

catalogue of which is given in his work *De Propriis Libris*, one only has come down to us, the treatise on Fallacies in dictione (περὶ τῶν κατὰ τὴν λέξιν σοφισμάτων). Many points of logical theory, however, are discussed in his medical and scientific writings. His name is perhaps best known in the history of logic in connexion with the fourth syllogistic figure, the first distinct statement of which was ascribed to him by Averroes. There is no evidence from Galen's own works that he did make this addition to the doctrines of syllogism, and the remarkable passage quoted by M. Minas from a Greek commentator on the *Analytiques*, referring the fourth figure to Galen, clearly shows that the addition did not, as generally supposed, rest on a new principle, but was merely an amplification or alteration of the indirect moods of the first figure already noted by Theophrastus and the earlier Peripatetics.

In 1844 M. Minoides Minas published a work, avowedly from a MS. with the superscription *Galenus*, entitled *Γαλινοῦ Εἰσαγωγή Διαλεκτικῆς*. Of this work, which contains no direct intimation of a fourth figure, and which in general exhibits an astonishing mixture of the Aristotelian and Stoic logic, Prantl speaks with the bitterest contempt. He shows demonstratively that it cannot be regarded as a writing of Galen's, and ascribes it to some one or other of the later Greek logicians. A full summary of its contents will be found in the 1st vol. of the *Geschichte der Logik* (591-610), and a notice of the logical theories of the true Galen in the same work, pp. 559-577.

There have been numerous issues of the whole or parts of Galen's works, among the editors or illustrators of which may be mentioned Jo. Bapt. Opizo, N. Leonicens, L. Fuchs, A. Lacuna, Ant. Musa Brassavolus, Ang. Gadaldinus, Conrad Gesner, Sylvius, Cornarius, Joannes Montanus, Joannes Caius, Thomas Linacre, Theodore Goulston, Caspar Hoffman, René Chartier, Haller, and Kühn. Of Latin translations Choulant mentions one in the 15th and twenty-two in the following century. The Greek text was edited at Venice, in 1525, 5 vols. fol.; at Basel, in 1538, 5 vols. fol.; at Paris, with Latin version by René Chartier, in 1639, and in 1679, 13 vols. fol.; and at Leipsic, in 1821-33, by C. G. Kühn, considered to be the best, 20 vols. 8vo. An epitome in English of the works of Hippocrates and Galen, by J. R. Cox, was published at Philadelphia in 1846.

Further details as to the life and an account of the anatomical knowledge of Galen will be found in the art. ANATOMY, vol. i. pp. 802-804. See also René Chartier's Life, in his edition of Galen's works; N. F. J. Eloy, *Dictionnaire Historique de la Médecine*, s. v. "Galen," tom. i., 1778; F. Adams's "Commentary" in his *Medical Works of Paulus Aegineta*, London and Aberdeen, 1834; J. Kidd, "A Cursory Analysis of the Works of Galen, so far as they relate to Anatomy and Physiology," *Trans. Provincial Med. and Surg. Assoc.*, vi., 1837, pp. 299-336; C. V. Daremberg, *Exposition des Connaissances de Galien sur l'Anatomie, la Physiologie, et la Pathologie du Système Nerveux* (Thèse pour le Doctorat en Médecine), Paris, 1841; and J. R. Gasquet, "The Practical Medicine of Galen and his Time," *The British and Foreign Medical-Chirurgical Rev.*, vol. xi., 1867, pp. 472-488.

GALENA, a city of the United States, the capital of Jo Daviess county, Illinois, is situated on the Fever or Galena river, 6 miles above its junction with the Mississippi, and on the northern division of the Illinois Central Railroad, 180 miles W.N.W. of Chicago. The city winds around the base of rocky limestone bluffs, which spring rather abruptly from the river on both sides, and the streets rise above one another, and are connected by flights of steps. It is the commercial depôt of an extensive and fertile district, but owes its prosperity chiefly to the species of lead from which it takes its name, and the mines of which surround it in all directions, underlying, more or less densely, an area of over 1,500,000 acres. In these mines copper is also found in combination with the galena. In the earlier years the produce of the mines found its way by water to St Louis, but in 1829 the first load, 3000 lb, was conveyed overland to Chicago. In 1846 the yield reached its highest point of 50,000,000 lb; in 1852 it was 40,000,000; and in 1877 only 3,300,000. This diminution is due to the absence of the expensive appliances necessary for deep

mining. Meanwhile zinc ore has been discovered, of which 12,000,000 lb were mined in 1877. The lumber produce is also considerable, averaging 7,000,000 feet annually. The principal buildings are the German-English normal school, the high school, and the building in which are included the custom-house and post-office. Galena has an iron-foundry, flour-mills, woollen mills, saw and planing mills, besides furnaces and manufactories for lead, zinc, copper, and furniture. Mining commenced in 1820, and in 1822 the United States began to grant leases of the mineral lands. The first street was laid out in 1826; village government was legalised in 1837, and a city charter granted in 1839. Population in 1850, 6004; in 1860, 8196; and in 1870, 7019, of whom 2473 were foreigners.

GALESBURG, a city of the United States, the capital of Knox county, Illinois, is situated at the junction of the Burlington and Peoria branches of the Chicago, Burlington, and Quincy Railroad, 163 miles W.S.W. of Chicago, and is the centre of a farming district of great fertility. It has several extensive manufactories of agricultural implements, besides carriages and waggons, and also contains the machine-shops and car-works of the railroad company. It is the seat of two colleges, Knox College (Congregational), founded in 1841, and Lombard University (Universalist), founded in 1852, to both of which female students are admitted. Population in 1860, 4953; and in 1870, 10,158, of whom 3136 were foreigners.

GALIANI, FERDINANDO (1728-1787), one of the most celebrated, if not one of the soundest, political economists of Italy, was born at Chieti on the 2d of December 1728. For his early education and opportunities of advancement in life he was less indebted to his parents than to his uncle, Monsignor Celestino Galiani. By his care, and at his expense, Galiani received the best education which Naples and Rome could then furnish, becoming qualified for an ecclesiastical career at a time when a clever abbé might hope to fill with profit and reputation important offices in the state as well as in the church. Galiani gave early promise of distinction as an economist, and even more as a wit. At the age of twenty-two he had produced two works by which his name became widely known far beyond the bounds of his own Naples. His taste for economic studies had been developed in the society of such men as Genovesi and Intieri, and prompted the composition of his *Trattato della Moneta*, in which many aspects of the question of exchange are set forth, always with a special reference to the state of confusion then presented by the whole monetary system of the Neapolitan Government. Galiani's fame as a humorist dated from the appearance of the *Raccolta in Morte del Boia*, a work as popular in Italian literary circles during the last century as the *Rejected Addresses* and *Lon Gaultier Ballads* have been in our own. In this volume Galiani parodied with exquisite felicity, in a series of discourses on the death of the public hangman, the style of the most pompous and pedantic Neapolitan writers of the day. Galiani's political knowledge and social qualities now pointed him out to the discriminating eye of Charles III., and his liberal minister Tanucci, as one eminently fitted to serve the Government as a diplomatist in France. He was therefore attached in the character of secretary to the Neapolitan embassy at Paris. Thither he repaired in 1759, at a time when a change in the relations between the courts of Paris and Vienna was about to exercise an influence on the course of the Seven Years' War, when the different Bourbon courts were engaged in a common action against the Jesuits, and when economic science held a foremost place in the speculations of the most eminent French writers. Galiani is chiefly remembered by posterity by the part which he took in these economic discussions. His *Dialogues sur les blés*, though published after his return to Naples, produced on its appearance a great

impression, and has again and again furnished to future controversialists arguments more specious than solid against the liberty of exporting corn. The criticism of Voltaire, that Galiani's volume united the wisdom of Plato and the wit of Molière, will not be accepted as a decisive judgment on the merits of the treatise; but it may be viewed as a tolerably fair test of the regard in which it was held by Galiani's contemporaries. Galiani returned to Naples after a ten years' residence in Paris, where his reputation as a wit had long surpassed that of an economist or a statesman. Until his death at Naples, on October 30, 1787, he kept up with his old Parisian friends a correspondence, of which the tone on his side can only be compared to the wailing and howling sent forth by Ovid during his banishment to the shores of the Euxine. Absence from Paris was with him the synonym of social and literary death.

To the common editions of Galiani which are found in great public libraries must be added the essay recently published at Naples, *L'Abate Galiani*, by Alberto Margheri, 1878, and the copious extracts from his correspondence with Tanucci, likewise published very recently in the new series of Viessesux's *L'Archivio Storico*, Florence, 1878.

GALICIA, in German *Galizien*, and in Polish *Halicz*, a crown-land of Austria which comprises the old kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand-duchy of Cracow. Towards the N. and E. it has an extensive and irregular frontier continuous with the Russian empire; in the S.W. it meets the Hungarian territory along the ridge of the Carpathian Mountains; its western borders, which are of small extent, touch both Austrian and Prussian Silesia; and in the S. it is bounded by the province of Bukowina, which was separated from it in 1849. As its area is 30,299 square miles, or more than 10,000 square miles greater than that of Bohemia, it is the largest of all the crown-lands of Austria. The population in 1869 was 5,418,016, which showed an increase since 1857 of 785,150. Of the whole 2,660,518 were males, and 2,757,498 females. The density was greatest in the circles of Biala, Tarnow, and Cracow, and least in the circle of Radworna. In 1876 the total was 6,000,326.

About a third of the whole area of Galicia is occupied by the Carpathians, and the greater proportion of the remainder consists of the terraces by which the mountain system gradually sinks down to the great eastern plains of Russia. Only a very small district near the Vistula can properly be described as lowland. The two most prominent summits of the Galician Carpathians are the Babia Gora or Women's Mountain, 5648 feet above the level of the sea, and the Waxmundska, 7189. Of the famous massif of the Tatra, hardly a fourth is within the Galician boundaries.

By its rivers Galicia belongs partly to the basin of the Baltic and partly to the basin of the Black Sea. The Dunajec, the San, and the Premsza, tributaries of the Vistula, are the navigable streams of the western region; and the Dniester, which is the principal river of the east, is navigable as far as Czartoria. There are few lakes in the country except mountain tarns; but considerable morasses exist about the Upper Dniester, the Vistula, and the San, and the ponds or dams in the Podolian valleys are estimated to cover an area of 208 square miles. Of the 35 mineral springs which can be counted in Galicia, the most frequented are Konopowka, south of Tarnopol, and Lubian and Sklo, west of Lemberg. The last is a good example of the intermittent class. The Galician climate is exceedingly severe, the range of temperature being nearly 145°. In July and August the mean temperature is 66° or 67° Fahr.; in March it is 32° or 33°. Winter is long, and the snowfall, which often begins in the early part of October, is very abundant. At Cracow the annual precipitation is

about 23 inches, and at Lemberg about 28. Rather more than 6 per cent. of the surface of Galicia is unproductive. Forests occupy upwards of 4 million acres, but they are so badly managed that in some districts straw has to be used as fuel; 1,550,128 acres are devoted to pasture, 8,486,358 are under tillage, and 3,007,024 are under gardens and meadows. Barley, oats, and rye, are the prevailing cereals; but wheat, maize, and leguminous plants are also cultivated, and hemp, flax, tobacco, and hops are of considerable importance. In 1873 the whole crop of cereals amounted to 9,878,563 bushels; and there were 2,016,326 bushels of pulse, and 65,581,331 bushels of potatoes. In 1869 the number of horses in the crown-land was 695,610; of asses and mules, about 2000; of cattle, 2,070,572; sheep, 966,763; goats, 35,825; and swine, 734,572. The stocks of bees were upwards of 257,490, and the yearly produce of honey and wax is about 18,300 and 7166 cwt. respectively. In West Galicia there are mines of coal, ironstone, and zinc ore; and in Eastern Galicia a certain quantity of lignite is obtained. The iron ore is poor, containing only 10 or 11 per cent. of metal; and in 1873 the out-put did not exceed 108,546 cwt. Salt is procured both from mines and from salt-springs in sufficient abundance to make it an article of export to Russia. The great factory at Kalusz for the making of potash was closed in 1875, the company having failed; and the exploitation of the rich petroleum springs of East Galicia languishes for lack of capital. Cracow is the centre of the iron manufacture, but it is of comparatively small development. Tile works are very numerous; stoneware is produced in a few establishments; and the glass works number about 15. In 1874 there were 237 breweries, 598 distilleries, and 3746 mills,—no fewer than 3524 of the mills being driven by water and 172 by wind. Cigars are manufactured at Monasteryska and Winniki, Cracow, Jupielnica, and Zablutow. The textile industries are for the most part very slightly developed, but the linen trade employs 11,255 looms. Railway traffic is rapidly increasing. There is a large transit trade down the river Dniester to Russia by means of light boats built at Zuravero, Halicz, Marianpol, &c., which are usually broken up for firewood when they reach Odessa; and all the navigable streams, both north and south, are used for the transport of wood from the forests. Large quantities of Galician timber thus find their way to Dantzic, Stettin, Hamburg, and Berlin. The country is divided into the eight districts of Lemberg, Zloczow, Tarnopol, Stanislawow, Sambor, Przemysl, Tarnow, and Cracow, which altogether comprise 74 administrative circles. There are in all 83 towns, 230 market villages, and 11,000 hamlets, the most populous places being Lemberg, 87,109; Cracow, 49,835; Tarnow, 21,779; Tarnopol, 20,087; Brody, 18,890; Kolomiya, 17,679; Drohobiez, 16,888; Przemysl, 15,185; Stanislaw, 14,479; Sambor, 11,749; Jaroslau, 11,166; Rzesznaw, 10,090; and Sniatyn, 10,305. The chief town is Lemberg, which is the seat of the royal imperial lieutenantcy or K. K. Statthaltereie. According to the laws of 1861 the diet of Galicia consists of the three archbishops (those of the Roman Catholic, the Greek Catholic, and Armenian Catholic Churches), the three Roman Catholic bishops, the rectors of the universities of Lemberg and Cracow, 44 representatives of the larger landowners, 4 representatives of the capital, 3 representatives of the chambers of trade and industry, 16 from the towns and industrial centres, and 74 from the rural communes. Sixty-three members are sent to the imperial diet, of whom 20 represent the landowners, 13 the towns, 27 the rural communes, and 3 the chambers of trade, &c. The two principal nationalities in Galicia are the Poles and the Ruthenians—the former predominating in the west and the latter in the east. The Poles who inhabit the Carpathians are distin-

guished as Goralians (from gor, a mountain), and those of the lower regions as Mazures and Cracoviaks. The Ruthenian highlanders bear the name of Huzulians.

Galicia (or Halicz) took its rise along with the neighbouring principality of Lodomeria (or Vladimir) in the course of the 12th century—the seat of the ruling dynasty being Halicz or Halitch, a town in the present district of Stanislawow at the confluence of the Lukey with the Dniester. Disputes between the Galician and Lodomerian houses led to the interference of the king of Hungary, Bela III., who in 1190 assumed the title of *Rex Galatiae*, and appointed his son Andreas lieutenant of the kingdom. Polish assistance, however, enabled Vladimir the former possessor to expel Andreas, and in 1198 Roman, prince of Lodomeria, made himself master of Galicia also. On his death in 1205 the struggle between Poland and Hungary for supremacy in the country was resumed; but in 1215 it was arranged that Daniel, son of Roman, should be invested with Lodomeria, and Koloman, son of the Hungarian king, with Galicia. Koloman, however, was expelled by Mstislaff of Novgorod; and in his turn Andreas, Mstislaff's nominee, was expelled by Daniel of Lodomeria, a powerful prince, who by a flexible policy succeeded in maintaining his position. Though in 1235 he had recognized the overlordship of Hungary, yet, when he found himself hard pressed by the Mongolian general Batu, he called in the assistance of Innocent IV. and accepted the crown of Galicia from the hands of a papal legate; and again, when Innocent disappointed his expectation, he returned to his former connexion with the Greek Church. On the extinction of his line in 1340 Casimir III. of Poland incorporated Galicia and Lemberg; on Casimir's death in 1377 Louis the Great of Hungary, in accordance with previous treaties, became king of Poland, Galicia, and Lodomeria; and in 1382, by the marriage of Louis's daughter with Ladislaus II., Galicia, which he had regarded as part of his Hungarian rather than of his Polish possessions, became definitively assigned to Poland. On the first partition of Poland, in 1772, the kingdom of Galicia and Lodomeria came to Austria, and to this was added the district of New or West Galicia in 1795; but at the peace of Vienna in 1809 West Galicia and Cracow were surrendered to the grand-duchy of Warsaw, and in 1810 part of East Galicia, including Tarnopol, was made over to Russia. This latter portion was recovered by Austria at the peace of Paris, and the former came back on the suppression of the independence of Cracow in 1846. Within the short period since 1860 great advances have been made in many ways in the development of the natural resources of the country and in the education of the people; and the general prosperity of the kingdom is evidenced by the rapid growth of several of its larger towns.

See Lill de Lillienbach, "Description du bassin de la Galice et de la Podolie," in *Mémoires de la société géologique de France*, tome I., mém. iv., 1833-34; Schmedes, *Geogr.-statist. Uebersicht Galiziens*, Lemberg, 1869; Lipp, *Verkehrs- und Handelsverhältnisse Galiziens*, Prag, 1870; Zellecke, "Die polit. und socialen Zustände Galiziens," in *Unsere Zeit*, 1870; "Die Ruthenen in Galicien," in *Die Globus*, 1870; Pillat, *Statist. Mittheil. über die Verhältnisse Galiziens*, Lemberg, 1874; *Ortsrepertorium des Königreichs Galicien und Lodomerien* (official), Vienna, 1874; Zellecke, "Die deutschen Kolonien in Galicien," in *Im Neuen Reich*, 1876; Kelb in *Jahrbuch der K. Geol. Reichsanstalt*, 1876; "Culturfortschritte in Galicien," in *Das Ausland*, 1876. Remarkable sketches of Galician life have been given by Sacher-Masoch, whose works are well known in France and Germany. A rich literature on the subject exists in Polish.

**GALICIA** (Gallicia or Callaicia, Καλλαικία, Καλαικία), an ancient kingdom, countship, or province in the N.W. angle of Spain, now divided into the provinces of Coruña, Lugo, Orense, and Pontevedra, lies between 41° 51' and 43° 47' N. lat., 6° 50' and 9° 16' W. long., and is bounded on the N. and W. by the Bay of Biscay and the Atlantic, on the S. by the Portuguese provinces of Entre Douro e Minho and Traz os Montes, and on the E. by Leon and the Asturias. The greatest length is about 125 miles, greatest breadth 115 miles; area, 11,222 square miles; population (1867), 1,937,792. Galicia is traversed from E. to W. by a continuation of the great Pyrenean and Cantabrian chain; and its surface is further broken by two spurs from that system, which, running in a south-westerly direction, enclose the basin of the Miño. The average elevation of the province is considerable, and the maximum height (6593 feet) is reached in the Peña Trevinca on the east border of Orense. The principal river is the *Miño* (Portuguese, *Minho*; Latin *Minius*; so named, it is said, from the minium or vermilion found in its bed), which, rising near Mondoñedo, within 20 miles of the northern coast, after a course of 170 miles in a south and south-west direction, enters the Atlantic near the port of La Guardia. It is navigable by small vessels on the lower part of its course.

Of the numerous affluents of the Miño, the most important are—on the left the Sil, which rises among the lofty mountains between Leon and Asturias, and on the right the Tea, which rises on the eastern flank of Monte Fano. Among other rivers having a westerly direction may be mentioned the Tambre, the Ulla, and the Lerez or Ler, which fall into the Atlantic by estuaries or *rias* called respectively *Ria Muros y Noya*, *Ria Arosa*, and *Ria Pontevedra*. The rivers of the northern versant, such as the Eume, the Juvia, and the Mero, are, like those of the Asturias, for the most part short, rapid, and subject to violent floods. The coast-line of Galicia, extending to about 240 miles, is everywhere bold and deeply indented, presenting a large number of secure harbours, in this respect forming a marked contrast to the neighbouring province. The Eo, which bounds Galicia on the east, has a deep estuary, the Rivadeo, which offers a safe and commodious anchorage in 3 fathoms water at ebb-tide. Further to the west is Vivero Bay, 1 mile wide and 3 in length, affording good anchorage throughout, with from 6 to 8 fathoms of water. The *Ria del Varquero y Vares* is of a similar character; while the harbour of Ferrol (see FERROL) ranks among the best in Europe. On the opposite side of Betanzos Bay (the *μέγας λιμὴν* or *Portus Magnus* of the ancients) is the great port of Coruña (see CORUNNA). The principal port on the western coast of Galicia is that formed by the deep and sheltered bay of Vigo, which is navigable for vessels of 500 tons to a distance of 16 miles from the ocean; but there are also good roadsteads at Corcubion under Cape Finisterre, at Marin, and at Carril. The climate of the Galician coast is mild and equable, but the interior, owing to the great elevation (the town of Lugo is upwards of 1900 feet above the sea level), has a wide range of temperature. The rainfall is exceptionally large, and snow lies on some of the loftier elevations for a considerable portion of the year. The soil is on the whole fertile, and the produce very varied. A considerable quantity of timber is grown on the high lands, and the rich valley pastures support large herds of cattle, while the abundance of oak and chestnut favours the rearing of swine. In the lowland districts good crops of maize, wheat, barley, oats, and rye, as well as of turnips and potatoes, are obtained. The fruit also is of excellent quality and in great variety, although the culture of the vine is limited to some of the warmer valleys in the southern districts. The dehesas or moorlands abound in game, and fish are plentiful in all the streams. The mineral resources of the province, which are considerable, were known to some extent to the ancients. Strabo speaks of its gold and tin, and Pliny mentions the gemma Gallica. Mines of lead, tin, copper, and iron pyrites continue to be wrought, though under considerable disadvantages, and chiefly by foreign capitalists. Galicia is also remarkable for the number of its sulphur and other warm springs, the most important of which are those at Lugo and those from which Orense is said to take its name (*Aquæ urentes*).

Ethnologically the Galicians (Gallegos) are allied to the Portuguese, whom they resemble in dialect, in appearance, and in habits more than the other inhabitants of the peninsula. The men are well known all over Spain, and also in Portugal, as hardy, honest, and industrious, but for the most part somewhat unskilled, labourers; indeed the word Gallego has come to be almost a synonym in Madrid for a "hewer of wood and drawer of water." Agriculture engages the greater part of the resident population, both male and female; other industries are little developed, and the fisheries are not extensive. There are a few linen and cotton factories in the larger towns. The principal exports are live cattle, preserved meats, eggs, bones, mineral ore, fish oil, salt fish (especially sardines), chestnuts and other nuts, grain (especially maize), and potatoes. The first-men-

tioned item is the most considerable; the exports to England from Coruña alone having mounted in 1875 to 17,000 head, at an average value of £15. The chief imports are coal, iron, tobacco, and manufactured goods. Apart from the few carreteras reales or royal roads, which are, as elsewhere in the Peninsula, unexceptionable, the means of internal communication in Galicia are decidedly defective. The only railways are those betwixt Lugo and Coruña (61 miles), and betwixt Santiago and Carril (24½ miles). Another line, from Vigo to Orense, has been in course of construction for some time, and it is also proposed to connect Lugo with Astorga. Galicia has 10 cities and 115 towns. The capital is Santiago, which is also an archbishopric, with a population of 29,000. Lugo, Tuy, Mondoñedo, Orense, are also episcopal sees. The largest city is Coruña, the seat of the audiencia (population about 40,000). The others are Ferrol, Vigo, Betanzos, and Pontevedra.

Gallicia, the country of the Callaici or Gallaici, seems to have been very imperfectly known to the earlier geographers. According to Eratosthenes the entire population of the peninsula were at one time called Galatae. The region properly called by their name, bounded on the S. by the Douro and on the E. by the Navia, was first entered by the Roman legions under Decius Junius Brutus in 137-6 a.c. (Liv. iv., lvi., *Epit.*); but the final subjugation cannot be placed earlier than the time of Augustus. Under the Antonines, possibly even under Hadrian, Gallicia and Asturia were erected into a separate Provincia Cæsaris, having been regarded previously as merely a portion of Lusitania. On the partition of Spain, which followed the successful invasions of the Suevians, Alans, and Vandals, Gallicia fell to the lot of the first-named (411 A.D.). After an independent subsistence of nearly 200 years, the Suevian kingdom was annexed to the Visigothic dominions under Leovigild in 590. In 713 it was occupied by the Moors, who in turn were driven out of it about the year 734 by Alphonso I. of Asturias and his brother Froela. During the 9th and 10th centuries it was the subject of dispute between more than one count of Galicia and the suzerain, and its coasts were repeatedly ravaged by the Norsemen. When Ferdinand I. divided his kingdom among his sons in 1063, Galicia was the portion allotted to Garcia, the youngest of the three. Ten years afterwards it was forcibly reannexed by Garcia's brother Alphonso, and thenceforward it remained an integral part of the kingdom of Castile or of Leon. The honorary title of count of Galicia has frequently been borne by younger sons of the Spanish sovereign. In the patriotic struggles of 1808 the junta of Galicia took an important part. For administrative purposes the ancient province has since 1833 been divided into four, namely, Coruña, Lugo, Orense, and Pontevedra.

**GALILEE** (Γαλιλαία, גליל), the most northerly of the three provinces into which Palestine was at the Roman period divided, was bounded on the E. by the Jordan, on the S. by Samaria, on the W. by the Mediterranean, on the N.W. by Phœnicia, and on the N. by the Leontes, the extreme length being about 60 miles, the extreme breadth 30, and the area 1000 square miles. The Galilee thus defined, however, though doubtless the Galilee of Herod's tetrarchy and of later centuries, was hardly that of ordinary parlance at the beginning of the Christian era. Josephus himself, while substantially giving these boundaries (*B. J.*, iii. 3, 1, and elsewhere), yet incidentally in one place speaks of Upper Galilee as constituting the whole of Galilee proper (*Ant.* xx. 6, 1), and elsewhere in giving Xaloth (Iksâl) and Dabaratta (Debûrieh) as boundary towns, seems to exclude from Galilee the plain of Esdraelon. In the early period of the history of Israel, the word גליל or גלילית, meaning a circle, was hardly a proper name at all, but was applied to several districts with considerable generality. Thus in Josh. xiii. 2 and Joel iv. 4 reference is made to the "borders" or "coasts" (Geliloth) of the Philistines. In Josh. xxii. 10, 11, however, the "Geliloth" of Jordan means the plain of Jordan referred to in Ezekiel xlvii. 8 as "the eastern Geliilah" (compare Josh. xviii. 7); while in Josh. xx. 7, xxi. 32, hag-Galil denotes the north portion of the territory of Naphtali westward of Merom, where Kadesh, one of the six cities of refuge, lay. Here were situated the twenty "worthless" cities which Solomon gave

to Hiram (1 Kings ix. 11; 2 Chr. viii. 2); and here, notwithstanding the conquests made successively by Joshua, several of the judges, David, and Solomon, the population seems to have retained a prevailingly ethnic character; for even in Isaiah's time "the land of Zebulun and the land of Naphtali" is called "Galilee of the Gentiles" (Isa. ix. 1). After the deportation by Tiglath Pileser (2 Kings xv. 29), in which it is to be presumed that chiefly Israelites were carried away, this ethnic character would most probably be intensified and extended rather than diminished either in area or in amount; and already in the time of the Maccabees, accordingly, we find the word apparently used in a considerably wider sense than in earlier times (1 Macc. v. 14, 15, x. 30; cf. Tob. i. 2). The later extension of the designation cannot be more particularly traced, but we know with considerable exactness what the limits were at the time of the Talmudists. The southern boundary was defined by the towns of Bethshean (Beisân), Ginea (Jenin), Caphar Utheni (Kefr Adân), and by the ridge of Carmel; on the east the Jordan formed the limit; while on the west and north the line ran from Carmel to Accho (Akka), and thence ascended eastwards by a great valley just south of Achzib (ez Zib) extending 8 miles, past Kabartha (el Kâbry), Gathin (J'athûn), and Beth Zanita (Zueinîta), to Gelila (Jellil), where it turned north near 'Malia, probably the Melloth which Josephus notices as on his boundary (*B. J.*, iii. 3, 1). From Melloth it ran 12 miles north to Kania and Aiya (probably Kânah and 'Aiya), and then appears to have run east along a high ridge by Berii and Tirii (Berîâs and Tireh), and thence, after a course of 5 miles, it trended north-east by Tifni (Tibnîn), Sifneta (Safed el Battikh), Ailshitha ('Atshith), and Aulami (Almôn), arriving thus at the deep gorge of the Leontes. Turning east it passed Migdol Kherub (el Khurbeh) and the "hollow of Ayun" (Merj 'Aydân, past Takra (unknown) to Tortalga ("the snowy mountain," or Hermon), and to Kisrin and the bounds of Iitir—that is, to Cæsarea Philippi (now Bâniâs), and thus to beyond Jordan. The boundary between Upper and Lower Galilee was natural, being marked on the east by the town of Caphar Hananya (Kefr 'Anân), situated at the foot of the high ridge which formed the actual line; Bersobe, on the same boundary (Josephus, *B. J.*, iii. 3, 1), is not as yet known.

*Lower Galilee.*—The whole of Galilee presents country more or less disturbed by volcanic action. In the lower division the hills are all tilted up towards the east, and broad streams of lava have flowed over the plateau above the sea of Galilee. In this district the highest hills are only about 1800 feet above the sea. The ridge of Nazareth rises north of the great plain of Esdraelon, and north of this again is the fertile basin of the Buttauf, separated from the sea-coast plains by low hills. East of the Buttauf extends the basaltic plateau called el Ahma ("the inaccessible"), rising 1700 feet above the sea of Galilee. North of the Buttauf is a confused hill country, the spurs falling towards a broad valley which lies at the foot of the mountains of Upper Galilee. This broad valley, running westwards to the coast, is the old boundary of Zebulun—the valley of Jiphthah-el (Josh. xix. 14). The great plain of Esdraelon is of triangular form, bounded by Gilboa on the east and by the ridge which runs to Carmel on the west. It is 14 miles long from Jenîn to the Nazareth hills, and has a mean measurement of 9 miles east and west. It rises 200 feet above the sea, the hills on both sides being some 1500 feet higher. The whole drainage is collected by the Kishon, which runs through a narrow gorge at the north-west corner of the plain, descending beside the ridge of Carmel to the sea. The broad valley of Jezreel on the east, descending towards the Jordan valley, forms the gate by which Palestine is entered from beyond Jordan. Mount Tabor stands isolated

in the plain at the north-east corner, and rather further south the conical hill called Neby Daby rises between Tabor and Gilboa. The whole of Lower Galilee is well watered. The Kishon is fed by springs from near Tabor and from a copious stream from the west side of the plain of Esdraelon. North-west of Nazareth is Wady el Melek, an open valley full of springs. The river Belus, just south of Acre, rising in the sea-coast marshes, drains the whole valley of Jiphthah-el. On the east the broad valley of Jezreel is full of magnificent springs, many of which are thermal. The plains of Esdraelon, and the Buttauf, and the plateau of el Ahma, are all remarkable for the rich basaltic soil which covers them, in which corn, cotton, maize, sesame, tobacco, millet, and various kinds of vegetable are grown, while indigo and sugar-cane were cultivated in former times. The Nazareth hills and Gilboa are bare and white, but west of Nazareth is a fine oak wood, and another thick wood spreads over the northern slopes of Tabor. The hills west of the great plain are partly of bare white chalk, partly covered with dense thickets. The mountains north of the Buttauf are rugged and covered with scrub, except near the villages, where fine olive groves exist. The principal places of importance in Lower Galilee are Nazareth (10,000 inhabitants), Sepphoris (now Seffürieh), a large village standing above the Buttauf on the spurs of the southern hills, and Jenin (En Gannim), a flourishing village, with a palm garden (3000 inhabitants). The ancient capital, Jezreel (Zerin), is now a miserable village on a precipitous spur of Gilboa; north of this are the small mud hamlets, Solam (Shunem), Endâr (Endor), Nein (Nain); on the west side of the plain is the ruin of Lejjûn (the Legio of the 4th century, which was then a place of importance). In the hills north of the Buttauf is Jefât, situated on a steep hill-top, and representing the Jotapata defended by Josephus. Kefr Kenna, now a flourishing Christian village at the foot of the Nazareth hills, south of the Buttauf, represents the probable site of Cana of Galilee, and the ruin Kâna, on the north side of the same plain, represents the site pointed out to the pilgrims of the 12th and 13th centuries.

*Upper Galilee.*—The mountains are tilted up towards the sea of Galilee, and the drainage of the district is towards the north-west. On the south the rocky range of Jebel Jermûk rises to 4000 feet above the sea; on the east a narrow ridge 2800 feet high forms the watershed, with steep eastern slopes falling towards Jordan. Immediately west of the watershed are two small plateaus, covered with basaltic debris, near el Jish and Kades. On the west are rugged mountains with deep intricate valleys. The main drains of the country are—first, Wady el 'Ayûn, rising north of Jebel Jermûk, and running north-west as an open valley, and secondly, Wady el Ahjâr, a rugged precipitous gorge running north to join the Leontes. The district is well provided with springs throughout, and the valleys are full of water in the spring time. Though rocky and difficult, Upper Galilee is not barren, the soil of the plateaus is rich, and the vine flourishes in the higher hills, especially in the neighbourhood of Kefr Birim. The principal town is Safed, perched on a white mountain 2700 feet above the sea. It has a population of about 9000, including Jews, Christians, and Moslems. It is one of the four sacred cities in Palestine revered by the Jews, to which nationality the majority of the inhabitants belong. Among the smaller towns we may notice Meirûn, near Safed, a place also much revered by the Jews as containing the tombs of Hillel, Shammai, and Simon bar Jochai. A yearly festival of most curious character is here celebrated in honour of these rabbis. The site of Hazor, one of the chief towns of Galilee in Bible times, has also been lately recovered. It was situated, according to Josephus, above the Lake Semechonitis (Bahr el Hûleh), and the name Hudreh, identical with the Hebrew

Hazor, has been found by the survey party in 1877 applying to a mountain and plain, near an ancient ruin, in the required position. The little village of Kades represents the once important town of Kadesh Naphtali (Josh. xix. 37). The ruins are here extensive and interesting, but belong apparently to the Greek period.

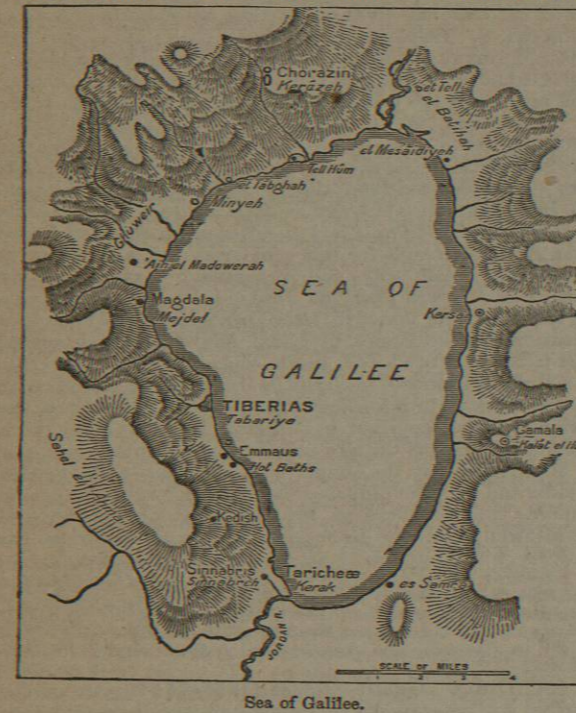
The population of Galilee is mixed. In Lower Galilee the peasants are principally Moslem, with a sprinkling of Greek Christians round Nazareth, which is a Christian town. In Upper Galilee, however, there is a mixture of Jews and Maronites, Druses and Moslems (natives or Algerine settlers), while the slopes above the Jordan are inhabited by wandering Arabs. The Jews are engaged in trade, and the Christians, Druses, and Moslems in agriculture; and the Arabs are an entirely pastoral people.

The principal products of the country are corn, wine, oil, and soap (from the olives), with every species of pulse and gourd.

The antiquities of Galilee include cromlechs and rude stone monuments, rock-cut tombs, and wine-presses, with numerous remains of Byzantine monasteries and fine churches of the time of the crusades. There are also remains of Greek architecture in various places, but the most interesting buildings are the ancient synagogues. These have not been found in other parts of Palestine, but in Galilee eleven examples are now known. They are rectangular, with the door to the south, and three rows of columns forming four aisles east and west. The architecture is a peculiar and debased imitation of classic style, attributed by architects to the 2d century of our era. The builder of the examples at Kefr Birim, el Jish, and Meirûn is known to have been the famous Simeon bar Jochai, who lived about 150 A.D., and built 24 synagogues in Galilee. The similarity of style renders it probable that the other examples at Tell Hûm, Kerâzeh, Nebartein, Umm el 'Amed, and Sufsâf were also his work. Both at el Jish and at Kefr Birim there are two synagogues, large and small. At Irbid, above Tiberias, is another synagogue of rather different character, which is said to have been built by Rabbi Nitai. Traces of synagogues have also been found on Carmel, and at Tireh, west of Nazareth. It is curious to find the representation of various animals in relief on the lintels of these buildings. Hebrew inscriptions also occur, and the carved work of the cornices and capitals is very rich. These synagogues were erected at a time when the Galilean Jews were flourishing under the Roman empire, and when Tiberias was the central seat of Jewish learning and of the Sanhedrin.

In the 12th century Galilee was the outpost of the Christian kingdom of Jerusalem, and its borders were strongly protected by fortresses, the magnificent remains of which still crown the most important strategical points. Toron (now Tibnin) was built in 1104, the first fortress erected by the crusaders, and standing on the summit of the mountains of Upper Galilee. Beauvoir (Kaukab, built in 1182) stood on a precipice above Jordan south-west of the Sea of Galilee, and guarded the advance by the valley of Jezreel; and about the same time Château Neuf (Hunîn) was erected above the Hûleh lake. Belfort (esh Shukif), on the north bank of the Leontes, the finest and most important, dates somewhat earlier; and Montfort (Kalat el Kurn) stood on a narrow spur north-east of Acre, completing the chain of frontier fortresses. The town of Bânias, with its castle, formed also a strong outpost against Damascus, and was the scene, in common with the other strongholds, of many desperate encounters between Moslems and Christians. Lower Galilee was the last remaining portion of the Holy Land held by the Christians. In 1250 the knights of the Teutonic order owned lands extending round Acre as far east as the Sea of Galilee, and including Safed. These possessions were lost in 1291, on the fall of Acre. (A. R. C.)

GALILEE, THE SEA OF, with its surrounding shores, deserves a more special description than that given of the rest of the district, as being the part of Palestine which most interests modern students and travellers. The lake was also called the Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias; and by Pliny it is said to have been once called Lake of Taricheæ. In form it is pear-



shaped,  $12\frac{1}{2}$  English miles in length, and  $7\frac{1}{2}$  at its greatest width. The level is now known to be 682.5 feet below the Mediterranean. The water is fresh and clear, and large shoals of fish abound in it. The formation of the lake basin occurred later than the Chalk period, and was due to a subsidence of the strata, which appears to have been sudden and violent, and probably accompanied by extensive volcanic eruptions from three centres east, west, and north of the lake. The district has always been liable to volcanic disturbance and to earthquakes. In 1837 Safed and Tiberias were destroyed by earthquake, and the temperature of the hot springs round the lake was then observed to rise considerably for a time.

The Sea of Galilee is best seen from the top of the western precipices, and presents a desolate appearance. On the north the hills rise gradually from the shore, which is fringed with oleander bushes and indented with small bays. The ground is here covered with black basalt. On the west the plateau of el Ahma terminates in precipices 1700 feet above the lake, and over these the black rocky tops called "the Horns of Hattîn" are conspicuous objects. On the south is a broad valley through which the Jordan flows. On the east are furrowed and rugged slopes, rising to the great plateau of the Jaulân (Gaulonitis). The Jordan enters the lake through a narrow gorge between lower hills. A marshy plain,  $2\frac{1}{2}$  miles long and  $1\frac{1}{2}$  broad, called el Batihah, exists immediately east of the Jordan inlet. There is also on the west side of the lake a small plain called el Ghuweir, formed by the junction of three large

valleys. It measures  $3\frac{1}{4}$  miles along the shore, and is 1 mile wide. This plain, naturally fertile, but now almost uncultivated, is recognized to be the plain of Gennesareth, described by Josephus (*B. J.*, iii. 10, 8). The shores of the lake are of fine shingle. On the east the hills approach in one place within 40 feet of the water, but there is generally a width of about  $\frac{2}{3}$  of a mile from the hills to the beach. On the west the flat ground at the foot of the hills has an average width of about 200 yards. A few scattered palms dot the western shores, and a palm grove is to be found near Kefr Hârib on the south-east. Thermal springs are found on each side of the lake, with an average temperature of about  $80^{\circ}$  Fahr. The hot baths south of Tiberias include seven springs, the largest of which has a temperature of  $137^{\circ}$  Fahr. The plain of Gennesareth, with its environs, is the best watered part of the lake-basin. North of this plain are the five springs of et Tâbghah, the largest of which was enclosed about a century ago by Aly, son of Dhahr el 'Amr, in an octagonal reservoir, and the water led off by an aqueduct 52 feet above the lake. The Tâbghah springs, though abundant, are warm and brackish. At the north end of the plain is 'Ain et Tineh ("spring of the fig-tree"), also a brackish spring with a good stream; south of the plain is 'Ain el Bârdeh ("the cold spring"), which is sweet, but scarcely lower in temperature than the others. The most important spring remains still to be noticed, namely, 'Ain el Madâwerah ("the round spring"), situated 1 mile from the south end of the plain and half a mile from the shore. The water rises in a circular well 32 feet in diameter, and is clear and sweet, with a temperature of  $73^{\circ}$  Fahr. The bottom is of loose sand, and the fish called coracinus by Josephus (*B. J.*, iii. 10, 8) is here found in abundance. Dr Tristram was the first explorer to identify this fish, and points out that it could not exist in the other springs. We are thus able to identify the "round spring" with the fountain of Capharnaum, which, according to Josephus, watered the plain of Gennesareth.

The principal sites of interest round the lake may be enumerated from north to west and from south to east. Kerâzeh, the undoubted site of Chorazin, stands on a rocky spur 900 feet above the lake, 2 miles north of the shore. Foundations and scattered stones cover the slopes and the flat valley below. On the west is a rugged gorge. In the middle of the ruins are the remains of a synagogue of richly ornamental style built of black basalt. A small spring occurs on the north. Tell Hûm is an important ruin on the shore south of the last mentioned site. The remains consist of foundations and scattered stones (which in spring are concealed by gigantic thistles) extending about half a mile along the shore. The foundations of a fine synagogue, measuring 75 feet by 57, and built in white limestone, have been excavated. A conspicuous building has been erected close to the water, from the fragments of the Tell Hûm synagogue. Since the 4th century Tell Hûm has been pointed out by all the Christian writers as the site of Capernaum, but the fatal objections to such an identification are—(1) the great distance from the fountain of Capharnaum, and (2) the fact that Jewish tradition preserves another site. The ruins at Tell Hûm are not of necessity as old as the time of Christ. The name Hûm means "black," and is probably connected with the surrounding black basalt. The place seems to be mentioned in the Talmud under the titles Caphar Ahim and Caphar Tanhumim (see Neubauer's *Geog. Tal.*, p. 220). Minyeh is a ruined site at the north end of the plain of Gennesareth,  $2\frac{1}{2}$  miles from the last, and close to the shore. There are extensive ruins on flat ground, consisting of mounds and foundations, with traces of a wall once surrounding the site. Masonry of well-dressed stones has also been here discovered in course of excavation. Near the ruins are remains of an old khân, which appears to have

been built in the Middle Ages; and above this a curious hillock, with an artificial rock-platform, called el 'Oreimeh, "the little knoll." Immediately to the north-east a precipice projects to the lake, and the aqueduct from the Tâbghah spring is led to an ancient rock-cut channel, which seems to have been once intended for a road in the face of the cliff. In the 17th century Quaresmius speaks of this place, Minyeh, as the site of Capernaum. In the 14th Isaac Chelo was apparently shown the same site as containing the tomb of Nahum, and as being the "city of the Minai." The "Minai," or "sorcerers," are mentioned in the Talmud, and by this title the Jews stigmatized the early Christians; and these "Minai" are called in one passage of the Talmud "sons of Capernaum." There is thus a close connexion between this Minyeh—named from the Minai—and the town of Capernaum. The position of the site is also suitable for that of Capernaum, being in the plain of Gennesareth, two miles from the "round spring," or fountain of Capharnaüm. No other site of any importance exists in the plain of Gennesareth. See CAPERNAUM.

South of the plain of Gennesareth is the undisputed site of the New Testament town of Magdala. A few lotus trees and some rock-cut tombs are here found beside a miserable mud hamlet on the hill slope, with a modern tomb-house or *kubbek*. Passing beneath rugged cliffs a recess in the hills is next reached, where stands Tabariya, the ancient Tiberias or Rakkath, containing 3000 inhabitants, more than half of whom are Jews. The walls, flanked with round towers, and now partly destroyed by the earthquake of 1837, were built by Dhahr el 'Amr, as was the serai or court-house. The two mosques, now partly ruinous, were erected by his sons. There are remains of a crusading church, and the tomb of the celebrated Maimonides is shown in the town, while Rabbi Akiba and Rabbi Meir lie buried outside. The ruins of the ancient city, including granite columns and traces of a sea-wall with towers, stretch southwards a mile beyond the modern town. An aqueduct in the cliff once brought water a distance of 9 miles from the south.

Kerak, at the south end of the lake, is an important site on a peninsula surrounded by the water of the lake, by the Jordan, and by a broad water ditch, while on the north-west a narrow neck of land remains. The plateau thus enclosed is partly artificial, and banked up 50 or 60 feet above the water. A ruined citadel remains on the north-west, and on the east was a bridge over the Jordan; broken pottery and fragments of sculptured stone strew the site. The ruin of Kerak answers to the description given by Josephus of the city of Taricheæ, which lay 30 stadia from Tiberias, the hot baths being between the two cities. Taricheæ was situated, as is Kerak, on the shore below the cliffs, and partly surrounded by water, while before the city was a plain (the Ghôr). Pliny further informs us that Taricheæ was at the south end of the Sea of Galilee. Sinnabreh, a ruin on a spur of the hills close to the last-mentioned site, is undoubtedly the ancient Sinnabris, where Vespasian (Joseph., *B. J.*, iii. 9, 7) fixed his camp, advancing from Scythopolis (Beisân) on Taricheæ and Tiberias. Sinnabris was 30 stadia from Tiberias, or about the distance of the ruin now existing.

The eastern shores of the Sea of Galilee have been less fully explored than the western, and the sites are not so perfectly recovered. The town of Hippos, one of the cities of Decapolis, was situated 30 stadia from Tiberias, and 60 stadia from Gadara (Umm Keis). It is conjectured that the town Susitha, mentioned in the Talmud, is the same place, and the name Susyeh seems to have existed east of the Sea of Galilee at a late period. Susitha from "sus," meaning "horse," is, etymologically at least, suggestive of the Greek "hippos." The site is at present unknown. Kalat el Hosn ("castle of the stronghold") is a ruin on a

rocky spur opposite Tiberias. Two large ruined buildings remain, with traces of an old street and fallen columns and capitals. A strong wall once surrounded the town; a narrow neck of land exists on the east where the rock has been scarped. Rugged valleys enclose the site on the north and south; broken sarcophagi and rock-cut tombs are found beneath the ruin. This site answers to the description Josephus gives of Gamala, an important fortress besieged by Vespasian (*Bell. Jud.*, iv. 1, 1). Gersa, an insignificant ruin north of the last, is thought to represent the Gerasa or Gergesa of the 4th century, situated east of the lake; and the projecting spur of hill south of this ruin is conjectured to be the place where the swine "ran violently down a steep place" (Matt. viii. 32). The site of Bethsaida Julia, east of Jordan, is also unknown. It has been supposed (and the theory is supported by even so important an authority as Reland) that two separate places named Bethsaida are mentioned in the New Testament. The grounds for this conclusion are, however, very insufficient; and only one Bethsaida is mentioned by Josephus. It was near the Jordan inlet, on the east side of the river, and under its later Greek name of Julia, it is mentioned, with Hippos, by Pliny. The site usually pointed out is the ruin of et Tell, north of the Batfiah plain; the remains are, however, modern and insignificant. Just south of the same plain is a ruined village called Mes'aidiyeh, the name of which approaches Bethsaida in sound but not in meaning. This is the site pointed out by Vandeveld, and it is possible that the course of Jordan has shifted westwards, and that the old mouth is marked by the two creeks running into the shore on the east, in which case the site of Mes'aidiyeh might be accepted as the Bethsaida of the gospels, which appears to have been east of Jordan.

*Literature.*—The most important works on the subject of Galilee and the Sea of Galilee are the following:—Robinson's *Biblical Researches*; Stanley's *Sinai and Palestine*; Tristram's *Land of Israel*; Warren and Wilson's *Recovery of Jerusalem*; Conder's *Tent Work in Palestine*; and the *Memoirs of the Survey of Palestine* (sheets 1-6, 8, 9). (C. R. C.)

**GALILEO.** Galileo Galilei (1564-1642), one of the earliest and greatest of experimental philosophers, was born at Pisa, February 18, 1564. His father, Vincenzo, was an impoverished descendant of a noble Florentine house, which had exchanged the surname of Bonajuti for that of Galilei, on the election, in 1343, of one of its members, Galileo de' Bonajuti, to the college of the twelve Buonomini. The family, which was fifteen times represented in the signoria, and in 1445 gave a gonfalonier to Florence, flourished with the republic and declined with its fall. Vincenzo Galilei was a man of better parts than fortune. He was a competent mathematician, wrote with considerable ability on the theory and practice of music, and was especially distinguished amongst his contemporaries for the grace and skill of his performance upon the lute. By his wife, Giulia de' Ammannati of Pistoja, he had two sons, Galileo and Michelangiolo, and two daughters, Virginia and Livia. From his earliest childhood Galileo was remarkable for intellectual aptitude, as well as for mechanical invention. His favourite pastime was the construction of toy-machines, not the less original and ingenious that their successful working was usually much hindered by the scarcity of suitable materials. His application to literary studies was equally conspicuous. In the monastery of Vallombrosa, near Florence, where his education was principally conducted, he not only made himself acquainted with the best Latin authors, but acquired a fair command of the Greek tongue, thus laying the foundation of the brilliant and elegant style for which his writings were afterwards distinguished. From one of the monks he also received instruction in logic, according to the system then in vogue; but the futilities of the science revolted, while its subtleties

failed to interest his understanding, and he was soon permitted to abandon a study so distasteful to him. A document published by M. Selmi in 1864 proves that he was at this time so far attracted towards a religious life as to have joined the novitiate of the order; but his father, who had other designs for him, seized the opportunity of an attack of ophthalmia to withdraw him permanently from the care of the monks. Having had personal experience of the unremunerative character both of music and of mathematics, he desired that his son should apply himself to the more profitable study of medicine, and, not without some straining of his slender resources, placed him, before he had completed his eighteenth year, at the university of Pisa. He accordingly matriculated, November 5, 1581, and immediately entered upon attendance at the lectures of the celebrated physician and botanist, Andrea Cesalpino.

The natural gifts of the young student, not less multifarious than those of an earlier Tuscan prodigy, Leonardo da Vinci, seemed at this time equally ready to develop in any direction towards which choice or hazard might incline them. In musical skill and invention he already vied with the best professors of the art in Italy; his personal taste would have led him to choose painting as his profession, and one of the most eminent artists of his day, Lodovico Cigoli, owned that to his judgment and counsel he was mainly indebted for the success of his works; his wit and eloquence gave promise that he would one day add to the literary glories of his country; while his mathematical and mechanical genius only awaited a suitable opportunity for full display and development. In 1583, while watching the vibrations of the great bronze lamp still to be seen swinging from the roof of the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were invariably executed in equal times. The experimental verification of this fact led him to the important discovery of the isochronism of the pendulum. He at first applied the new principle to pulse-measurement, and more than fifty years later turned it to account in the construction of an astronomical clock. Up to this time he was entirely ignorant of mathematics, his father having carefully held him aloof from a study which he rightly apprehended would lead to his total alienation from that of medicine. Accident, however, frustrated this purpose. A lesson in geometry, given by Ostilio Ricci to the pages of the grand-ducal court, then temporarily resident at Pisa, chanced to have Galileo for an unseen listener; his attention was riveted, his dormant genius was roused, and he threw all his energies into the new pursuit thus unexpectedly presented to him. With Ricci's assistance, he rapidly mastered the elements of the science, and eventually extorted his father's reluctant permission to exchange Hippocrates and Galen for Euclid and Archimedes. In 1586 he was withdrawn from the university, through lack of means, before he had taken a degree, and returned to Florence, where his family habitually resided. We next hear of him as lecturing before the Florentine Academy on the site and dimensions of Dante's *Inferno*; and he shortly afterwards published an essay descriptive of his invention of the hydrostatical balance, which rapidly made his name known throughout Italy. His first patron was the Marchese Guidubaldo del Monte of Pesaro, a man eminent for his scientific attainments, as well as influential by his family connexions. At his request he wrote, in 1588, a treatise on the centre of gravity in solids, which obtained for him, together with the title of "the Archimedes of his time," the honourable though not lucrative post of mathematical lecturer at the Pisan university. During the ensuing two years (1589-91) he carried on that remarkable series of experiments, by which he established the first principles of dynamical science, and by which he earned for himself the

undying hostility of the bigoted Aristotelians of that day. From the leaning tower of Pisa he afforded to all the professors and students of the university ocular demonstration of the falsehood of the Peripatetic dictum that heavy bodies fall with velocities proportional to their weights, and with unanswerable logic demolished all the time-honoured maxims of the schools regarding the motion of projectiles, and elemental weight or levity. But while he convinced, he failed to conciliate his adversaries. The keen sarcasm of his polished rhetoric was not calculated to soothe the susceptibilities of men already smarting under the deprivation of their most cherished illusions. He seems, in addition, to have compromised his position with the grand-ducal family by the imprudent candour with which he condemned a machine for clearing the port of Leghorn, invented by Giovanni de' Medici, an illegitimate son of Cosmo I. Princely favour being withdrawn, private rancour was free to show itself. He was publicly hissed at his lecture, and found it prudent to resign his professorship and withdraw to Florence in 1591. Through the death of his father in July of that year family cares and responsibilities devolved upon him as eldest son, and thus his nomination to the chair of mathematics at the university of Padua, secured by the influence of the Marchese Guidubaldo with the Venetian senate, was welcome, as affording a relief from pecuniary embarrassment, no less than as opening a field for scientific distinction.

His residence at Padua, which extended over a period of eighteen years, from 1592 to 1610, was a course of uninterrupted prosperity. His appointment was three times renewed, on each occasion with expressions of the highest esteem on the part of the governing body, and his yearly salary was progressively raised from 180 to 1000 florins. His lectures were attended by persons of the highest distinction from all parts of Europe, and such was the charm of his demonstrations that a hall capable of containing 2000 people had eventually to be assigned for the accommodation of the overflowing audiences which they attracted. His ingenious invention of the proportional compass—an instrument still used in geometrical drawing—dates from 1597; and about the same time he constructed the first thermometer, consisting of a bulb and tube filled with air and water, and terminating in a vessel of water. In this instrument, the results of varying atmospheric pressure were not distinguishable from the expansive and contractive effects of heat and cold, and it became an efficient measure of temperature only when Rinieri, in 1646, introduced the improvement of hermetically sealing the liquid in glass. The substitution, in 1670, of mercury for water completed the modern thermometer.

Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, and was deterred from avowing his opinions—as is proved by his letter to Kepler of August 4, 1597—by the fear of ridicule rather than of persecution. The appearance, in September 1604, of a new star in the constellation Serpentarius, afforded him indeed an opportunity, of which he eagerly availed himself, for making an onslaught upon the Aristotelian axiom of the incorruptibility of the heavens; but he continued to conform his public teachings in the main to Ptolemaic principles, until the discovery of a novel and potent implement of research placed at his command startling and hitherto unsuspected evidence as to the constitution and mutual relations of the heavenly bodies. Galileo was not the original inventor of the telescope.<sup>1</sup> That

<sup>1</sup> The word *telescope*, from *τῆλε*, far, *σκοπεῖν*, to view, was invented by Demisicanus, an eminent Greek scholar, at the request of Prince Cesi, president of the Lyncean Academy. It was used by Galileo as early as 1612, but was not introduced into English until much later. In 1655 the word *telescope* was inserted in Bagwell's *Mysteries of Astronomy*, as a term requiring explanation, *trunk* or *cylinder* being commonly used instead.