carried out, during the years between the downfall of Louis Philippe and the final establishment of Napoleon III., an enthusiastic *Histoire de la Révolution Française*. Despite or because of its enthusiasm, this is by no means Michelet's best book. The events were too near and too well known, and hardly admitted the picturesque sallies into the blue distance which make the charm and the danger of his larger work. In actual picturesqueness as well as in general veracity of picture, the book cannot approach Carlyle's; while as a mere chronicle of the events it is inferior to half a dozen prosaic histories older and younger than itself. The *coup d'état* lost Michelet his place in the Record Office, as, though not in any way identified with the republic administratively, he refused to take the oaths to the empire. But the new *régime* only kindled afresh his republican zeal, and his second marriage (with Mademoiselle Adèle Malairet, a lady of some literary capacity, and of republican belongings) seems to have further stimulated his powers. While the history steadily held its way, a crowd of extraordinary little books accompanied and diversified it. Sometimes they were expanded versions of its episodes, sometimes what may be called commentaries or companion volumes. In some of the best of them natural science, a new subject with Michelet, to which his wife is believed to have introduced him, supplies the text. The first of these (by no means the best) was *Les Femmes de la Révolution* (1854), in which Michelet's natural and inimitable faculty of dithyrambic too often gives way to tedious and not very conclusive argument and preaching. In the next, *L'Oiseau* (1856), a new and most successful vein was struck. The subject of natural history was treated, not from the point of view of mere science, nor from that of sentiment, nor of anecdote, nor of gossip, but from that of the author's fervent democratic pantheism, and the result, though, as was to be expected, unequal, was often excellent. *L'Insecte*, in the same key, but duller, followed. It was succeeded by *L'Amour* (1859), one of the author's most popular books, and not unworthy of its popularity, but perhaps hardly his best. These remarkable works, half pamphlets half moral treatises, succeeded each other as a rule at the twelve months' interval, and the succession was almost unbroken for five or six years. *L'Amour* was followed by *La Femme* (1860), a book on which a whole critique of French literature and French character might be founded. Then came *La Mer* (1861), a return to the natural history class, which, considering the powers of the writer and the attraction of the subject, is perhaps a little disappointing. The next year (1862) the most striking of all Michelet's minor works, *La Sorcière*, made its appearance. Developed out of an episode of the history, it has all its author's peculiarities in the strongest degree. It is a nightmare and nothing more, but a nightmare of the most extraordinary verisimilitude and poetical power.

This remarkable series, every volume of which was at once a work of imagination and of research, was not even yet finished, but the later volumes exhibit a certain falling off. The ambitious *Bible de l'Humanité* (1864), an historical sketch of religions, has but little merit. In *La Montagne* (1868), the last of the natural history series, the tricks of staccato style are pushed even farther than by Victor Hugo in his less inspired moments, though—as is inevitable in the hands of such a master of language as Michelet—the effect is frequently grandiose if not grand. *Nos Fils* (1869), the last of the string of smaller books published during the author's life, is a tractate on education, written with ample knowledge of the facts and with all Michelet's usual sweep and range of view, but with visibly declining powers of expression. But in a book published posthumously, *Le Banquet*, these powers reappear at their fullest. The picture of the industrious and famishing populations of the Riviera is (whether true to fact or not) one of the best things that Michelet has done. To complete the list of his miscellaneous works, two collections of pieces, written and partly published at different times, may be mentioned. These are *Les Soldats de la Révolution* and *Légendes Démocratiques du Nord*.

The publication of this series of books, and the completion of his history, occupied Michelet during both decades of the empire. He lived partly in France, partly in Italy, and was accustomed to spend the winter on the Riviera, chiefly at Hyères. At last, in 1867, the great work of his life was finished. As it is now published it fills nineteen volumes. The first of these deals with the early history up to the death of Charlemagne, the second with the flourishing time of feudal France, the third with the 13th century, the fourth, fifth, and sixth with the Hundred Years' War, the seventh and eighth with the establishment of the royal power under Charles VII. and Louis XI. The 16th and 17th centuries have four volumes apiece, much of which is very distantly connected with French history proper, especially in the two volumes entitled *Renaissance* and *Réforme*. The last three volumes carry on the history of the 18th century to the outbreak of the Revolution. The characteristics which this remarkable history shares with Michelet's other works will be noted presently. At present it may be remarked that, as the mere division of subjects and space would imply, it is planned on very original principles. Michelet was perhaps the first historian to devote himself to anything like a picturesque history of the Middle Ages, and his account is still the most vivid though far from the most trustworthy that exists. His inquiry into manuscript and printed authorities was most laborious, but his lively imagination, and his strong religious and political prejudices, made him regard all things from a singularly personal point of view. Circumstances which strike his fancy, or furnish convenient texts for his polemic, are handled at inordinate length, while others are rapidly dismissed or passed over altogether. Yet the book is undoubtedly the only history of France which bears the imprint of genius, and in this respect it is not soon likely to meet a rival.

Uncompromisingly hostile as Michelet was to the empire, its downfall and the accompanying disasters of the country once more stimulated him to activity. Not only did he write letters and pamphlets during the struggle, but when it was over he set himself to complete the vast task which his two great histories had almost covered by a *History of the Nineteenth Century*. He did not, however, live to carry it further than Waterloo, and the best criticism of it is perhaps contained in the opening words of the introduction to the last volume—"l'âge me presse." The new republic was not altogether a restoration for Michelet, and his professorship at the Collége de France, of which he contended that he had never been properly deprived, was not given back to him. He died at Hyères on the 9th of February 1874, and an unseemly legal strife between his representatives took place as to his funeral.

The literary characteristics of Michelet are among the most clearly marked and also among the most peculiar in French literature. A certain resemblance to Lamennais has been already noted, and to this may be added an occasional reminiscence of the manner of Bossuet. But in the main Michelet, even in the minor details of style, is quite original and individual. His sentences and paragraphs are as different as possible in construction and rhythm from the orderly architecture of French classical prose. A very frequent device of his (somewhat abused latterly) is the omission of the verb, which gives the sentence the air of a continued interjection. Elsewhere he breaks his phrase, not finishing the regular clause at all. In these points and many others the resemblance to his contemporary Carlyle is very striking; and, different as were their points of view, their manners of seeing were by no means unlike. History to Michelet is always picturesque; it is a series of tableaux. Allusion has been already made to the singular perspective in which these tableaux are drawn, a perspective so strange that a reader unacquainted with the actual size and relation of the objects represented is certain to be deceived. Nothing indeed is further from Michelet's purpose than deceit. Although a strong republican, an ardent anti-sacerdotalist, and a patriot of fanatical enthusiasm, he is always scrupulously fair as far as he understands what he is doing. For instance, his hatred for England and Englishmen is one of the most comically intense passions in literature. He is never tired of exclaiming against their diabolical pride, their odious jealousy of France, their calculating covetousness, and so forth. In his excited imagination the long drama of European history is a kind of conflict of Ormuzd and Ahriman, in which France, it is needless to say, plays the first part and England the second. Yet he is never unfair to English fortitude and coolness, never (after the childish fashion of some of his countrymen) slurs over English victories, and often expresses genuine admiration (mixed, it is true, with a shudder or two of aversion) for the masterful ways and constantly advancing prosperity of the English people. So, with all his dislike to the priesthood, he never is chary of praise to pope or monk whenever it can fairly be given, and, with all his republicanism, he is never weary of worshipping the heroism of a great king. But his poetical fashion of dealing with events, his exaggeration of trivial incidents into great facts of history, his fixed ideas, especially in reference to the intellectual and social condition of mediæval times, the evils of which he enormously exaggerates, and his abiding prejudices of a general kind combine to distort his accounts in the strangest fashion. A laborious person might pick out of contemporary authors a notable collection of erroneous views of which Michelet is not so much the author as the suggester, for it is when his brilliant exaggerations are torn from their context and set down in some quite other context as sober gospel that they are most misleading to those who do not know the facts, and most grotesque to those who do. This is especially the case in regard to literature. Michelet began his great work too early to enjoy the benefit of the resurrection of old French literature which has since taken place; and though his view of that literature partakes of the amorous enthusiasm which colours his view of everything French, it is astoundingly incorrect in detail. The most remarkable passage of all perhaps is the passage in his *Renaissance* relating to Rabelais, Ronsard, and Du Bellay, a passage so widely inconsistent not only with sound criticism but with historic fact that the author (a very rare thing with him) makes a kind of half apology for it elsewhere. Of the work of the age of chivalry proper, the chansons de gestes, the Arthurian romances, the early lyrics and dramas, he evidently knew but little, and chose to subordinate what he did know to his general theories of the time. Even much later his praise and blame, though transparently honest, are quite haphazard. Unless, therefore, the reader be gifted with a very rare faculty of applying the "grain of salt" to what he reads, or unless he be well acquainted with the actual facts before coming to Michelet's version of them, he will almost certainly be misled. But despite this grave drawback (which attends all picturesque history) the value of Michelet merely as an historian is immense. Not only are his separate tableaux, the wonderful geographical sketch of France in the beginning of the book, the sections devoted to the Templars, to Joan of Arc, to the Renaissance, to the Camisards, almost unequalled, but the inspiriting and stimulating effect of his work is not to be surpassed. If his reconstruction is often hazardous and conjectural, sometimes definitely and demonstrably mistaken, and nearly always difficult to adjust entirely to the ascertained facts, it is always possible in itself, always instinct with genius, and always life-like. There are no dead bones in Michelet; they are if anything only too stirring and lively. These criticisms apply equally to the minor books, though these are necessarily fuller of the author's somewhat wearisome propaganda, and less full of brilliantly painted facts. The great fault of Michelet as of not a few other modern authors is the comparatively improvised and ephemeral character of too much of his work. His immense volume is, much of it, mere brilliant pamphleteering, much more mere description equally brilliant but equally liable to pass. Nevertheless he is (especially in French, the language *par excellence* of measured and academic perfection) so characteristic and singular a figure in his turbid eloquence and fitful flashing insight that he is never likely to lose a place, and a notable one, in literary history.

Almost all Michelet's works, the exceptions being his translations, compilations, &c., are published in uniform size and in about fifty volumes, partly by Marpon and Flammarion, partly by Calmann Lévy.

(G. SA.)

MICHELL, JOHN, an eminent English man of science of the 18th century. He received his university education at Queen's College, Cambridge. His name appears fourth in the Tripos list for 1748–49; and in 1755 he was moderator in that examination. He was a fellow of his college, and became successively Woodwardian professor of geology (in 1762) and rector of Thornhill in Yorkshire. He was elected a member of the Royal Society in the same year as Henry Cavendish (1760). He died in 1793. In 1750 he published at Cambridge a small work of some eighty pages, entitled *A Treatise of Artificial Magnets, in which is shown an easy and expeditious method of making them superior to the best natural ones*. Besides the description of the method of magnetization which still bears his name, this work contains a variety of acute and accurate magnetic observations, and is particularly distinguished by a lucid exposition of the nature of magnetic induction. He is now best known as the original inventor of the torsion balance, which afterwards became so famous in the hands of its second inventor Coulomb. Michell described it in his proposal of a method for obtaining the mean density of the earth. He did not live to put his method into practice; but this was done by Henry Cavendish, who made, by means of Michell's apparatus, the celebrated determination that now goes by the name of Cavendish's experiment (*Phil. Trans.*, 1798).

Michell's other contributions to science are—"Conjectures concerning the Cause and Observations upon the Phenomena of Earthquakes," *Phil. Trans.*, 1760; "Observations on the Comet of January 1760 at Cambridge," *Ib.*, 1760; "A Recommendation of Hadley's Quadrant for Surveying," *Ib.*, 1765; "Proposal of a Method for measuring Degrees of Longitude upon Parallels of the Equator," *Ib.*, 1766; "An Inquiry into the Probable Parallax and Magnitude of the Fixed Stars," *Ib.*, 1767; "On the Twinkling of the Fixed Stars," *Ib.*, 1767; "On the Means of Discovering the Distance, Magnitude, &c., of the Fixed Stars," *Ib.*, 1784.

MICHELOZZI, MICHELOZZO (1391–1472?), was a Florentine by birth, the son of a tailor, and in early life a pupil of Donatello. He was a sculptor of some ability in marble, bronze, and silver. The statue of the young St John over the door of the Duomo at Florence, opposite the Baptistery, is by him; and he also made the beautiful silver statuette of the Baptist on the altar-frontal of San Giovanni. Michelozzi's great friend and patron was Cosimo I. dei Medici, whom he accompanied to Venice in 1433 during his short exile. While at Venice, Michelozzi built the library of San Giorgio Maggiore, and designed other buildings there. The magnificent Palazzo dei Medici at Florence, built by Cosimo, was designed by him; it is one of the noblest specimens of Italian 15th-century architecture, in which the great taste and skill of the architect has combined the delicate lightness of the earlier Italian Gothic with the massive stateliness of the Classical style. With great engineering skill Michelozzi shored up, and partly rebuilt, the Palazzo Vecchio, then in a ruinous condition, and added to it many important rooms and staircases. When, in 1437, through Cosimo's liberality, the monastery of San Marco at Florence was handed over to the Dominicans of Fiesole, Michelozzi was employed to rebuild the domestic part and remodel the church. For Cosimo I. he designed numerous other buildings, mostly of great beauty and importance. Among these were a guest-house at Jerusalem, for the use of Florentine pilgrims, Cosimo's summer villa at Careggi, and the strongly fortified palace of Cafagiuolo in Mugello. For Giovanni dei Medici, Cosimo's son, he built a very large and magnificent palace at Fiesole. In spite of Vasari's statement that he died at the age of sixty-eight, he appears to have lived till 1472. He is buried in the monastery of San Marco, Florence. Though skilled both as a sculptor and engineer, his fame chiefly rests on his architectural works, which claim for him a position of very high honour even among the greatest names of the great 15th-century Florentines.

MICHIGAN, one of the States of the American Union, situated in the region of the great lakes. It lies between 41° 42′ and 47° 32′ N. lat., and 82° 24′ and 90° 31′ W. long., the centre of the State being 670 miles north of west from New York, the nearest point on the seaboard. The area is 58,915 square miles. The State consists of two

natural divisions, known as the Upper and the Lower Peninsula. The Upper or Northern Peninsula is bounded on the N., E., and S. by Lakes Superior, Huron, and Michigan, and on the W. by the river St Mary and the State of Wisconsin. The Lower Peninsula is bounded on the W., N., and E. by Lakes Michigan, Huron, St Clair, and Erie, and the St Clair and Detroit rivers, and on the S. by the States of Ohio and Indiana. The general contour of the Lower Peninsula approaches that of a horse-shoe, with an average width of about 200 miles from east to west and a length of about 300 miles from north to south. Its surface gradually rises in gentle undulations from the surrounding lakes to an elevation of about 400 feet above Lake Huron, no point reaching an altitude of more than 600 feet. The Upper Peninsula is much more rugged in contour and surface, at some points reaching an elevation of about 1100 feet. The territory was originally covered with forests, with only here and there a small open prairie. It abounds in fine inland lakes, with areas varying from a few acres to several miles. The rivers are not large enough to be navigable, but they afford ample water-power, and are particularly valuable for floating down the logs of the lumbering districts. The coast-line of the State is not less than about 1600 miles in length; and along the whole of this distance vessels of 2000 tons may pass without losing sight of land.

Geological Formation.—The Lower Peninsula occupies the central part of a great basin, the borders of which extend to the east as far as London, Ontario, and to the west as far as Madison, Wisconsin. Within these limits the traveller starting in any direction from the centre of the State encounters successively the outcropping edges of older and older strata. The whole series has been likened to a nest of wooden dishes; it embraces not only the Laurentian and Huronian systems but also the numerous groups that go to make up the Silurian, the Devonian, the Carboniferous, and the Quaternary systems. These several formations are covered almost universally with a drift of finely comminuted and triturated rock, borne thither by moving glaciers and floating icebergs, or washed to its present position by currents of water, while the surface was still submerged. This loose material varies in thickness, sometimes extending to a depth of 200 or 300 feet. While the lower formations contain almost inexhaustible deposits of copper, iron, gypsum, and salt, the surface soil is pre-eminently fertile, uniting all the mineral constituents necessary for the most luxuriant growth of plants. There are limited areas of light and somewhat sterile drift soil; but even these have shown themselves under proper treatment to be capable of yielding a rich vegetation. For the most part the drift soil is composed of a mixture of clay with sand and gravel. It is easily cultivated, is retentive of moisture, and is sufficiently porous to prevent the injury of crops by excessive rains.

Climate and Natural Products.—The mean temperature of Lansing, the capital of the State, as determined by observations extending through eighteen years, is 46°·71 Fahr., or about the same as that of Berlin. During the summer months the mean temperature is nearly the same as that of Vienna; in the winter it is nearly that of Stockholm. The annual rainfall during the eighteen years previous to 1882 was about 31 inches. This is very evenly distributed throughout the year, though a little more than half the amount falls in the five months from May to October. The average snowfall in the centre of the State is about 4 feet, though it is seldom that more than 12 inches lie on the ground at any one time. The winter temperature is much modified by the open water of the adjacent lakes. The severe winds are commonly from the west and north-west; but in sweeping across the open waters of Lake Michigan they are so far softened as to make the climate much milder than that found in the same latitude on the western side of the lake. This peculiarity is specially favourable to the growth of fruits. Peaches are grown successfully along the 45th parallel, and figs thrive in the open air in lat. 42½°. The modifying influence of the lake winds also gives great variety to the flora. The predominant woods are oak, maple, beech, elm ash, cherry, hickory, walnut, basswood, and pine. All these grow luxuriantly in the vast forests of the State, and afford an abundant supply of the best timber. There are 165 species of trees and shrubs indigenous to Michigan; and the entire flora of the State makes a list of 1634 species.

Cereals and Fruits.—The most important crop of Michigan is wheat, and the average yield per acre, as shown by the latest census, is greater than that of any other State in the Union. The acres sown in 1879 were reported as 1,822,749, and the amount produced as 35,532,543 bushels. These figures show that Michigan is fourth in rank of the wheat-producing States, the number of bushels grown being exceeded by the crops of Illinois, Ohio, and Indiana. In 1879 the yield in bushels of the other principal cereals is shown by the following figures:—Indian corn, 32,467,452; oats, 18,190,793; barley, 1,204,316; rye, 294,918; buckwheat, 413,062; clover seed, 313,063; peas, 538,332. The crop of potatoes in the same year was 8,025,475 bushels, and the hay amounted to 1,051,115 tons. Of the fruits grown in the State apples are the most important, and these are believed to be unsurpassed in excellence in any country in the world. The sales in 1880 were 4,834,936 bushels, a considerable quantity going to the markets of Europe. Next in importance is the peach crop, annually gathered from more than fifty of the counties of the State. In 1880 the peach orchards were reported as covering 12,908 acres, and the fruit sold as amounting to 413,418 bushels. The long coast-line of Lake Michigan affords easy access to market even for the most perishable fruits. Besides the facilities thus afforded, the railroads that now thread the State, with an aggregate length in March 1882 of 4332 miles, afford abundant means of rapid transportation. As the fruit belt extends from north to south more than 200 miles, the danger of disastrous competition in the markets is obviated by prolongation of the season of ripening. At the meeting of the State Horticultural Society held in 1881 it was reported that the average value of the peach crop per acre was above $125. The ten volumes of the *Transactions* of the State Horticultural Society published since its organization in 1870 show that the development of fruit culture within the last decade has been much more rapid than in any other State.

Lumber.—The timber produce in Michigan is of superior quality, and the amount is so great that about two-thirds of the best lumber sold in New York, Philadelphia, and Boston go out from its mills. The logs are borne along the lakes, rivers, and small watercourses to the booms of mills situated at convenient points, where the lumber is sawed and shipped for the different markets of the world. Of these manufacturing districts those known as the Saginaw, the Grand River, and the Muskegon valleys are the most important. The Saginaw receives the waters of the Tittabawasse, the Cass, the Flint, the Shiawasse, the Bad, the Pine, the Chippewa, the Tobacco, and their numerous tributaries, draining a vast region that still yields an undiminished supply of pine. The forests of the western parts of the State are easily accessible by the Grand River and its tributaries, while those still farther north find a natural outlet through the numerous streams that flow into Lake Michigan. On the banks of these watercourses are

some of the largest and finest mills of the world. In 1854, when the first effort was made to collect statistics of this industry, it was found that there were only sixty-one mills in operation, and that the entire annual product was only 108,000,000 feet. Eighteen years later, in 1872, it was estimated that the annual product was not less than 2,560,000 feet of oak, 12,700,000 of staves, 300,000,000 lath, 400,000,000 shingles, and 2,500,000,000 of sawed pine. The number of saw-mills had already reached about 1500, the number of persons employed 20,000, and the capital represented $25,000,000. In 1881 the manufacture of pine lumber amounted to 3,919,500,000 feet, the value of which exceeded $60,000,000. The aggregate value of the forest products of the State was estimated in 1881 to have reached more than $1,000,000,000. *Forestry Bulletin*, No. 6, issued December 1, 1881, estimated the amount of standing white pine of merchantable quality at 35,000,000,000 feet, and the amount of standing hard wood at 700,000,000 cords. Besides these amounts, the same authority estimates the amount of hemlock at 7,000,000,000 feet, with 7,000,000 cords of bark, and an aggregate of 70,000,000 of cedar and tamarack. It is probable that before many years the hard wood produced by the State will approach in value the figures representing the value of the pine now sent to the markets of the world. It is probable that Michigan for many years to come will maintain its precedence as a lumber-producing State.

Mineral Resources.—Of the mineral products of Michigan the most important is iron. As early as 1842 the report of the first State geologist, Dr Douglas Houghton, called attention to the presence of hæmatite ore, though for a considerable time after this it was not found in such quantities as to make it certain that mining could be made profitable. Before 1860, however, it became known that iron in the Upper Peninsula not only existed in vast quantities, but also that it was of superior quality. From that time iron-mines were rapidly developed, until in 1881 they had come to exceed in value, though not in amount, even the products of Pennsylvania. In 1880 the product was 1,834,712 tons, with a value at the mines of $6,034,648, as against the yield in Pennsylvania of 2,185,675 tons, with a value of $5,517,079. The product of Michigan in 1882 was 2,948,307 tons of ore, with a market value of about $25,000,000. The Michigan minerals are of extraordinary richness,—62·9 per cent. being the average of the first-class ores, while the furnace books often show a much higher yield.

Next in importance to the iron-mines are those of copper. These are also situated in the Northern Peninsula, in the mountain range of trappean rocks which crown the point of land extending northwards into Lake Superior. This secondary peninsula or cape, known as Keweenaw Point, rises to an average height of about 600 feet above the lake, the highest pinnacles reaching nearly double that altitude. This point contains what are believed to be the richest copper-mines ever discovered; the metal is not found as an ore, but as virgin copper almost chemically pure. It has only to be separated from its rocky matrix, when it is ready for the market. The largest of the copper-mines, that at Calumet, has built up an industry which employs 2000 men, and its total product of refined copper in 1882 was no less than 50,770,719 lb, or one-eighth of the annual production of copper in the world. In quality the copper of the Lake Superior district is such that it commands the highest price at home and abroad. Its tenacity is remarkable, and therefore it is eagerly sought after for cartridges by all the great military powers. In 1882 the copper-mines paid dividends amounting to $2,900,000,—making an aggregate of $28,248,000 since they were opened.

Within a few years the salt-works of Michigan have also come to exceed those of any other State in the Union. The first well was sunk in 1859–60, but in 1882 the production was found to have exceeded that of the famous works in New York, and to have amounted in that year to no less than 3,204,921 barrels. The extraordinary development of this industry is due to several causes. A careful system of inspection by State authority has kept its salt unsurpassed in purity. The salt basin is not only accessible by navigable waters, so as to have the advantage of cheap transportation, but the wells are situated in the great lumber-producing districts, and the manufacture is thus carried on at very small expense, in connexion with the saw-mills. The power is furnished by the same engines, the exhausted steam is used for the evaporation of brine during the day, and during the night evaporation is still carried on by means of refuse wood and sawdust, while the staves for barrels are made from rejected timber. By this system the best quality of salt is obtained at a minimum expense. The chief reservoir of salt is the series of sandstones and shales constituting the Waverly group. This salt-producing rock covers no less than about 8000 square miles, and it is safe to presume that the supply is inexhaustible. The average depth of the wells is about 800 feet, but in some localities wells sunk to nearly 2000 feet have been remunerative. Important salt-works have recently been developed in the western part of the State.

There are also certain other minerals of considerable importance. Deposits of gypsum, easily accessible, practically inexhaustible in quantity, and superior in quality, are found in several localities both in the eastern and in the western parts of the Lower Peninsula. In the outskirts of Grand Rapids the deposit crops out at the surface, and at an average depth of from 40 to 70 feet extends over an area of 10 or 12 square miles. The rock is easily quarried, and is either ground for use as a fertilizer or calcined into plaster of Paris. The deposits of coal are supposed to cover about 8000 square miles, but as yet the product at any one point has not been very considerable. In quality the coal is highly bituminous, and is not sufficiently pure to be useful for smelting or for the manufacture of gas. For these reasons the stock of coal in the State is practically untouched. If future explorations and experiments should make these deposits available, a new era in the manufacture of iron will be the result. At present the coal for smelting the Lake Superior ores is brought chiefly from Ohio and Pennsylvania. Quarries of limestone and of sandstone have been opened in various parts of the State. The brown stone of the Upper Peninsula is of excellent quality, and is capable of receiving a high finish. The supply is inexhaustible, and the accessibility of the quarries by water gives promise of a thriving industry. The grindstones taken from the Huron county quarries are of superior quality, and the slates found in unlimited quantities on the shores of the Huron Bay are unsurpassed in point of durability and colour. Clays and sands of commercial value are found in great abundance. Though the manufacture of glass is yet in its infancy, sands in large quantities have been discovered in Monroe county suitable for the manufacture of plate glass of excellent quality. Brick and tile clays are found in all parts of the State. Though native silver has been found in small quantities in the Upper Peninsula, the systematic mining of this metal has not yet been carried on with successful results. The *Report* of the commissioner of mineral statistics for 1882 shows that, except as to coal, Michigan is the foremost of all the States in mineral wealth.

Fisheries.—The geographical position of Michigan explains the fact that its fresh-water fisheries are the most productive in the United States. The most important varieties of fish are lake-trout,

sturgeon, bass, pickerel, herring, brook-trout, grayling, and white-fish. General laws for the protection of fish have been passed; and a fish commission has been maintained for some years for the purpose of propagating the best varieties and planting them in waters adapted to their natural development. Up to the close of 1880 the commissioners had planted about 80,000,000 young white-fish, 1,000,000 silver eels, 1,000,000 lake-trout, 2,000,000 salmon, and 500,000 brook-trout, besides smaller numbers of shad, grayling, pike, and bass. Excellent results have followed, especially in the multiplication of white-fish, salmon, and eels. In 1879 the total "take" was 24,013,100 lb, of which 12,902,250 lb were white-fish, the most valuable lake-fish known to epicures and to commerce. During winter large quantities preserved by freezing are taken to Eastern markets, where they are readily sold at a high price.

Educational Institutions.—As early as 1785 the law of congress which provided for the sale of lands north of the Ohio river reserved for the support of public schools "section 16" of each township. This fundamental law devoted to educational purposes one-thirty-sixth of all the lands of that vast domain known as the north-western territory. The "ordinance of 1787," by which this territory was organized, further provided that "schools and the means of education shall for ever be encouraged." In 1826 this congressional action was supplemented by a grant to Michigan of two townships of land for the founding and support of a university. When Michigan became a State in 1837, its educational policy took definite form. The constitution provided, not only that the grant of "section 16" should be devoted exclusively to the support of schools of the primary grade, but also that the State and not each township should be the custodian of the lands so appropriated. The constitution expressly provided that the proceeds from the sale of "school lands" should be held by the State as a perpetual fund, the interest of which should be annually applied to the support of primary schools. The lands devoted to school purposes in Michigan under these provisions amounted to 1,077,209 acres, of which, in September 1881, 675,000 acres had been sold. On the sum realized by these sales, $3,095,679, the State pays interest at 7 per cent., and the resulting income, amounting to $216,645, is annually distributed to the schools. This source is supplemented from local taxes, so that in 1881 the total sum realized from all sources for the primary schools was $3,644,778.

The schools organized under State law are known as graded and ungraded. In the small districts where the schools are under the charge of but one or two teachers, grading is impracticable. Of ungraded districts there were in 1881 6120, attended by 219,570 children, while the graded schools were 404 in number, with an attendance of 152,043. The school census includes all children between the ages of five and twenty, amounting in 1881 to 518,317, of whom there was an average attendance of 391,401. To all children of school age the public schools are free, though a fee may be required for advanced studies in the high schools. The immediate administration of the schools is entrusted to school officers elected annually by the tax-payers of the individual districts. The State constitution requires that a free school shall be in session at least three months of every year in each district. In districts of more than 30 and less than 500 children, the law requires at least five months of school; while in districts of more than 500 children, the session must be not less than nine months in length. In the graded schools the division is into primary schools, grammar schools, and high schools, each of these divisions retaining the scholar ordinarily four years. At the end of the course the student is ready for the university, to which, under certain restrictions provided by the university itself, he is admitted on diploma from the high school. The university of Michigan, situated at Ann Arbor, was first opened for instruction in 1841. It now (1883) consists of the department of literature, science, and the arts, the department of medicine, the department of law, the college of homœopathic medicine, the school of pharmacy, the college of dental surgery, and the school of political science. Connected with the medical departments are the State hospitals. In 1881–82 there were 86 officers of instruction and 1534 students. The total income for the year 1879–80 from Federal grant, State grants, and fees was $231,339. The general control of the university is placed in the hands of eight regents elected by popular suffrage at the biennial spring elections, two regents being chosen at each election. The normal school, situated at Ypsilanti, and generously supported by the State, may be said to complete the school system.

Charitable and Reformatory Institutions.—A school for the deaf, dumb, and blind, instituted under an Act passed in 1848, is situated at Flint, about 60 miles north-west of Detroit; in February 1882 it had 249 pupils. In 1879 a distinct school for the training of the blind was established at Lansing. The "State public school for dependent and neglected children" is devoted to the systematic education of such children as otherwise would have to be maintained in the county poorhouses. The pupils are divided into "families" of about thirty each, and are cared for in separate cottages, each cottage being under the charge of a "cottage manager." The school receives dependent children of sound health, and free from contagious disease; and it is made the duty of the officers having charge of the poor to send all such children between the ages of three and twelve to it. This institution, the pioneer of its kind, and one of the most useful of charitable schools, is situated at Coldwater, 132 miles south-west of Detroit. In February 1882 there were 320 children and 27 officers and teachers. The "Reform School" at Lansing is designed to reclaim juvenile offenders who have been convicted of some offence. A farm of 224 acres connected with the school is, in considerable part, tilled by the boys. The number of inmates in February of 1882 was 325. A similar school at Adrian has recently been instituted for girls. There are State asylums for the insane at Kalamazoo (715 patients) and Pontiac (499 patients). The legislature of 1881 provided for the establishment of an additional asylum in one of the northern counties of the Lower Peninsula.

Population.—In 1837 the State had 174,647 inhabitants. The numbers according to the different census returns from 1840 are given in the following table:—

Census.	Total.	Males.	Females.	Density per Square Mile.
1840	212,267	113,788	98,479	3·77
1850	397,654	209,897	187,757	7·07
1860	749,113	394,694	354,419	12·11
1870	1,184,059	617,745	566,314	20·01
1880	1,636,937	862,678	774,259	27·80

At the last census 388,508 of the inhabitants were of foreign birth, 97,346 being natives of the United Kingdom, 89,085 Germans, and 16,445 Scandinavians. In point of population the State, which was twenty-third in 1840, now stands ninth in the Union.

The following are the principal cities in the State, with population at the census of 1880:—Detroit, 116,340; Grand Rapids City, 32,016; Bay City, 20,693; East Saginaw City, 19,016; Jackson City, 16,105; Muskegon City, 11,262; Saginaw City, 10,525; Port Huron, 8883; Flint City, 8410; Lansing (the State capital), 8319; Ann Arbor, 8061; Adrian City, 7849; Battle Creek, 7063; Manistee, 6930; West Bay City, 6397; Alpena City, 6153; Ishpeming, 6039.

History and Government.—The State of Michigan is part of the territory that was first settled by the French, and until the fall of Canada into the hands of the British after the middle of the 18th century was under the government of New France. The territory was explored by Jesuit missionaries in the 17th century; but, although it was known at an early period that the lands were of exceptional excellence, very little progress was made in developing the resources of the territory until after the completion of the first half-century of the American Union. The surveyors employed by the general government to inspect the lands and report as to their fitness for settlement by the soldiers of the war of 1812 appear to have derived their impressions almost exclusively from the low lands in the south-eastern corner of the territory. The report, accordingly, was not favourable; and consequently the tide of immigration that had already begun to set in flowed steadily past Michigan into the territories farther west. It was largely for this reason that the early development of Indiana, Illinois, Iowa, and Wisconsin was somewhat more rapid than that of Michigan. But gradually the false impressions concerning the soil and climate were dispelled; and within the past few years the increase of the population and the growth of wealth have been very rapid. In 1851 the valuation of the State for purposes of taxation (which excludes much valuable property) was $30,976,270; in 1861, $172,055,808; in 1871, $630,000,000; at 1881, $810,000,000. The State constitution, adopted in 1837 at the time of admission to the Union, has been modified in some minor particulars; but in most respects it remains unchanged. The governor is elected for two years, with no restriction as to re-election. The legislature meets biennially in the first week of January, and usually continues in session till May. The supreme court consists of four judges chosen by popular vote for terms of eight years, one being elected every second year. Judges have been so frequently re-elected that the office may be said to be practically a permanent one, with a provision for termination in case of need. The State is divided into twenty-two judicial districts, in each of which a circuit court sits for the trial of causes of original jurisdiction, and of causes appealed from the justice courts. The judges of the circuit courts are also elected by popular suffrage. On political questions voting is open to all naturalized citizens of the male sex more than twenty-one years of age unless prevented by some natural disqualification. At school meetings the right of suffrage is extended so as to include tax-payers of either sex.

Authorities.—Frederick Morley, *Michigan and its Resources*, compiled under authority of the State, 2d ed., Detroit, 1882; *Walling's Atlas of Michigan, with an Account of the Topography, Climate, and Geology of the State*, by Alex. Winchell, LL.D.; James V. Campbell, *Outlines of the Political History of Michigan*; *Reports of the Secretary of the State Pomological Society of Michigan from 1871 to 1880*; *Report of the Commissioner of Education for* 1880; *Forty-fifth*