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CHAP. XXVII.

9 which they offer — Sam. יקריב which he offers (id. v. 11).

17 if from the year — Sam. and if from the year.

22 יקדיש he sanctifies — Sam. יקדיש איש a man sanctifies; Syr. גברא.

25 twenty gerahs shall be the shekel — Sam. twenty gerahs the shekel.

26 only the firstling — Sam. only every firstling אך כל; Sept. πᾶν πρωτότοκον.

30 of the fruit — Sam. ומפרי and of the fruit.

31 the fifth — Sam. and the fifth.

[זה ספר השלישי : קנין מאה ושלושים this is the third book (with) one hundred and thirty Kazzin.]

ARTICLE VI.

GOVERNMENTAL PATRONAGE OF KNOWLEDGE.

BY PROF. JAMES DAVIE BUTLER, LL.D., MADISON, WIS.

THE phrase "Knowledge is power" may be no older than Bacon; some say it is not so old; but the feeling it indicates runs back of all chronology and round the world. It is implied in the very name *man*, which means *thinker*, and which is as old as the pre-historic Aryan cradle.

In no portion of any community has the appreciation of knowledge in some form been more conspicuous than in the ruling class. According to Carlyle the first sovereign was called "king," being regarded, as by way of eminence, the *kenning* man, because he who *kens*, can. The feeling that knowledge is power we see in the African potentate when he saw the first plow turning up its furrow, exclaiming in royal rapture, "This will save me five wives." We see it in Peter the Great throwing his arms round the statue of Richelieu, and crying out, "Why were we not contemporaries? Then I would have given thee half my kingdom for teaching me to make the most of the other half." We see it in

Turks for ages baffled by Greek fire; and in savage chiefs always and everywhere seeking fire-arms, regardless of expense. We see it in Philip of Macedon writing that he thanked the gods less for his son Alexander than for Aristotle as his teacher.

Believing that *governmental patronage of knowledge* deserves more attention than, so far as I know, that theme has received, I propose, as the subject of the present Article, Some of the Modes in which Governments have Patronized Knowledge or Contributed to its Increase. Let us render unto Caesar the things which are Caesar's. I am well aware that public patronage is often more selfish than private gifts are. Frequently it has cost nothing to those public functionaries who have been its almoners, so that satirists would compare them to Dr. Reineke Fuchs prescribing for the sick lion a plaster torn off from the back of the bear. Still the application may have been as salutary as if the fox had made his medicament by the sacrifice of his own skin. So the dollars of the self-seeking may prove as beneficent as those of the benevolent, wherever money is the sinews of science.

Governments have been forced to patronize knowledge for their own *interest*, and that both in war and peace.

War under great captains has always been a science, and it has both called into its service the best knowledge of its time, and it has done its utmost to improve that knowledge. Mark the endeavors persisted in through all ages to render fortifications, navies, arms, and every warlike munition more scientific. Remember among the ancients the walls of Babylon, of the Romans, of China; the bridges of Darius, Xerxes, and Trajan; the Roman roads; the engines devised for Hiero by Archimedes.

Not a few governmental works of peace are no less noteworthy as marking dates in the progress of knowledge. Of this class are the palaces of the Pharaohs, Caesars, and of mediaeval or modern sovereigns by hundreds; the treasuries, from that of Athens to that of the United States; the Athenian propylaea; statues and fountains everywhere; the ancient

Colossus at Rhodes, — the modern at Munich; Egyptian obelisks, Roman pillars, arches, and aqueducts; the German Walhalla; halls of legislation, from the Roman senate-house to the new-born capitol at Washington, or the parliament-house at Melbourne costing a million sterling. These are but a small part of the forms in which — thanks to the helping hand of government, accorded either for self-preservation or self-aggrandizement — there has been an endeavor to incarnate art or science in some new embodiment, and that, if possible, superior to whatever had been realized.

Governments have patronized various departments of knowledge less *indirectly*. Music and the drama are specimens.

The chiefest among singers and players have been court musicians, and through court patronage have reached their acme. So have poets also been developed. Pindar and Theocritus, the Athenian dramatists, Horace and Virgil, Ariosto and Tasso are familiar examples. You may even see in the British Museum the title-deed to a lot bestowed by a king of Assyria on his poet-laureate before Rome was founded. The success of one has given hope to all. It used to be said that whenever Calhoun took snuff all South Carolina would sneeze. So when the pencil, dropped by Titian, was picked up by the Emperor on whose dominions the sun never set; when Charles the First hung a diamond cordon round the neck of Rubens; when the Grand Monarque invited Moliere to dine with him; when Wedgwood's queen's ware was adopted by Queen Charlotte, and when Goethe was buried in the mausoleum of the Duke of Weimar, every artist in the world felt honored and was stimulated. The use of public wealth by Pericles to pay for the admission of the Athenian demos into the theatre, has been pronounced a collateral recognition of the arts which expanded into the most intelligent fostering that they have ever had.

France, like Athens in her golden era, has always been a patron of the drama. In 1861 its annual appropriation to Parisian theatres was a million and a half francs. The Parisian opera founded in 1671 by public funds, in 1840 was

receiving from them almost a million francs a year. The new Opera, "le plus grand theatre de l'univers," which was opened on new year's day 1875, built at a cost of more than ten millions of dollars, is a government work. A century ago Voltaire said that France owed her comedy and her opera to two cardinals, who were prime ministers, and the latest authorities testify that national funds have made the *Théâtre Francais* what it is, and that without such assistance it could not retain its position. German exactions never stopped that aid. It was only for two years that they cut it down.

Another of the modes in which governments have advanced knowledge is through establishing *universities*.

Such institutions have sometimes proved rather cisterns to preserve than fountains yielding anything new. Yet these reservoirs have usually given a momentum to the knowledge they contain which has impelled it forward, and have not been without collateral influences.

> "Thither, as to a fountain, countless stars
> Repairing, in their golden urns draw light."

They pave the way for each new generation of scholars to reach more rapidly the limits of actual knowledge, and point out the quarters in which they are to push forward in order to enlarge it.

Next to the Academy at Athens founded by Plato and afterwards endowed in part by King Attalus, the earliest university on record was established by Ptolemy at Alexandria, nearly three centuries before Christ. Its faculties were three, — philosophy, philology, and medicine. It included a tropical and a zöological garden. It did something for the mathematical discoveries of Euclid, and for those of Ptolemy in geography and astronomy, which have been leavening the world for two thousand years.

The institution established by Constantine in A.D. 320 at Constantinople, boasted twelve Professors, who were maintained at the public expense. Thus, in the words of Newman: "First carried forth upon the wings of genius, and dissemi-

nated by the energy of individual minds or of single cities, knowledge was extended to and fro in the basin of the Mediterranean. Introduced, in course of time, to a more intimate alliance with political power, it received the means at the date of Alexander and of his successors, both of its cultivation and of its propagation. It was formally endowed under the Ptolemies, and at length became the direct object of the solicitude of the government under the Caesars." At the University of Rome in 1514, the Professors were one hundred and one. Their salaries were paid by the government. It may hence be inferred that those in similar mediaeval institutions of earlier origin were likewise so paid. Among such institutions were the University of Wittenberg, the cradle of the Reformation, founded twelve years earlier, in 1502, by a Saxon prince, with nine others in Germany still older; Oxford, where Oriel College was established by Edward II. in 1326; Bologna reckoned the oldest of all, dating from 1119, Salamanca from 1200, and Paris from 1215.

Whatever facts can be gleaned concerning the endowment of these and similar mediaeval institutions show them to have had patronage from the ruling powers. In 1050 the French king, Robert Capet, furnished board to a hundred clerks while they attended the lectures which were the seed that grew into the University of Paris. In 1365 the University of Vienna was chartered, as well as granted grounds, buildings, and exemption from taxes, by the reigning prince. In 1477 the University of Tübingen, at its foundation, was, by the favor of the pope, vouchsafed the avails of five benefices and of eight canonries. The University of Pisa being endowed by the pope with tithes, it was contended by some that Galileo, inasmuch as he was a layman, was disqualified for holding a professorship. The University of Leyden, at its foundation in 1574, was endowed by the Dutch republic, in the very darkest period of the struggle against Spain, with a handsome revenue, principally derived from the ancient abbey of Egmont. Universities never were so much encouraged by governments as at the present day. A new one

founded by Austria at Czernowitz, on her eastern frontier, was opened on the fourth of October 1875. The Prussian appropriation for the Berlin University in 1874 was 930,980 marks. (A mark is twenty-six cents.) In the same year Great Britain appropriated for her universities £52,027, and the Czar sent a donation of 25,000 rubles to that in Tomsk in Siberia. In 1875 the Berlin Federal Council voted 100,000 marks for the University of Strasburg.

In the same line with universities as nurseries of knowledge, ought to be classed *special schools* supported by government for imparting and increasing the best science in special departments.

Specimens of this sort are our national Naval School at Annapolis, costing $200,000 a year; West Point Academy, maintained by a much larger appropriation, $345,362 in 1874, and similar seats of science in several European states. At the head of all military academies stands the War-school at Berlin. The number of officers who can be here admitted is limited to forty a year. These students are selected after a rigid examination from a much larger number of candidates who have been seven years in preparation, and three of those years in military service. Advancing from such a starting-point what can their goal be in their specialty but the utmost limit of the attainable?

No class of men have done more to extend the bounds of human knowledge than professors in higher schools. Such names as Vesalius, Galvani, Volta, Galileo, Torricelli, De Saussure, Newton, Laplace, Berzelius, Oersted, Bopp, Boeckh, Ritter, Niebuhr, Curtius, Mommsen, will be remembered by every one, and hundreds more may be counted in biographical dictionaries. Professors, however, superannuate, die, or depart, but universities are professors who remain, never grow old, continually learn, as well as teach. They are either, as Bacon holds, "mines resounding on all sides with new works and further progress," or, at least, they are like the "tower of David builded for an armory, whereon there hung a thousand bucklers, all shields of mighty men."

The several States in the American Union, and foreign nations perhaps without exception, exempt from taxation the property of institutions dedicated either to the advancement or to the diffusion of knowledge. Our general government not only admits their imports free of duty, but, thanks to Agassiz! it lets all the alcohol they consume for scientific uses escape the domestic excise!

For promoting higher education the United States, previous to 1862, had patented 1,119,440 acres of land, and in that year added to its grant 9,600,000 acres for so-called agricultural colleges. The total outlay on public schools in 1874 was $74,000,000. The school lands, amounting to 62,428,413 acres of the public domain, — a larger area than England, Scotland and Wales, — are intended rather for the diffusion than for the increase of knowledge. But all diffusion of knowledge increases it, if not objectively, at least subjectively. If it does not add to the sum of what may be learned, it adds to the sum that is learned. Accordingly, all public outlays for schools, however primary, and all laws compelling school attendance, promote knowledge. The recent appropriations for public schools from public funds in several states have been as follows: In 1873–74 Great Britain, £1,971,692; in 1875 France, 36,683,939 francs; in 1874 Italy, 21,946,213 francs; Prussia, 21,587,799 marks of twenty-six cents; Russia, 13,135,089 rubles of eighty cents. (These educational statistics are compiled from the one hundred and twelfth volume of the "Gotha Almanac.") But in addition to the rubles above credited to Russia, under the title public instruction (*öffentliche Unterricht*), which may include higher as well as lower schools, other appropriations are mentioned as made in the province of Finland; namely for "*worship* and instruction" 1,887,712 marks of twenty cents, and for "people's schools and *prisons*" 726,100 marks. Linking together the outlays for religion and schools is natural, where church and state are still wedded in union, but the coupling of schools and prisons is not so easy to be accounted for. In 1871–72 the outlay of Austria and Hun-

gary for education was 12,860,051 gulden of forty-eight cents.

Governments may minister to the growth of knowledge by *legislation* concerning *benefactions*.

In 1723 one Betton, an Englishman, bequeathed the income of his estate, year by year, for the redemption of captives in Barbary. When such captives could no more be found, and the estate had become worth half a million dollars, parliament turned it into a fund for supporting free schools, and thus delivering from a worse bondage than that in Barbary. In the same spirit, in 1875, a Royal Commission reported that the trust deeds of educational funds now yielding £1,500,000 annually, but so tied up by testamentary restrictions as to be now of small use, ought to be modified, as their donors if now alive would doubtless modify them, so as to make those foundations more suitable to the requirements of the present day. They seek to escape the letter which killeth, but to give free course to the spirit which imparts life and rejuvenescence.

The earliest *library* of which any history remains was a governmental creation. It was in Egyptian Thebes, in the palace of Osymandyas, who flourished in the fourteenth century before our era. What modern explorers identify as its ruins was pointed out to me in the Memnonium. Over its door, according to Diodorus Siculus, was the legend, ψυχῆς ἰατρεῖον, "The soul's house of cure," or dispensary. Such was the Greek interpretation of the figures of Thoth and Saf, the inventors of letters. Among other ancient libraries amassed at public expense those of the Pergamean king Attalus, and of the Ptolemean university are especially notable.

Of modern collections all those pre-eminent in size or value, such as the Vatican, as well as those in London, Paris, Berlin, and St. Petersburg, have been gathered by governments. Japan had in 1875 already accumulated in her educational department thirty thousand foreign books. The outlay on the library of Congress — the largest in America —

for the year 1873 was $54,928. In 1857 the city of Boston completed for its public library a building costing, with its lot, $365,000, and has ever since rendered it efficient aid. In September 1875 its volumes amounted to 288,816. The best medical and surgical library in our country, comprising more than 25,000 volumes in that specialty, is that of the surgeon-general of the army, which is enlarged by an annual outlay of $10,000. An equal sum is expended in preparing an exhaustive catalogue. The State of Wisconsin in aid of the library of its Historical Society now makes an annual appropriation of $8,000; its volumes in 1875 were 32,319. Several governments have passed enabling acts, by which cities and towns are empowered to lay taxes for the formation and maintenance of local libraries. Such a permissive bill, allowing a maximum tax of a penny in the pound, was enacted by the British Parliament in 1855.

In addition to forming general libraries governments have taken special pains to preserve their own *archives*, which all serve as materials for history. Those of Spain at Simancas are world-famous. In Venice the reports of ambassadors, when they were the only reporters abroad in the world, and other State papers, fill more rooms than any tourist has pedestrian pluck enough to traverse. I rambled through some scores; but turned back when told that the whole series ran up to two hundred and ninety-eight.

A Royal Commission appointed by parliament in England in 1869, within the next six years had compiled important documents relating to constitutional law, science, and general history from no less than four hundred and twenty private collections of manuscripts. The British State Paper Office, according to Dr. Drake, who spent years in it, occupies a space which all the records in the United States in 1860 could not fill. The cost of filling such an historical armory may be conjectured, when we remember our government paying ten thousand dollars for manuscript documents relating to French discoveries in the northwest, thirty thousand dollars for the Madison papers, twice as much for the com-

bined writings of Washington and Jefferson, and a still larger sum for a few confederate documents. In 1875 Portugal paid £7,000 for manuscripts illustrative of its early history. Public authorities, local as well as national, are growing doubly careful of their papers. Antwerp and Bologna are two cities among many which are just now bestirring themselves to set in order their records,

> "Picked from the wormholes of long-vanished days,
> And from the dust of old oblivion raked."

Moreover, a Hand-book of the German and Austrian Archives was announced in October, 1874, by Dr. Burkhardt, keeper of the archives at Weimar. This volume will describe not only the public archives of the German States, but also those of the towns (some of which as Frankfort-on-the-Main, Nuremberg, Goslar, Worms, etc., possess extremely valuable archives), and those of the provinces. A congress of German archive officials was called to meet at Eisenach in 1875. In 1874 even semi-barbarous Egypt laid out $10,000 on her archives.

At Frankfort, above mentioned, the writer saw among the Town Hall manuscripts what is regarded as the protograph of the Golden Bull or constitution of the German Empire, dating from 1356. In the far West he was also shown among the wonders of Salt Lake City, the "House of the Mormon historiographer," an office not to be found in many older States. *Fas est et ab hoste doceri.*

Archives are manuscripts, and they are much more. They are largely *architectural.* Accordingly, many governments have promoted knowledge by preserving structures, "where stones themselves to ruin grown are gray and death-like old." For this purpose they have expended money and enacted protective laws as well. The popes have done much to keep the monuments of the Caesars from being burned for lime, or incorporated with modern buildings, or from tumbling down for want of props and buttresses. Speaking of the action of Roman pontiffs regarding the demolition of pagan edifices, Gibbon remarks: "No positive charge can be

opposed to the meritorious act of saving the majestic structure of the Pantheon."[1] England, France, and Germany have also long done something in this direction. Among the mediaeval castles visited by the writer which owe their ruinous perfection to governmental conservation, he recalls, in Scotland, Stirling, Dumbarton, and Edinburgh; in Germany, Heidelberg and Stolzenfels; in Spain, the Alhambra; and in France, most notable of all, restored under M. Viollet-le-Duc by the State, Carcassonne, a section cut out of the age of the Visigoths and of Saint Louis, brought safe into the present, and set down unaltered before our eyes. May it endure forever!

Governments have advanced knowledge by outlays on *printing* and *publishing*.

They have thus committed written documents to a more trusty and trustworthy guardian than any fire-proof vault, even to the art preservative of all arts. So have they sometimes made known to the world, — or to fit audience though few, — the lucubrations of investigators which book-sellers, and hence the world, would have let die, because they were in advance of their age. Take for a few specimens, "Monumenta Germaniae historica," issued for half a century under the superintendence of Pertz, and now under a commission, dividing the labor which had become too arduous for any one man; engravings of the *musée Francais* for which the first Napoleon paid 400,000 francs; the Sanscrit Lexicon, which Russia has granted an annual subsidy of £300 for twenty-five years; "Egyptian Monuments," as published by France, Prussia, and Egypt, in about fifty folios; the Rig-Veda, with its commentary, — the oldest book in the Aryan world, and perhaps the largest, filling fifteen thousand pages — for a quarter of a century in publication by the East India government, and completed in 1874; voluminous reports of the British Royal Commissions; Nautical Almanacs, both British and American, — more than one hundred volumes of the former; thirty quartos on the Documentary

[1] Decline and Fall, Chap. lxxi. Note 26.

History of New York, eighteen on that of Massachusetts, eight of Connecticut Colonial Records, ten of Rhode Island (though she be small as a diamond), unnumbered folios of American archives; sixteen annual volumes of Washington astronomical and meteorological observations, twenty-five of the exploring expedition, six of Schoolcraft's Indian Tribes, etc. British writers express surprise at the mine of knowledge — archaeological, ethnological, philological, geographical, historical, and general — contained in the volumes issued by their East India government presses. An exhaustive statistical survey by fifty-nine collaborateurs is now in publication, of which five volumes appeared in 1875. In 1874 Bradford, a Vermont town of fourteen hundred and ninety-two inhabitants, directed its "selectmen" to pay the oldest minister there, Rev. Dr. Silas McKeen, $500 for a history he had written of the place, and to publish his work. Similar measures had been previously adopted in the Massachusetts towns, Pittsfield, Lexington, Marlborough, etc. Indeed the number of towns in our country, and out of it, which have thus perpetuated their local history, it would not be easy to count. I wish it were harder.

As an aid to scientists, governments have built *observatories*, styled by John Quincy Adams "light-houses to the skies."

Such astronomical stand-points are described as reared by kings and caliphs in Alexandria and Bagdad, — in the latter place with a quadrant of fifteen cubits radius. 1576 is the date of the earliest observatory in modern times, which was built by a Danish King for Tycho Brahe, unless we call by that name the lookouts at Sagres of Prince Henry of Portugal, a century earlier. Other observatories were erected at public charge at Dantzic in 1641, Paris 1667, Greenwich 1675, Copenhagen 1704, Russia 1725, Bagdad in 1788, by Louis XVI. in order to test Arabian observations on the very spot where they had been made, and at the Cape of Good Hope in 1828, by Great Britain. A century ago George III. paid Herschel £200 a year, and enabled that astronomer to fabricate the telescope which discovered the

first new planet discovered in modern times. That old forty-foot tube suggested to the monarch his only *bon mot* in sixty years. "Come," said he to a bishop, "I will show you the way to heaven"!

Observatories, so called, and those of great astronomical utility, had been erected in America previous to the nineteenth century. The only one known to Lalande in 1790 was that of Dr. Rittenhouse, in his garden at Philadelphia. It was a small but pretty octagonal edifice of brick, dating from about 1780. But more than ten years before, Rittenhouse had constructed a wooden observatory, which was five months in building, at his residence in Norriton; another had been reared in the State-house square of Philadelphia, and a third at Cape Henlopen light-house; all three for viewing the transit of Venus in 1769, "which had drawn the attention of every civilized nation in the world." Here also was government patronage, for the Provincial Assembly of Pennsylvania voted £100 for a telescope, to be bought in London by our Dr. Franklin, for a state observatory, and an equal sum for incidental charges. For observing the same transit, there was, at least, a temporary station established at Harvard College. Moreover, eight years earlier, the sloop "Province" had been fitted out at public expense to convey a Harvard Professor to Newfoundland, for observing the transit of Venus in 1761. So the United States in 1805 paid $1000 to procure a telescope, transit, and clock for its first surveyor, General Mansfield, that he might ascertain meridians, and base lines, for measuring the public lands in the great West.

In 1825 European observatories had multiplied to one hundred and thirty, but not one worthy of the name was then to be found in America. The appropriation for one, which had been recommended by John Quincy Adams, was overwhelmed with ridicule in Congress. His recommendation was not vouchsafed even the coldly courteous postponement which had been accorded to a similar proposal in 1815, when a committee had reported in favor of adopting

it "whenever attention to objects of a pressing nature and of more immediate importance will permit." Under the reign of the second Adams, the average congressman's creed was that of Biron in "Love's Labor Lost":

> "Those earthly god-fathers of heaven's lights
> Who give a name to every fixed star,
> Have no more profit of their shining nights,
> Than those who walk and wot not what they are."

In 1836, however, our scholarly President saw an observatory, the first on this continent, in operation at Williams College, — though not built by public money, — and in 1843 his own hands laid the corner-stone of another at Cincinnati, — also a private establishment. But he also survived to behold his views adopted by the national government, which opened its first observatory in 1843 at West Point, and the next year at Washington. The latter establishment now boasts the largest refracting telescope in the world. It was mounted in 1873, with an object-glass of twenty-six inches; no other measures more than twenty-five. Another refractor of twenty-six inches is reported to be now (1876) in making for an observatory in Vienna. The annual outlay for the Washington observatory is at least $20,000. Here, as elsewhere, government bounty has stimulated private munificence. In 1852 a well appointed observatory in Australia was presented to the State by a Mr. Brisbane, and in 1874 $700,000 were given by a Californian, James Lick, to build and furnish an observatory on our Pacific slope which will have no rival in the world, or will have one only in the czar's marvel at Pulkova, which since 1834 has been reputed matchless. In the palace of Wallenstein at Prague, I was conducted into a hall where the sides and ceiling were frescoed with astronomical figures, and a staircase led up to a tower from which Seni, the Italian astrologer of that aspiring prince, was dismayed, or delighted, at the signs of heaven. Had Wallenstein's dream of empire been fulfilled, his tower would have become one of the earliest among governmental observatories.

In 1868 I visited the site of Robert College, an American

foundation on the Bosphorus. Its President, Dr. Hamlin, pointed me to the grand castle of Europe just at hand, now dismantled, and which he was confident of obtaining gratis from the Sublime Porte for an observatory. We climbed its drum-donjon, or principal tower, and he showed me how its makers — "building wiser than they knew" — had, four centuries ago, admirably adapted that pier to astronomical purposes. To expect the gift of a grand tower from the Grand Turk seemed to me very natural, for I had just come from Cairo where, surprised that the American missionaries were living in a palace on one of the finest sites in the city, I had learned on inquiry that it had been presented them as a free gift by the pacha "who," said they, "loves our science more than he hates our religion."

Governments have furnished scholars materials with which to work by creating *gardens* and *museums*.

Aside from the tropical flora caused to grow at the Ptolemaic University, the earliest public garden for scientific purposes is set down as having been laid out in Pisa in 1545, though some believe that one existed in Venice two centuries before. Others, formed at public expense for medical or botanical purposes, are mentioned in the sixteenth century at Montpellier, Leyden, Leipsic, and Hampton Court; in the seventeenth at Paris, Upsala, etc. Superior to all others at present is that at Kew, near London,

"In narrow room nature's whole wealth, nay more."

Its Palm-house cost £35,000, and all things are in keeping. In the national garden at Washington a conservatory, costing $25,000, had been finished before 1870; and for the garden which it adorns the appropriation in 1873 was $52,345. Its head gardener has been sent on a horticultural tour to all the great gardens of the world. Connected with the Washington garden is a National Herbarium, the accumulated results of the various government expeditions and surveys, as well as irregular contributions from a great variety of miscellaneous sources. In the employ of this department botanists have been commissioned for manifold explorations. Thus Dr.

Palmer in 1869 traversed New Mexico and Arizona on a collecting tour, and brought home to the national hive not a few plants before unknown to science.

In addition to gardens, governments have established museums, and age by age have multiplied and enriched their departments. In this matter the British government may not have been so liberal in proportion to its resources as some others, yet its expenditures for buildings alone on the British Museum during the second quarter of the present century were £850,000. During the year 1872 its outlay for the running expenses of that repository was £111,304, and for building £29,091, as well as the so-called science and art department £224,875, and enough on National Galleries to make a total of £388,972. In subsequent years these expenditures have still increased. That for science and art in 1875 was £320,000.

Moreover, the international exposition of 1851 convinced England that she was behindhand in art, and that art is the greatest auxiliary to industry, — "adding to every power a double power," — and hence it led to the formation of the Kensington Museum, the expenditure for which, previous to 1873, had amounted to six millions of dollars, in exact figures £1,191,709 17*s.* 4*d.*, and which within twenty years numbered 13,560,624 visitors. No museum has become grander, or is now growing faster, than Kensington. In October 1874, the curiosities from the East — the accumulations of a century at the India House — were transferred to it. In 1875 it received sixty-two cases of curiosities from Teheran, amounting to more than two thousand pieces — the result of the skilful judgment of a foreign gentleman during nearly twenty years residence in various Persian provinces — and has established a section devoted to Persian art, which is a new thing in the world of museums.

A British Royal Commission now urges the national endowment of research, and to add to the cabinet a minister of science, on the ground that all departments of government have permanent need of scientific assistance, and that

economical advantages result from every scientific step forward. In 1874 a national art gallery was formed at the antipodes, in Melbourne, and £500 were voted by the provincial parliament towards the establishment of a picture gallery in Sydney — a site better known to half the world as Botany Bay. Thus a good thing is going into Nazareth, or originating there.

Few European States are destitute of national museums, as large and excellent in proportion to their wealth as are those of Great Britain. That in Berlin appropriates 40,000 thalers a year for plaster casts alone, — copies of sculptural masterpieces. It is not long since it paid 22,000 thalers for certain Moabite potteries, which have proved sham antiques.

Though the word "museum" was familiar in Athens and Alexandria, the thing which it now denotes may not be anciently discernible except in Rome. The collection of Augustus would pass for a museum of natural history. "He furnished his palaces," says Suetonius (Aug. § 72), "not so much with the ornaments of statues and pictures as with groves and walks, as well as objects noteworthy for antiquity and rarity, as at Capri the monstrous limbs of huge and savage beasts, which are called "giants' bones" and "arms of heroes."

The earliest of modern museums, in the sense of a collection of fine art specimens, is said to have been that of Cosmo de Medici, the Florentine prince, who died in 1464. Such treasuries naturally rose first in Italy, where art treasures were at once most numerous and soonest appreciated. Several museums, at first formed by opulent and enthusiastic individuals have been bought and perpetuated by governments. Hügel, an Austrian Baron, made researches, with many assistants, in Greece, Egypt, and India from 1831 to 1837. His collections comprising 32,000 specimens in natural history, with multitudinous coins, manuscripts, and other antiques, were bought for the imperial museum at Vienna. The Suermondt gallery, — one of the most notable private collections of old masters, — with the well-nigh unrivalled etch-

ings of Albert Von Everdingen (costing 6000 thalers), and 11,000 antique coins, mostly Oriental, costing £16,000, in 1874 passed into the Berlin Museum. The articles added in three years after 1872 were 44,337.

The pictures of Angerstein, the great Russian merchant of London, bought by Great Britain in 1820 for £60,000, were the germ of the National Gallery. The Hunterian museum of anatomy, styled by Professor Owen "the seed of all the surpassing discoveries since made in paleontology," was also bought by the British nation in 1799.

The British Museum originated in 1753 by parliament paying £20,000 for the collections of Sir Hans Sloane. Among its other accessions through the purchase of other private collections, have been the following: those of Cotton, Harley (costing £10,000), Lansdowne, George III., Burney, Townley (£28,000), Elgin (£35,000), the Blacas gems (£48,000), Payne Knight, Sir William Hamilton, etc. A London lawyer, Francis Hargrave, as he passed to and from his office, was a snapper up of unconsidered trifles at the book-stalls. He thus filled such a savings bank as the museum curators held cheap at £8,000. The entire outlay of the museum previous to 1860 had been £3,000,000.

The rudiments of an American governmental museum may be discerned in the numismatic curiosities of the Philadelphia mint, as well as in whatever the general government, from its exploring expeditions and other sources, has aggregated around the Smithsonian nucleus. A city museum has been commenced in New York. The Park Commissioners have appropriated half a million dollars to procure grounds and buildings for collections in natural history, and the treasures of Verreaux which it cost him, aided by a large outlay from the French government, a generation to gather, have been purchased.

But national museums are not confined to Christendom. In London, Paris, and Berlin Egyptian marvels are so multitudinous that in each of those cities my feeling was, "Egypt is empty, and all her wonders are here." But in Boulak, a

suburb of Cairo, I encountered a magazine of relics so rare and unmutilated that the genius of the Nile might well say, "Behold, these are my jewels!" A few representative specimens sent to the World's Fair in 1867, won unbounded admiration. The appropriation for Boulak from the khedive in 1874 was $26,858. The Turkish sultan also is both striving to regain whatever Schliemann has carried into captivity from Trojan Hissarlik, and has founded a museum in Stamboul, which he means shall outdo the Egyptian khedive's. What a remove from his predecessor who, less than fourscore years ago, when giving the Earl of Elgin permission to explore Athens, added regarding the chiefest works of Grecian chisels, that "if any stones there appeared interesting to him," he was welcome to them. Among the sultan's recent purchases are the largest and finest Japanese vases ever made, and seventy-four cases of antiques from Cyprus.

Another mode in which governments have promoted the progress of knowledge is by *prizes*.

A mode of ascertaining longitude at sea was early felt to be one of the chief desiderata in navigation. To any one who would supply this need Spain, in 1598, offered 1,000 crowns; Holland, soon after, 10,000 florins; and England, in 1714, £20,000. In the race for these prizes many men, and among them Galileo, made valuable advances; though they failed to find the key to longitude; and Harrison, the actual finder, while after a thirty years' struggle making his fortune, developed an idea worth a thousand fortunes. Harrison found longitude, as is well known, by means of a chronometer. His success is the more memorable, because secured by the self-same expedient which Sir Isaac Newton had just then declared must fail. In 1724, Newton's words were, that "he believed no clock could be so justly made and regularly ordered as to keep the ship's way for any considerable voyage without the loss of many leagues." The first trial of Harrison's clock, on a voyage from England to Jamaica, showed a variation of only one minute and one fourth from absolute exactness in crossing the Atlantic.

England has offered several other grand prizes, as, in 1743, £20,000 for the discovery of a northwest passage, (found by McClure, in 1851); in 1776, £5,000 for approaching within one degree of the pole; in 1819, £5,000 for pushing west of 110° in Baffin's Bay, which was gained by Parry's men; and in 1849, £20,000 for the rescue of Sir John Franklin, in addition to £2,000 offered by Lady Franklin.

The legislature of New York, in 1871, offered $100,000 for the best model of a steam-vessel not liable to the objections which had long prevented the use of steam on her canals. After two hundred plans had been submitted, they secured the improvement they sought, and paid the reward to William Baxter, who had produced a boat which transports freight at twice the former speed and at one half the former cost, and that with no injury to the canal banks.

Australia promised a large reward for a specific cure of diphtheria, and is said to have paid it for a preparation of sulphuric acid which has proved a panacea. The deaths by that disease in the city of New York, during the last half of October 1874, were two hundred, wanting seven. The French institute confers an annual prize of 10,000 francs, drawn from the imperial treasury, for the most useful invention of the last five years.

Public authorities have bestowed gifts on advancers of knowledge not merely to stimulate their activities, but after their work has been done. They have thus encouraged those who came afterward. "One good deed dying *thankless* slaughters a thousand waiting upon that." Great Britain paid Parry and McClure each £5,000 for Arctic discoveries, and Rowland Hill £13,000 for his plan of penny postage. A pension of £300 was granted to Dr. Johnson, in 1762, seven years after his dictionary was completed. It was natural that Johnson should hesitate to receive a pension, since as a lexicographer he had defined it to be "pay given to a state hireling for treason to his country," and a pensioner as "a slave of state, hired by a stipend to obey his master." His hesitation, however, was not lasting. When he decried

pensions he was the dog at the foot of the tree, who barks because he cannot climb; but when the dog's mouth is full he barks no more. Pensions of the same amount as Johnson's were given, among others, to Dalton and Faraday, not for anything that they were to do, but for what they had done; others to Newton, Miss Herschel, and Henry Bell, who, according to my Scotch guide-book, was "the first person that applied the steam-engine to river navigation, in 1811"; to Archibald Smith, who lately applied mathematics to improve the shape of ships; as well as on the continent to thousands, as Leibnitz, Hevelius, Descartes, D'Alembert, Botta, Bonpland, Daguerre. After Galileo had invented the telescope his salary was increased five-fold by Venice.

In 1860 ten European States united in contributing 400,000 francs as an honorarium to Morse, for his telegraphic inventions. The testimonial of the United States to Fulton was more tardy. Not till thirty-one years after his death did Congress award to his heirs $76,300 in part for the benefits he had conferred on his country by his improvements in the application of steam to navigation. One of the speakers before the Scientific Association, at their Portland meeting, in 1873, gave a startling account of a philosophic convict in Siberian exile, while making researches in the canyons near the mouth of the river Lena, coming upon five living mammoths, twelve feet high and eighteen in length; and being in consequence granted a full pardon. However false this discovery may have been, its pretended result is quite in keeping with the gracious favors — "benefits of clergy," as it were, or freedom to a slave for finding a big diamond — which governments have been wont to bestow on advancers of knowledge. In former ages the stock story to illustrate the idea was about an artist who had painted a matchless crucifixion for the pope, and was therefore pardoned by his holiness for having crucified a man in order to portray his agonies more true to life.

Somewhat analogous to prizes and pensions in fostering the growth of knowledge are governmental *copyrights* and *patents*.

The earliest mention of a copyright is in Venice, in 1469. The first in France was in 1507, and in Spain three years later. The first appearing in England was in 1662, and in the United States in 1790. Patent rights in England date from 1624. The number granted there up to 1870 was 73,621. In the United States, between the same date and 1790, the number was 121,308, and in the single year 1873, it was 12,864.

In a mode not so unlike patents and copyrights as at first appears, governments encourage knowledge when they make it a crime, as New York has just done, to practise medicine or surgery without examination and license from some competent authority. Great Britain excludes all such quacks from collecting bills and from governmental employment. In France, Germany, and other continental states, no person can exercise any of the so-called liberal professions unless he has obtained a degree at a state university. While this usage is objectionable as increasing governmental patronage, it doubtless heightens the thoroughness of professional education. On the other hand, when a professor in Salt Lake city, who was my cicerone through the university there, deplored its low estate, my answer was: "It is no wonder. Your government holding that the sick are cured by miracle, preachers taught by inspiration, and lawyers worthy to be outlawed, how can it cherish knowledge?"

In the interest of knowledge governments have granted charters, and sometimes endowments, to *learned societies*.

One of the earliest of these associations, incorporated at Florence in 1657, demonstrated the incompressibility of water. Its apparatus is still to be seen there, in the Tribune of Galileo. But the French Academy claims to have had a name to live from 1635, and so to be a score of years older than its Italian sister. About 1663 it was divided into several branches, and its members began to be paid an annual stipend. These branch academies have now flourished during more than two centuries. They are yearly subsidized by the government with about half a million francs, and by

indirect aids perhaps worth still more. Hope of enrolment in some one of them is a spur to every young scholar in France; and the prizes, aggregating about 50,000 francs, which they annually confer, have not only maintained many a poor genius, — as Thierry for fifteen years, — but are chiefly striven for as honors, and as affording hopes of better things beyond.

Affiliated to home-academies, France has set up others abroad — one in Rome, dating from 1661, and another in Athens, from 1846. In these schools the artistic youth of France, who have carried off the highest prizes at home, enjoy for years a frugal maintenance, with the best helps for their aesthetic training. The yearly stipend for each youth is at present 2,500 francs. Among the painters developed in the French Academy at Rome were the two Davids, two Vernets, and Baudry, whose master-piece at the new Opera just now puts him at the head of French artists. Denmark, Prussia, and Russia also send young men of promise to study abroad, with allowances similar to those vouchsafed to French artists. Among those thus despatched to Rome were Thorwaldsen from Denmark, and Brühloff from Russia. The latter built St. Petersburg forty years since, as truly as Christopher Wren did London two centuries ago. But of late no state has sent more scholars abroad, to tax all the world and bring home the best of its knowledge, than Japan.

The British Royal Society, being incorporated in 1662, is not much younger than its French rival; but it has not basked in the sunshine of much national bounty. It was, however, endowed by Charles II. with a hospital, which it sold for £1,300. It was further allowed to claim the bodies of executed malefactors. But until 1790 English law prescribed that criminals, if women, should be burned ("si sit mulier, in igne comburatur"), "out of regard to the decency due the sex," as Blackstone has it; and if men, should be usually disembowelled, and quartered or beheaded, and boiled, if poisoners. It is, therefore, doubtful whether the criminal remains were worth much for further dissection.

In 1837 the Royal Society received a national appropriation for a magnetical observatory. It is not unlikely that it now shares in the annual appropriation to learned societies — a grant which in 1872 amounted to £12,450 pounds. At all events, it receives £1,000 a year to be distributed to scientific investigators. Moreover, in compliance with its recommendations, the British authorities have set on foot many costly observations, experiments, and expeditions. Cook's voyages, lasting a dozen years, and girdling the globe more than once, are a specimen. So is the squadron despatched to the north pole, under Captain Nares, in 1875.

Such are loyalty and gastronomy in England that government has never there done so much for learned societies as when its patronage has taken the form of *dinners*. It is an established custom that some member of the royal family shall dine with the royal academicians. Such governmental condescension, according to Hazlitt, lifts them all up forever, securing them both length of days and a table well spread to the end of them. He mentions as specimens Nollekens, Northcote, West, Flaxman, Fuseli, and Cosway, all longevitarians, and all flourishing at once. As a further proof how potent prandials appear to Englishmen, it is worth noting, that in 1875 the South American States having failed to pay interest on their British debts, their officials in London were not invited to the lord mayor's diplomatic dinner.

Other governments besides England have followed, at great expense, the suggestions of learned societies. The French expedition under La Perouse in 1785, which it was hoped would rival Cook's, was started through the French Society of Natural History. A United States astronomical expedition to the southern hemisphere took observations from 1849 to 1852, in accordance with instructions which had been submitted for approval, or criticism, to the American Academy of Arts and Sciences. Counsel was sought from the Smithsonian Institute for the Arctic cruise of the "Polaris."

In this way, through the long and strong arms of political rulers, the eyes and the intellects of experts, and often their

whole bodies too, have gone abroad throughout all the earth. Of the papers printed by the Royal Society, each adding its fraction to the stock of knowledge, the State Historical Library of Wisconsin contains one hundred and fifty-four quartos, though the series is not complete. Similar volumes already published by kindred associations during two centuries seem likely, like Banquo's royal line, to stretch on to "the crack of doom." Or, we may compare them to an endless rope, which an Irishman pulled and pulled till he was tired, and then in language more rough than reverent, declared that the other end of the blessed thing was *cut off*.

Among the societies for the increase of knowledge incorporated by states, and receiving governmental aid and comfort, direct or indirect, are those in Berlin, originating in 1700, St. Petersburg in 1724, Sweden in 1741, Denmark 1742, Munich 1759, Portugal 1779, and the American Academy 1780. The Smithsonian Institution at Washington, though of private origin, has always been assisted by Congress. Its grounds, their improvement, printing their reports, and $15,000 a year for the care of collections, are a portion of Congressional favors.

He that hath, to him shall be given. Accordingly the societies most assisted by public funds have also shared most in private munificence. Thus the private gifts bestowed on the British Museum during a dozen years previous to 1835, were valued at two millions of dollars. The museum founded by the British government in Kensington soon became a center of gravitation for all the art-treasures and curiosities owned by the community around it. When parliament hesitated to buy the Angerstein collection for founding the National Gallery, one member, George Beaumont, said, "If you buy it, I will give you mine to increase it; and mine cost seventy thousand guineas." In the year 1874 a Signor Ponte bequeathed a fortune of three fourths of a million francs to three learned societies, one in London, one in Paris and one in Vienna. Stanziani, an Italian grown rich in Russia, has left much to a society in Rome.

Men of titles by dint of patronage often seek, and find, a welcome in learned societies. "The reason is," says some cynic, "that nobles love to fancy themselves scholars, and scholars love to fancy themselves nobles. Hence lords seek to be among wits, and wits to be among lords, each hoping to be known by their company."

Governments have sometimes been patrons of knowledge by *importing* from abroad *philosophers* capable of raising the home standard.

They have not procured such imports without awarding to men of genius more of emolument, honor, and free scope than those celebrities had enjoyed at home. They thus rouse to a higher pitch the ardor of all students in the country from which they call one away, while they stimulate him to do his best in his new field. In France "greatness of reward," as Bacon says, "whistling for the ablest men out of all foreign parts," bringing Cassini from Italy, Roemer from Denmark, and Huyghens from Holland, wakened each to new activities in a wider sphere. Japan during the last decade has imitated this policy of France. Weimar did in the days of Herder, Wieland, Schiller, and Goethe. Frederick the Great kidnapped for a grenadier recruit every very tall non-enlisting foreigner he could seize, and took as much pains to make his own those men who were colossal in mind.

In 1609 Galileo wrote from Venice to a Tuscan friend: "Daily I discover new things, and if I had more leisure I should do much more. But so long as I find it necessary to depend on lectures for support I cannot have leisure enough." Thereupon, in 1610, Tuscany invited Galileo to a sinecure of 1000 crowns a year, that, being exempt from all duties, he might be better able to pursue those studies which had already resulted in marvellous discoveries. This maintenance he received for thirty-two years; that is as long as he lived. "His strength was to sit still," for leisure enabled him to produce that, "Dialogue on the Ptolemaic and Copernican systems," which has been moving the world ever since, and will move it forever. In a similar love of "en-

dowment for research" Max Müller, while continued as an Oxford Professor on half-pay, has been relieved of all educational duties. The following note from the most learned of British kings shows his patronage of learning: "Chancellor of my exchecker! I will have Mr. Casaubon paid before me, my wife, and my (sic) barnes. James Rex".

But of all nations Russia, downward from Peter the Great, has most delighted to enlist foreign talents and acquirements in her service. Notice three instances out of hundreds.

Pallas, invited from Holland by Catharine, revelled for six years in the paradise of his specialty, heading an exploring tour throughout Eastern Russia, and then, as he liked the Crimean climate better than all others, was installed in a handsome residence there, was paid for his collections one third more than they had cost him, yet was permitted to retain them to the end of his life.

The English traveller, Simpson, who in 1843 committed himself to a Russian courier in order to be put through from Pekin to Moscow, at first made his way with infinite delay and difficulty, neglected or even insulted. All of a sudden everything was changed. Horses were ready everywhere in a moment, and all relays went on the gallop. Every delicacy was proffered, and Simpson became the observed of all observers. When he demanded an explanation from his conductor, the answer was: "I saw we should never get through Siberia at the rate we started, so I whispered to postillions, who told postmasters, that you were nothing less than a Chinese ambassador posting incog to the czar, and that I should not wonder if you turned out to be own brother of the Celestial sun or moon. You see the result." Humboldt's journeys, whithersoever he pleased in all the Russias, were like Simpson's triumphal progress, and that with no danger of his delectations collapsing through its being found out that the reputed celestial dignitary was an obscure adventurer.

Again, Murchison, the British geologist, was invited to direct the Russian surveys, — a post in which his duties and delights pointed all one way, — and afforded such appliances

and means to boot, as no man in his profession had ever commanded. Then, besides imperial pay, he was knighted and decorated with the grand cross. Thus has Russia sought to bring the glory and honor of the nations into it.

In the way of honorary titles no government has been more liberal than the British, and nowhere does this sort of patronage seem to have been more effective than in Great Britain. Sotheby, writing in 1861, gives sketches of one hundred and fifty-three men who had been knighted by English sovereigns within the last two centuries for their advancement of knowledge.

Governments have advanced knowledge by defraying the expenses of special scholars while *travelling* or *residing* where they could best promote their specialty.

Such investigators have circled the earth in every zone, and their missions have been widely diversified. French, Danish, Russian, and Prussian artists have been mentioned as maintained while making the most of themselves at Rome, the nurse of high art. Canova, so maintained there by Venice, and Sir John Soane, by George III., are two more of a legion. Sustained by government patronage, specialists have gone far and wide for explorations, observations, or collections — astronomical, geographical, geological, archaeological, aesthetic, or miscellaneous. Great Britain commissioned Fellows, Newton, and Wood for Asia Minor, — where the former discovered at Cnidus the veiled Demeter, "one of the most beautiful antiques brought to light in modern times," — Layard farther East; as early as 1765 it sent Bruce into the heart of Africa, and then Park in 1804, Clapperton in 1825, the Landers in 1830, Barth in 1849 to Timbuctoo, and in later years many others besides Dr. Livingstone. The researches of Schomburgk in Guiana, who discovered the Victoria Regia, were paid for by the British government.

France early dispatched Tournefort and Galland to the Orient, and Picard to Denmark, Richer to Cayenne, Condamine to Peru, and Maupertius up the gulf of Bothnia till he saw no night for fifteen times twenty-four hours. De

Tocqueville's mission to investigate the American penitentiaries is well known, as well as that of Chevalier to examine our railroads. Not less important for the increase of knowledge was the despatch of Renan to Italy, and afterwards to Syria, or Cuvier to Holland, Mariette to Egypt, LeCaille to the Cape of Good Hope, Lalande to Berlin, or DeCandolle through Napoleon's empire when it was widest, or Gay Lussac half way to heaven for aeronautic observations. Instances of German missions for the good of knowledge, were Liebig's journey to Paris, Agassiz's to the United States, Roth's to Syria, Sepp's to Tyre, and Mommsen's epigraphic tour, — all at public expense. Russia sent Tischendorf to Arabia, Pallas far and wide in Siberia, and Humboldt in princely pomp overland to China, building scientific stations all along his route. A corps of explorers in the Aral-Caspian region have just returned to St. Petersburg. The Egyptian khedive in 1874 fitted out the archaeologist Brugsch Bey magnificently for the cosmopolitan convention of Orientals in London, having called him from Göttingen in 1871. Various public authorities in the United States have patronized researches abroad, both historical and of other descriptions.

In 1849 New York commissioned J. R. Brodhead to search the archives of England, Holland, and France for original documents referring to its history. At the end of three years he had collected eighty manuscript volumes, and returned in a ship which Mr. Bancroft declared "more richly freighted with new materials for American history than any that had ever crossed the Atlantic." A commission analogous to that of Mr. Brodhead was given by Maine to the German Professor, J. G. Kohl, who has hence produced a volume, published by that State, in reference to its discovery by the Northmen.

The labors of investigators abroad have been often rendered more successful through governments giving them the prestige as well as the pay of *official* position.

Loftus was appointed on the Turko-Persian boundary commission, Rawlinson was made Consul in Bagdad, Botta in

Mosul, Livingstone in Quilimane, Professor Pitman in Jerusalem, Cesnola in Cyprus, Niebuhr ambassador at Rome, Professor Henry head of the light-house board, Schoolcraft Indian agent, Squier chargé to Central America, and Thomas Hogg, the florist, marshal of the American embassy to Japan; each installed in the niche he was ordained to fill.

Governments have drawn largely on their regular officials for the advancement of knowledge.

Venice, downward from the year 1268, required reports, styled "Relations," from her agents abroad, and for centuries she touched the world at more points than did any other state. She thus unawares imperceptibly rendered her archives the most valuable among all the sources of European history. Under Louis Napoleon French engineers elucidated by topographical surveys the battle-fields mentioned in the Commentaries of Julius Caesar, and French soldiers were placed at the disposal of Renan to aid by excavations his Phenician researches.

In 1819 meteorological measurements were ordered at all the United States forts by the Secretary of War, and they have continued to be made ever since. Reports derived from more than fifty millions of such observations have been published by the government. They afford such climatic knowledge of even our most unexplored territory as few of the oldest States could previously show. The engineer corps of the United States army have been occupied ever since the close of our civil war in the work of examining and mapping its battle-fields. Those east of the Alleghanies were exhibited in a government atlas issued in 1870. Throughout our history that corps have led the van in American scientific research.

The inspector-general of Italian prisons, Beltrami Scaglia, was lately commissioned to examine the penal system of Great Britain. Many British consular reports are noble monuments. A good specimen is those made by a hundred consuls "respecting the condition of the industrial classes in foreign countries." The reports made to our own govern-

ment either by the diplomatic corps or by special agents, would form no small library. In 1870 three of the army engineers were detailed to examine and report on the sea-coast defenses of Europe. Delafield and McClellan's reports on the art of war in Europe from 1854 to 1856 need no mention.

Governments, aiming to increase knowledge of some sort, have engaged in *exploring expeditions*.

So many such expeditions were fitted out in the first half of the fifteenth century by Prince Henry of Portugal that his revenues were exhausted, and he died in debt. Similar enterprises were continued by his successors, till the southernmost point of Africa had been doubled, and a new highway to the East Indies laid open. The voyages of Columbus were of the same character with those of the Portuguese, and were governmental enterprises. After his grand success and that of Cabot, whose first voyage, however, was a private undertaking, England and France joined in emulous endeavors for bringing to light the dark places of the new-found hemisphere. But Spain and Portugal jealously hedged up the southern routes to the East Indies by both capes. Hence other nations, especially England, Holland, and Russia, being excluded from the south, sought a passage to India either by the northwest or by the northeast. As Cape Horn was never doubled till 1646, Spain, by blockading the Magellanic Straits, shut up the Pacific door. In the endeavor to find or force a new route to India, adventurous parties were sent out by land and by sea, and their zeal was roused to the highest pitch by princely prizes offered for success.

In 1741 two British ships sought to pass northwest from Hudson's Bay; in 1773 the orders of Captain Phipps of the royal navy were to steer for the north pole. His highest latitude was 80° 40′. The discovery of the Arctic Ocean by Hearne in 1772, and by Mackenzie in 1789, was made at the charge of the Hudson Bay Company, — the only government ever known north of Canada until the attempt to establish one in Manitoba half a dozen years ago. No sooner was the

long agony of Napoleonic wars over than Great Britain resumed the Arctic explorations. The expeditions of Ross in 1819, and others afterwards, as of Parry in 1827, of Franklin in 1845, with those in search of that lost hero, are computed to have cost the empire £800,000, besides immense sums contributed by individuals and something of aid extended by the United States and American citizens.

The independent expenditures of our country in Arctic adventure are already considerable. Congress voted $150,000 for the party sent to rescue Dr. Kane. The Polaris crew, notwithstanding the death of Captain Hall, is reported to have penetrated nearer to the pole than any band before them, namely to 82° 16′ or even 83°. A project is now on foot in Washington to build a vessel specially adapted to Arctic conditions to engage in another race for the north pole.

In 1875 Great Britain sent up Smith's Sound the "Alert" and "Discovery," two model steamers for arctic navigation, with picked crews, to be followed in 1876 by a relief ship. This expedition is so much superior in appointments to all before it, that the Edinburgh Review calls it "the first which any government has carefully and deliberately fitted out to find the north pole." Should it fail in this grand endeavor, it must succeed in making discoveries in geography, geology, meteorology, and magnetism,— adventuring where there is ample room and verge enough for more than one Columbus — a *regio incognita* of more than two millions of miles. The Russian voyages of Admiral Wrangell from 1820 to 1824, were only a continuation of persistent endeavors during the century before, to examine the Siberian coast and the ocean north of it. In 1875 Russia explored the Kara Sea north of Siberia, and discovered a navigable route from the Yenisei — an arctic Mississippi — to Europe. Professor Leutz who, in 1823 was sent around the world with Kotzebue by Russia, is now confessed to have anticipated the theory of oceanic circulation, which was at first supposed to have originated with the English Professor Carpenter, and that less than half a dozen years ago. From 1858 to 1872 Swedish ships were pushing

northward in the icepack above Spitzbergen. The latest among Arctic findings is north of Russia, a region called Francis Joseph, in honor of their emperor, by the Austrians, who discovered it in 1873, though with little government aid. The ship left when already twenty-one months frozen in there, and the crew reaching Nova Zembla only after ninety-six days of ice-travel, have not discouraged Austria. She immediately fitted out two more polar companies, and many of the old hands volunteered again. A polar expedition, dispatched from Northern Germany in 1869 largely by private enterprise, persevered in its search till one of its ships was crushed in the ice. It is now plausibly maintained that "the polar regions are the most important parts of our globe for the study of all the natural sciences, — for terrestrial magnetism, for meteorology, and for geodesy especially."

In voyages primarily for advancing commerce, yet not without regard to the good of knowledge, Portugal and Spain were foremost to engage. The whole *mundus incognitus* was so divided by the pope, "out of his pure liberality, infallible knowledge, and plenitude of apostolical power," between these nations, that Portugal had all the east and Spain all the west of a point two hundred and seventy leagues west from the Azores. Nor did either for some time encroach on the other. But after the Portuguese, in 1510, had seized the Spice Islands, the envious Spaniards pressed westward with double vigor. Magellan, a Portuguese deserter in their service, discovered the Straits which bear his name, and pushed on to the Spice Islands entering, as it were, their back door. One of his ships doubling the Cape of Good Hope achieved the first circumnavigation of the globe in 1522, — fifty-seven years before any English ship performed that voyage. In ascertaining the pope's line of demarcation between the east and the west, the rival proprietors patronized astronomy, fitting out longitudinal commissions, and convening according to Prescott, "more than one congress, as at Badajos, in which all the cosmographical science of the day was put in requisition." So hard was it to decide where the east and the west meet.

In the geographical progress of the last century, England, as the leading commercial nation, has naturally taken the lead. Next to the voyages of Byron in 1764; Wallis in 1766; Carteret in 1767; Cook, already alluded to, in 1768 and for a dozen years after, came Bligh of the Bounty on a botanical mission in 1787, and then Vancouver for four years after 1791. In 1817 Basil Hall explored the Japan Sea; and Sabine, both equatorial and polar latitudes in 1820. Between 1831 and 1836 the "Beagle" was carrying Darwin, now so famous, round the world. In 1838 the "Arrow" was dispatched to examine the Falkland Islands. Similar British expeditions are beyond counting. In 1791 Great Britain commenced a hydrographic survey of her own coast, so elaborate that after an outlay of many millions, and fourscore years of scientific toil, the task is not yet ended. The outlay on the ordnance, or topographical survey of England in progress from 1784, had amounted, up to 1875, to £4,200,000. Through her cruising squadrons, she has also drawn up half the accurate charts of navigable waters now in existence. About 1830 Captain King made charts of the Straits of Magellan. That of the Mediterranean by Admiral Smyth is invaluable to classical commentators. While sailing up the Gulf of Finland in 1867, I observed that my Captain's charts were all English. No Russian circumnavigated the world before Krusenstern in 1806.

Since 1868, British vessels, particularly the "Porcupine," "Lightning," and "Challenger," have surpassed all former achievements in regard to deep-sea soundings, temperature, currents, and dredging. Their thus ascertaining the thermal stratification of 15,000,000 square miles is pronounced by the highest authorities, "the grandest single contribution yet made to terraqueous physics." The "Basilisk," in 1873, visiting hitherto unexplored portions of New Guinea, discovered a new route from Singapore to Australia. The interior, also, of many unknown regions has been recently explored by parties sent forth at British charges. Livingstone, whose career has so lately closed, more than a quarter of a

century ago was already the official head of an expedition up the Zambesi river. All the frontiers of the British Indian empire have been passed, and the northern, eastern, and western *terrae incognitae* penetrated by public agents. Every Russian conquest in those regions has also been an invasion of the great Asiatic unknown, and has borne scientific fruit, and more of it year by year.

But our country's grand explorations have been within its own limits. The United States Coast-Survey was projected in the first year of our century; but no work was done, save measuring a base line near the Hudson, till 1832. Since then operations have gone on, with slight interruptions, with an outlay constantly increasing, till in 1873 it had risen to $852,828.75. Triangulations from the Coast-Survey are every year extended further and further into the interior, with a view ultimately to form a geodetic connection between the Atlantic and the Pacific. A scientific basis will thus be laid for American maps of such accuracy as is now impossible, and as very few governments outside of Switzerland have as yet attained, in showing the surface of their territory, and the relative positions of rivers, mountains, and towns. The survey of Lake Champlain, having been four years in progress, was completed in October, 1874. It is claimed by Professor Pierce, head of the Coast-Survey, that triangulation by quadrilaterals, originating in that service, and of such exactitude as to "distinguish and divide a hair twixt north and northwest side," is sure to be adopted everywhere abroad, and that the instruments for the purpose, and skill also to make the most of them, must be sought in America. One unexpected result of this survey is its proving California, which had long boasted of 188,981 square miles, to be more than 30,000 miles smaller than that. Cutting a huge half-moon, — a monstrous cantle out, it has robbed the Golden State of much more territory than Prussia tore away from France.

The United States exploring expedition, between 1838 and 1842, costing $400,000, which in 1840 discovered the Antarctic continent, — about the same year with the French

and English, but before either of them, — and Commodore Perry's visit to Japan in 1858, added much to the stock of human knowledge. Dana, the geologist, sailed in the former; and it yielded precious material to the chief of our botanists, Gray, and to the conchologist, Gould. The orders issued to its commander, Lieutenant Wilkes, were, to determine the existence of all doubtful islands and shoals, to ascertain the geographical position of as many as possible, as well as in other ways to extend the bounds of science. Many minor voyages have been made by our national vessels abroad in the interest of science. Instances are, the cruise of the "Dolphin," in 1851, and Lieutenant Herndon's ascending the Amazon the same year; the "Water-Witch" sailing up the LaPlata, in 1843; four vessels under Ringold, in 1853, into China seas; and the "Ashuelot" steaming, in the summer of 1874, a thousand miles up the Yang-tse-Kiang.

United States engineers, and those of several nations, have explored and mapped many routes between Panama and Tehuantepec, in order to determine the most feasible point for an inter-oceanic ship-canal — an improvement necessitated by the Suez success. As preparatory to the exactitude of present Western land-surveys, many reconnoissances had been prosecuted. The same year in which Louisiana was purchased, — namely, 1803, saw forty government employes on their way to ascend the Missouri, which had never been ascended by whites, and, crossing from its source to navigable waters which were assumed to flow on the western slope, to pass down them to the ocean. This trans-continental journey was not accomplished till late in the third year of forced marches, and was the first ever made in United States latitudes; though further north Mackenzie had, a dozen years earlier, penetrated from Hudson's Bay to the Pacific. The exploration by Lewis and Clarke cost only $11,000, besides its scanty outfit. It was followed by Pike, an army officer, ascending both the Mississippi and the Colorado to their supposed sources; by Schoolcraft, in 1820, voyaging from Detroit to the head of

Lake Superior, as a government geologist; by Major Long, after traversing all the continent between Texas and the Great Lakes, going up the Platte River to the peak which bears his name; by Fremont, from 1842 to 1846, who laid open the Pacific slope; by Sitgreaves, in 1852; by Marcy on the Red River, etc.

To enumerate the manifold exploring expeditions which our government has sent out would exceed the limits of this Article. A list of ninety-two, despatched by the War Department west of the Mississippi since that under Captains Lewis and Clarke, was laid before Congress in 1874. There had also been five trans-Mississippi boundary commissions. Tracing well nigh a hundred enterprises in which our army thus increased scientific, as well as military knowledge, one might almost say its chief end had been to serve as the handmaid of science; even as the Italian army is now described as the schoolmistress of the Italian people. The conscripts of Italy, when drafted into service, are a majority of them illiterates — *analphabetici;* but they are forthwith put into regimental schools, and promised a discharge as soon as they can read and write. The stimulant to become *alphabetici* is as powerful as that of the boy with a goblet of wine at the furrow-end upon the plowman on the shield of Achilles. In most cases the plans of operation and results of these government expeditions have been praiseworthy. Yet they were sometimes open to criticism. On the grand Mormon anniversary of Salt Lake, in 1869, where the writer chanced to be present, one speaker stated that Fremont, when westward-bound, had found the north end of Salt Lake salter than any sea; that, returning by a more southern route, he fell in with a body of fresh water which he mistook for the south end of Salt Lake, and then puzzled himself to guess how the same lake could be half salt and half fresh.

Congressional doubts as to what route ought to be preferred for an inter-oceanic railroad led to a thorough research onward from 1857, along many lines north and south of the latitude which was finally chosen. These surveys, em-

bracing climate, soil, botany, zoölogy, geology, as well as physical geography, and published in thirteen corpulent quartos, form a magnificent contribution to the world's knowledge. They are now being supplemented by more minute trans-Missourian investigations, conducted by Hayden, Raymond, and especially those by Clarence King on the fortieth parallel, which is the average latitude of the Pacific railroad. One result of these recent surveys has been to multiply knowledge concerning our fossil flora. In 1850 only eighteen species were described by Brogniart in his *Végétaux Fossiles*. The number now known exceeds one thousand.

The British craving for trans-continental railroads within the territory of British America has induced Great Britain, during the last ten years, to make a more thorough examination of vast spaces westward from Manitoba than would otherwise have been thought of for a century. The first among our States to ordain a geological survey of its territory was North Carolina, in 1824, which was only two years after France, first of all nations, began hers. Every State in our Union, probably, has made some appropriation in order to know itself geologically.

Among government expeditions organized primarily for astronomical observations, and incidentally for the cause of other knowledge, the most considerable are those for observing the transit of Venus. That transit in 1769 led to Cook's circumnavigation of the globe. It brought other English observers to St. Helena, French astronomers to Mauritius and Coromandel, Danes to Lapland, and Germans, especially Pallas and Klaproth, with imperial escorts overland to Kamschatka. It was inspected, in all, from seventy-three stations. The passage of Venus across the sun, on the eighth of December, in 1875, was an astronomical jubilee. It was scrutinized all over the globe by experts under the patronage of many states. Italy fitted out an astronomical commission for India. Five principal stations were selected by England,—viz. Alexandria, Oahu, Mauritius, New Zealand, and Kerguelen's Island,—twenty-seven by

Russia, eleven by Germany, and six by the United States. Some of the stations taken by our astronomers were in China and Japan; and $150,000, besides the use of government ships, were granted by Congress for assisting the observations.

France has patronized astronomy, as well as other knowledge, more on the land than on the seas. Her first voyager round the world was Bougainville, between 1766 and 1769, two hundred and forty-seven years after the first Spaniard, and one hundred and ninety after the first Englishman, and only thirty-seven years before the first Russian. The first circumnavigation by a United States ship-of-war was completed in 1834. France may have been discouraged by the fate of La Perouse, who was sent out, in 1785, with two frigates, emulous of rivaling the glories of the English Captain Cook. In 1788 he and his ships vanished so mysteriously that for generations no trace of them could be detected by the strictest search. Yet in 1800 the French Admiral Baudin went on a national scientific voyage to Australia, and Freycinet on another in 1817, and in 1822 Duperry on still another. France was first to ascertain, in 1669, the true length of a degree — an error regarding which, so long as he persisted in it, rendered Newton's great discovery impossible. France maintained for years a scientific corps in Peru to test the accuracy of her home-measurement of a degree. In 1693 she despatched a party headed by Charelles to Alexandria for repeating the observations of Ptolemy on the very spot where he had made them; and in 1788 Beauchamp was directed by Louis XVI. to build an observatory in Bagdad, with a view to test the results reported there under the caliphs. In 1850 another national expedition, including Oppert, went forth from France to Mesopotamia. No one needs to be told that explorers supported by French authorities were first to traverse and to make known the interior of North America, especially the valleys of the Mississippi and St. Lawrence, as well as the basins of the Great Lakes.

France has spent much on archaeology. In 1798 a corps

of savans accompanied Napoleon to Egypt, and by his aid gave the world the first accurate account of Egyptian wonders. In 1828 Champollion and five other specialists were sent thither by France, in conjunction with Rosellini and six companions maintained by Tuscany. While Italy was controlled by the great Napoleon, more excavations were made in Rome and Pompeii than in any previous period of equal length. The disinterment of Caesar's palace on the Palatine since 1860, by Louis Napoleon, was the greatest single antiquarian labor of the present age in Rome. Some might not call this labor governmental; but it was certainly paid for by French tax-payers, and ordered as by him who taxed them at pleasure, saying, "L'etat! c'est moi!" Regarding the art-patronage of Prince Napoleon there may be room for doubt. This prince during the empire received about 15,000,000 francs, most of which he disbursed for the benefit of science and art. As he did not earn this public money, one is tempted to class his gifts, far more than those of Maecenas, among public, rather than private, liberalities.

The occupation of the Morea by a French army, in 1829, was fruitful in classical findings there, thanks to the soldiers' taking scholars in their train. French conquests in the north of Africa, also, have lighted up that land of darkness. The ruins of Carthage have been explored, and many a relic has thus been rescued from its grave. Soleillet has penetrated Central Sahara and the oasis In-Calah. One result of levelling at the Syrtis near Tunis has been the appropriation of some millions by France for a cut from the Mediterranean, which will form in Sahara a sea as large as Lake Erie. In 1864 a French exploring party in Cambodia fell in with the gigantic ruins of Ankor, and have now filled the imperial palace at Compiegne with their harvest from farther India. In 1875 another party of French officials started up the Congo, bound for the basin of the upper Nile.

Prussia in patronizing knowledge took the field later than England and France, but will not be long a whit behind them. Her scientific researches in Egypt, under Lepsius,

for four years onward from 1842, added much to the findings there of France, England, and Italy, and, in Humboldt's words, "threw much light upon the whole of antiquity." She has now a monopoly, as it were, of Greece, has set a large corps at work there,—particularly at Olympia in 1875,—and will doubtless reveal to us many a Pompeii.

Among the late advices from Germany there is an announcement that the kaiser has granted 25,000 thalers in aid of scholarly adventurers in equatorial Africa, and 40,000 thalers annually for plaster-casts of Italian sculpture. In 1870 the world heard with astonishment that the Prussian invaders of France had maps showing all the strategic minutiae of every locality. It has been plausibly asserted that, had the French penetrated into Germany, it would have been seen that their acquaintance with the lay of the land there was no less exact. In topography, as in other matters, self-knowledge is often that which is last acquired. Whatever may have been the comparative knowledge of the two nations, the strategic advantage accruing to Prussian invaders from their intimacy with the physical geography and topography of France will everywhere double the governmental encouragement which those sciences have hitherto received.

In 1817 Austria and Bavaria despatched a scientific delegation to Brazil, which made researches there through the three following years. Their collections form the most interesting scientific museum in Munich. The earliest work of Agassiz was a treatise on the fishes brought home by this expedition. Its title was: "Pisces quos collegit et pingendos curavit Spix, descripsit Agassiz."

In reference to Syria, it is worth noting that a corps of explorers was sent thither by France under the charge of Renan. This was thirteen years after Lieutenant Lynch of the United States navy, in 1848, had boated down the Jordan with a party of fifteen, mainly at the expense of our government. Excavations in the Holy Land, partly at the charge of Great Britain, were commenced in 1867. A survey of the region this side Jordan, including the peninsula of

Sinai, is now being made by British officers, and is already more than half done. It is said to be as accurate as the world-famed ordnance survey of England itself. The ruler of Egypt has caught the fever of research. No corps so large as that at the head of which he placed Sir Samuel Baker has ever essayed to pierce the heart of Africa. Not only has he sought out primitive Korans, and found some dating almost from the lifetime of Mohammed (that of Gaafar, written in Cufic on gazelle-skins, dates from 720), he is also now surveying the Nile-basin, with a view to turn a stream from it into what the Arabs call "the Dry-River Valley," hoping to double the arable acreage of Egypt, as a pre-historic Pharaoh did by excavating Lake Moeris.

Moreover, Italy, unified and liberalized, is now raising its own classical treasures from their graves, as in Rome and Herculaneum, with an energy undreamed of in any former era. The latest finding in the latter city is a female bust of pure silver, life size, in admirable preservation and of high art. In the eternal city excavations under director Rosa, *veterum volvens monumenta virorum*, have lately done more to show the plan of the Flavian Amphitheatre and its adaptation to its purposes than had ever been achieved. At twenty-one feet below the level of the ellipse has been laid bare the ancient arena, paved with *opus spicatum*, or herring-bone work. Elevators, which ten years ago had not been introduced in Boston hotels, have been brought to light in the Colosseum, and those on so grand a scale that they were evidently intended to raise and lower elephants. Among the findings on the Esquiline alone, in 1874, Mr. Hemans, son of the poetess and correspondent of the London Academy, enumerates 17 statues, parts of 57 others, 8936 coins, 39 inscriptions, dining forks, which had always been supposed altogether a modern invention, and five sarcophagi. The municipal archaeological outlay for 1875 was 3,040,000 francs.

Scientific expeditions supported by smaller states have often rivalled those of the great powers. The beginning of modern knowledge concerning Arabia and Persia is due to a

band of travellers, among whom Niebuhr, father of the historian, was at last chief, — maintained for seven years, from 1761 to 1768 by Denmark. No other party has accomplished more at so small expense. Other Danish expeditions have been those of Oersted and Forchhammer.

Discoveries made at the charge of the Hudson Bay Company I have credited to government patronage. So I do those made under the auspices of the Levant Company. That association, incorporated by England in 1605, was for two centuries an absolute *imperium in imperio* on all shores of the Mediterranean to the east of Italy. It could tax, imprison, bastinado, banish. It appointed all consuls, and even ambassadors, as Lords Elgin and Montague. Among its employes were Pococke, Maundrell, Shaw, Salt, and a score of other scholars, — owing their places to scholarship, — and to whom Christendom owes the blessings of inoculation, as well as disarming the plague of panic terrors, and to whom England owed almost all she learned during two centuries concerning the Orient — its art, science, literature, and manners.[1]

Governments have patronized knowledge through enabling philosophers to test their theories by *experiment* and *observation*.

Alexander the Great, as Pliny informs us, placed at the disposal of Aristotle, when preparing to write his "history of animals," several thousand hunters, fishers, and fowlers, who laid at the feet of the philosopher whatever they could capture in the three kingdoms of nature. Aristoteli, summo in omni doctrina viro, aliquot millia hominum in totius Asiae, Greciaeque tractu parere jussa, omnium quos venatus, aucupia, piscatusque alebant, quibusque vivaria, armenta, alvearia, piscinae, aviaria in cura erant; ne quid usquam gentium ignoraretur ab eo; quos percontando quinquaginta ferme volumina illa praeclara *de animalibus* condidit.[2] The amount thus expended is estimated by Athenaeus (ix. 398 *e*) at eight

[1] See "Account of Levant Company." London. 1825.

[2] Pliny, Natural History, Vol. viii. chap. 17.

hundred talents, and that in an age when a single talent was tantamount to the highest daily pay of six thousand soldiers. A century later Archimedes, the first born of ancient mechanical philosophers, was reinforced by King Hiero so powerfully that he half believed his patron would furnish him a fulcrum on which to rest a lever for lifting the world.

Patronage of alchemy was a patronage, albeit blind and wasteful, of knowledge. For, says Bacon, "the search and stir to make gold hath brought to light a great number of good and fruitful inventions." Laudanum and Glauber's Salts (*sal mirabile Glauberi*) are not a tithe of the medicines we owe to alchemists. The black art student, Agricola, by governmental aid first made chemical analyses and discovered bismuth. Bottger, furnished by Saxony with a hundred and fifty thousand dollars with which to seek the philosopher's stone, found Dresden porcelain. Charles the second, of England, at his restoration in 1660, brought over a famous alchemist from Paris and built for him in St. James's Park a very fine "elaboratory." But the patrons of alchemy can no more be numbered than can the devotees of avarice and credulity.

All the deer in Windsor Park were given by Charles I. to Harvey, the discoverer of the circulation of the blood, for dissection. Whether the monarch gave him the venison too, chroniclers do not relate. For testing Halley's theory concerning variations of the compass, that philosopher was put in command of a British ship, with which he made ocean voyages for several years, returning to England in 1700. The same act of parliament which offered a prize for ascertaining longitude at sea also authorized commissions to defray the expense of longitudinal experiments. In 1805 Robert Fulton was afforded opportunities by the British government to experiment with his submarine torpedoes, and in 1807 was granted $5000 by the authorities in Washington for testing again his torpedo theory. In 1842 $15,000 were granted to Colonel Samuel Colt, inventor of the revolver, for the same purpose.

The Prussian admiralty is reported to have lately purchased of an English inventor the secret of the so-called "fish-torpedo" for harbor defences. In 1800 Prussia gave the chemist Achard a farm for experiments on beet sugar; — the beginning of a manufacture, afterward encouraged in France when stripped of her sugar-islands, by the premium of a million francs for the best method of making it, and which to-day renders half Europe independent of the sugar-cane and tropical islands. The manufacture of beet sugar — beginning so lately and on so small a scale — will repay a million-fold the fostering care of Germany. In 1874 the tax on it in the German empire yielded more than that laid on any other article, namely, 35,451,300 marks, while that on salt was 32,350,470, and that on distilled liquors 30,761,670. But extracting sugar from beets seemed so chimerical a project to the average English mind, that one of the most popular of Gillray's caricatures shows George III. standing on the channel coast, and throwing a huge beet across to the French emperor, and bidding him make sugar of it.

In 1843 the United States Congress erected a line of telegraph for Morse from Washington to Baltimore. Who can estimate the influence of this appropriation of $30,000 in hastening on the telegraphic era? An index of telegraphic progress in thirty years is afforded by the outlay on telegraphs of $834,169 in 1872 by the government even of Brazil. Again, had not the inventor Ericsson been permitted to try his propeller on a United States steamer in 1841, the navies of the world might still have been sailing ships. Had not our government given the same genius its patronage for building the unique, new-fangled Monitor, who can calculate the disasters that would have followed in the wake of the triumphant Merrimac?

In 1817 the canton of Geneva established a botanical garden simply to aid DeCandolle in his botanical researches. In 1872 De Lôme was granted £1600 by France, that he might try aeronautic experiments. In 1847 Agassiz, having executed his American commission for Prussia, was about to

return thither, when he was offered by the head of our coast-survey, Mr. Bache, — who held that tools belong to him that can use them, *tractet fabrilia faber*,— its aid in his researches. This offer was the secret of Agassiz's deciding to end his days here, deaf to tempting European invitations. It enabled him at will to push researches on all shores from Maine to Texas, as well as along the Pacific. It bore him up the Amazon and round Cape Horn. It gave him more hands than those of Briareus. At first he could not credit his good fortune, which was more than Aristotle's; or his feeling was,

> "Give me a gash, put me in present pain,
> Lest this great sea of joys rushing upon me,
> O'erbear the shores of my mortality,
> And drown me in their sweetness."

The Washington authorities by making Professor Henry, — who is the chief executive officer of the Smithsonian Institution,— president of the light-house board, do science a service as well as themselves. They afford him abundant facilities for experiments in optics and acoustics, which would otherwise be impossible, as well as for testing plausible theories.

Governments have sometimes patronized knowledge by relaxing for its benefit the severities of war.

> "The great Emanthian conqueror bid spare
> The house of Pindarus, when temple and tower
> Went to the ground."

In the very heat of our war for independence, Dr. Franklin, as Plenipotentiary of the United States in France, forbade American privateers to molest the squadron with which the British discoverer, Captain Cook, was circumnavigating the globe. France, in the interest of science, is said to have laid a similar interdict on her cruisers. It is certain that Franklin did, and on those of Spain also. In acknowledgement of Franklin's magnanimity the British Admiralty sent him, as from the king, a presentation copy of Cook's voyages and a gold medal. In 1813 Davy, the scientist, was allowed by Napoleon to make a chemical tour on the continent of Europe, when it was shut up against all other Englishmen.

Through upholding some form of *religion*, governments have patronized knowledge.

Among the seven wonders of the classical world all save two were religious monuments; namely, the pyramids and the mausoleum, the colossal statues of Apollo at Rhodes, and of Jupiter at Olympia, and the Ephesian temple of Diana; and all were national works. So were the architectural miracles of Karnak, Jerusalem, Baalbec, and Athens, as well as those in India and farther east.

After the fall of paganism every government which favored Christianity favored the advance of knowledge. For the last millenary the grandest architecture in the world has been displayed in European cathedrals, the larger part of which were built at public expense. The funds obtained by the pope through the sale of indulgences for lavishing on St. Peter's were as really public money as was that fund raised in England by a parliamentary tax on coal for erecting fifty churches in London by Sir Christopher Wren. So were the sums secured by priests in Rouen for licenses to eat butter in Lent, and then laid out in building there one of the most massive church towers in France, called "*La Tour de Beurre*, parcequ'elle fut construite de l'argent payé par les fidèles pour obtenir la permission manger du beurre pendant le carême."

Through the church also governments have patronized sculpture and painting no less than architecture. The master-pieces of most of the masters were executed for the ornamentation of churches. They have usually been paid for by public money, — money exacted rather than voluntarily contributed. In maintaining Christian clergy, governments have done a service to knowledge. The maintenance of Christian teachers from the revenues of the state began with the first Christian emperor, Constantine. Charlemagne at the opening of the ninth century was the legal author of tithes. Thus was furnished a physical basis which is often a *sine qua non* of intellectual advancement, — the *πού στῶ* which Archimedes wanted as a pre-requisite for moving the

world. Ecclesiastics thus fed, have done as much as any other class for the increase of knowledge. Such names as Roger Bacon, and "gunpowder Schwarz," both friars; Grosseteste a bishop; Basil Valentine, who invented percussion powder, a Benedictine, cannot be surpassed among mediaevals. The only man in the ninth century known to have maintained the rotundity of the earth, was a bishop. Petrarch was a prebendary, as some one says, "fattening upon benefices while writing about philosophy." Copernicus was a parish priest. The monks of Salamanca entertained Columbus for two years, and supported his scheme of discovery after it had been condemned by the university. The foremost founders of libraries and museums were popes.

When Milton visited Rome in 1638 — his biographer, Professor Masson, writes — the popes and cardinals had come to regard the patronage of learning and the arts as a part of their official duties. To build new edifices, surround them with gardens and fountains, and adorn them with sculptures and paintings; to preside at meetings of the academies and to hold large reunions in their own palaces, at which all the learned were assembled, and at which the best singing in Italy was to be heard, to collect books and manuscripts, and to employ librarians to catalogue and keep them,— such were the occupations of the Roman cardinals.

Some portions of papal patronage are underrated when we view them from a Protestant stand-point. Thus Borghese, who had laboriously and scientifically arranged the papal numismatic treasures, was paid, at his own request, by permission to eat meat on Friday. Protestants would choose a largess of meat, choosing pork rather than permission to partake of it, loin rather than license. But Borghese was well paid, for he was well satisfied. Cardinal del Monte, having begged a telescope from Galileo, sent him in return a certificate of indulgence, as it were celestial pardons for celestial prospects. Never, however, can we forgive the seven cardinals, who silenced, and as it were paralyzed, Galileo during the last nine years of his life — though the

pope was too wary to sign the decree, and the actual imprisonment of the sage lasted no more than twenty days, and that in "the best and most comfortable rooms of the holy office."

In nothing, perhaps, is the papal power of literary patronage more enviable than in its protection of libraries, which no locks, or police, or penalties among Protestants can secure from kleptomaniacs. The invaluable library at Santa Maria Sopra Minerva, — the very spot where Galileo was incarcerated, — is open to all the world, and yet its books are safe. Their palladium is this. Over its door, in letters which he that runneth may read, you see a notice that whosoever carries a book through that door is, by that very act, *ipso facto*, excommunicated. On the whole Newman has reason to say: "Not a man who now talks bravely against the church, but owes it to the church that he can talk at all."

Various outlays of the United States in the cause of knowledge have been mentioned in the course of this Article. But it may help to a better appreciation of our national contributions of this nature if we look, in a table, at the principal annual appropriations. Those for the official year ending with June 1874 were as follows: Coast-Survey, $852,828; West Point, $345,362; Naval School, $200,000; Naval Observatory, $42,600; Nautical Almanac, $20,000; Congressional Library, $54,646; Surgeon-General's Library, $10,000; National Museum, warming and repairing, $27,000; Testing strength of materials and experiments with new systems of guns, $153,000; Botanical Garden, $54,646; Making Maps, $30,000; Storm Signals, $88,000; Transit of Venus, $150,000; Western Explorations, $125,000; Bureau of Education, $34,850; Statistics (astronomical, etc.), $65,440; making a total of $2,253,372. But the actual outlay for the good of knowledge will probably amount to nearer three millions than two. In addition to this, President Grant, in compliance with a resolution of Congress, has invited the statistical association to hold their next, and ninth, congress in the United States.

Under the patronage of Belgium, Austria, France, Great Britain, Prussia, Italy, Holland, and Russia, that society has held one congress in each of those states. Should it accept our invitation, doubtless it will find our authorities shrinking from no outlay needful to render its first welcome in the New World a match for any reception that has greeted it in the Old.

Buckle and some others have depreciated patronage, counting it of little worth, and have even decried it as killing with kindness. "Glory," says Lord Camden, "is the reward of science. When the bookseller offered Milton £5 for 'Paradise Lost,' he did not reject it, and commit his poem to the flames, nor did he accept the miserable pittance as the reward of his labor. He knew that the real price of his work was immortality, and that posterity would pay it." But the foregoing facts — though their results, for want of space, have been only incidentally alluded to — seem to evince that patronage has done much in advancing knowledge. Its benefits would have been seen to be much greater, had showing private as well as public aid been my purpose. Yet candor demands the admission that pecuniary favor has done far less for genius than for talent. Genius "is made better by no mean, but genius makes that mean." Genius creates; talent explains and applies. Genius is spontaneous; talent is called out. Genius, stamped in nature's mint of ecstasy, can snatch a grace beyond the reach of art, and needs not, like talent, the aid of art. It is the wind, which "bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh." Talent is steam, developed by man and under human control. So it is well said:

> "Talk not of Genius baffled; Genius masters man.
> Genius does what it must, while Talent does what it can."

Homer achieved immortality, without library, or printing, or perhaps writing. But who ever did before him? And how few have since! It is the nature of the aid ministered to talent, rather than to genius, by patronage, which has now been unfolded.

Governmental patronage of knowledge, as now passed in review, has been shown founding and furnishing universities and learned societies, building and equipping libraries and museums, laying out botanic gardens, collecting and publishing archives, offering prizes for advances to be made, rewarding them when made, importing men more precious than the wedges of Ophir, paying the charges both of single experts and of scientific parties sent forth — either within their own territories or to the uttermost parts of the earth and sea and air — to test the deductions of theorists and extend the area of knowledge, reinforcing explorers by official prestige and by opportunities for observation and experiment, lavishing money on religious establishments, and mitigating the rigors of war — a policy which has increased the number of students of truth, as well as their ability and zeal in their pursuit.

The Grand Seignior, when the Italian painter Bellini showed him the head of John the Baptist in a charger, declared the rendering of the muscles not natural, and, to justify his criticism, had a slave decapitated on the spot. This story, however false to fact, is true as illustrating the alacrity of many governments in testing, regardless of expense, the theories of students in all departments, and hence extending the area of knowledge.

Such patronage as we have now considered, beginning with the dawn of enlightenment, has grown with its growth in all the principal nations of the world. It is now most conspicuous in those which lead the van of civilization. It is increasing in every one of them to-day. Seeing what has been in the action of governments for the good of knowledge, no man can doubt what will be; just as on the western borders of Wisconsin, when we behold how far the Father of Floods has flowed, we cannot doubt but he will flow farther, "spreading broad and more broad till he reaches the sea."