contains and illustrates. The study of a single group of species demonstrates the fact that the evolutional stage of the group is indicated with precision, independent of the names of the species, and independent of the fact that the specimens actually present in the Maine fauna agree precisely in scarcely a single case with those of any fauna in New York.

Mr. Gregory reports on the geology of the Aroostook volcanic area. North-eastern Maine is essentially a region of sedimentary rocks, with prominent exposures of igneous rocks in Castle Hill and Mapleton townships. This area appears to have been a distinct centre of volcanic activity. Rhyolites, trachytes and andesites are described. Elsewhere there are tracts of granite and other igneous rocks.

Of purely palæontological papers there is an account of the flora of the Montana formation (No. 163) by Mr. F. H. Knowlton. The formation is approximately of Laramie (late Cretaceous) age. There is also an elaborate synopsis of American fossil Bryozoa (No. 173) by Mr. J. M. Nickles and Mr. Ray S. Bassler.

Contributions to chemistry and mineralogy, with analyses of rocks, are given (in Nos. 167 and 168) by Mr. F. M. Clarke. Various crystalline and sedimentary rocks, soils, and meteorites, are dealt with. Mr. W. F. Hillebrand treats of some principles and methods of rock analysis (in No. 176). Of miscellaneous reports we have a gazetteer of Utah (No. 166), altitudes in Alaska (No. 169), and other topographical papers (Nos. 170, 171, 174 and 175).

Several Monographs published by the U.S. Geological Survey have also been received. Monograph No. 39 (1900) contains an account of the Eocene and Lower Oligocene Coral Faunas of the United States with descriptions of a few doubtfully Cretaceous species, by Mr. T. Wayland Vaughan. The author laments that the classification of corals is in a most unsatisfactory condition, but he has described his material with all possible care in the hope that ere long some one may be able to give a classification based on the actual phylogenetic grouping of the various genera. The larger the number of specimens the more difficult it is to define species: Mr. Vaughan has tried to be conservative, and when a form in one horizon grades into a form in the horizon next above, he has named them varieties of the same species, even when the variety possesses an individuality that makes it easily recognisable.

In Monograph No. 40 (1900) Mr. S. H. Scudder deals with certain Coleoptera from the Tertiary deposits at Florissant, Colorado, and gives a systematic list of the non-rhynchophorous Tertiary Coleoptera of North America.

NOTES.

H.R.H. THE PRINCE OF WALES has accepted the presidency of the Society of Arts, which was vacated by His Majesty the King on his accession.

DR. WILLIAM SOMERVILLE, late professor of agriculture at the University of Cambridge, has been appointed to be an assistant secretary to the Board of Agriculture in succession to Sir Jacob Wilson, who has retired.

DR. ARTHUR SMITH WOODWARD, F.R.S., has been appointed keeper of the Geological Department of the British Museum (Natural History), South Kensington, in succession to Dr. Henry Woodward, who retired on November 23 after a service of nearly forty-four years. Curiously enough, there is no family relationship between the present and past keepers.

MAJOR A. W. ALCOCK, F.R.S., Superintendent of the Indian Museum, Calcutta, informs us, that Mr. L. de Niceville died at Calcutta of fever contracted in the Darjeeling Terai, on December 3.

IT is announced by Dr. D. Morris that the fourth annual West Indian Agricultural Conference will be held at Barbados on January 4 and 6, 1902. The object of the conference, as laid down by the Secretary of State, is the reading of papers and discussion on the scientific and economic aspects of the sugar-cane and other industries. It is hoped that the subjects brought forward will be dealt with from a thoroughly practical point of view and with a full knowledge of the requirements and circumstances of each colony concerned.

THE death of Mr. James G. Shipman, F.G.S., deprives geological science of an ardent local worker, who did much to enlarge our knowledge of the rocks and fossils of the neighbourhood of Nottingham. He commenced life in comparatively humble circumstances; he was apprenticed to the printing trade, and was finally given a post on the sub-editorial staff of the Nottingham *Daily Express*. His interest in geology was aroused by lectures given more than thirty years ago by the late Edward Wilson. Thereafter he devoted himself to the subject with remarkable assiduity. His leisure hours were spent in studying all sections within reach of Nottingham, and he contributed a number of papers, chiefly on the Drift and Triassic deposits, to the Annual Report and *Transactions* of the Nottingham Naturalists' Society. Latterly he had paid much attention to the structure of the Nottingham and Derbyshire Coal-field, and had qualified himself to give expert advice on water-supply. He died on November 21, aged fifty-three.

A REUTER'S telegram states that Mr. William Bruce, the leader of the Scottish Antarctic expedition, has purchased the Norwegian steam whaler *Hecla* for his forthcoming expedition to South Polar regions. The *Antarctic*, with Prof. Nordenskjöld's South Polar expedition on board, left Buenos Ayres on Friday for the Falkland Islands. The *Discovery* left Lyttelton for Dunedin on Saturday afternoon, and has by now sailed for the Antarctic.

PROF. H. HERGESELL, president of the International Aëronautical Committee, informs us that arrangements are being made to continue the manned and unmanned balloon ascents during 1902, the dates proposed being the first Thursday in each month, except January, when the second Thursday is selected. Since November 7, 1900, 120 ascents have been made; the observations are now being discussed and will throw much light on the physics of the upper air. It is proposed to hold a meeting of the Committee next year in Berlin, when questions relating to new thermometers, observations of atmospheric electricity and magnetism will be discussed.

IN connection with the valuable series of forty years' observations taken at Camden Square (N.W. London), *Symons's Meteorological Magazine* for December contains the monthly results and extremes of solar temperatures for twenty-eight years commencing with 1870, made by both black and bright bulb radiation thermometers. The following are some of the values obtained by the black bulb *in vacuo*:—Highest monthly average, 123°·4, absolute maximum, 137°·7, both in July. Lowest monthly mean, 36°·9, absolute minimum, 24°·8, both in Decem-