limits of Russia. He also composed numerous songs and romances. In 1857 he went abroad for the third time, and died suddenly at Berlin, on February 14th of that year.

GLINKA, Sergy Nikolaevich (1774–1847), Russian author, the elder brother of Fedor N. Glinka (noticed above), was born at Smolensk in 1774. In 1796 he entered the Russian army, but after three years' service retired with the rank of major. He afterwards employed himself in the education of youth and in literary pursuits, first in the Ukraine, and subsequently at Moscow, where he died in 1847. His poems are spirited and patriotic; he wrote also several dramatic pieces, and translated Young's *Night Thoughts*.

Among his numerous prose works the most important from an historical point of view are—*Russkoe Chtenie* (*Russian Reading: Historical Memorials of Russia in the 18th and 19th Centuries*), 2 vols., 1845; *Istoriya Rossii*, &c. (*History of Russia for the use of Youth*), 10 vols., 1817–19 (2d ed. 1822; 3d ed. 1824); *Istoriya Armyan*, &c. (*History of the Migration of the Armenians of Azerbijan from Turkey to Russia*), 1831; and his contributions to the *Russky Vyestnik* (*Russian Messenger*), a monthly periodical, edited by him from 1808 to 1820.

GLOBE. With the exception of illuminated portolani, the most interesting monuments of geography are globes. Celestial globes are much more ancient than terrestrial ones. The earliest of these with which we are acquainted is one made of copper engraved in the Arab-Cufic character of the 11th century. It is preserved in the Bibliothèque Nationale de Paris, Sect. Géog., No. 396 (see fig. 1). In Italy the

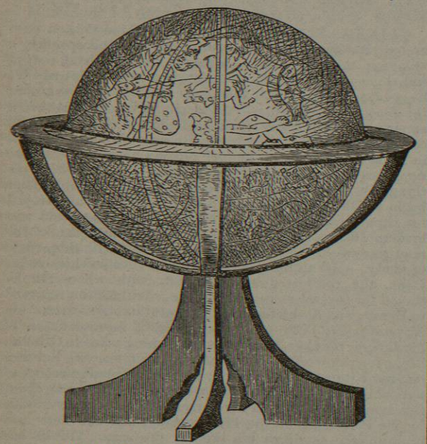

Fig. 1.—Globe in Bibliothèque Nationale, Paris.

emperor Frederick II. (1197–1250) possessed a celestial globe of gold, probably also of Arab manufacture, on which the stars were indicated by pearls; from the scanty information that has come down to us respecting it we should imagine that it partook somewhat of the nature of an armillary sphere, as representations of the planets were to be seen in the interior of it. To these succeed a series of globes ranging from the 15th to the 17th century.

One might suppose that many specimens of these globes would exist in public libraries, but diligent research has shown that the majority of those not made of metal are more perishable than maps, and much more so than books. The earliest terrestrial globe of any importance known to geographers is the well known one of Martin Behaim of Nuremberg, bearing the date of 1492. It is about 21 inches in diameter, and is made of pasteboard covered with parchment, on which are designed historical pictures with their legends written in Old German in various colours. The first meridian passes through Madeira, and the only other lines on it are those of the equator, the two tropics, and the polar circles. It has also a meridian of iron and an horizon of brass, but these were not added until 1500, which date they bear. As a monument of geography it is of the highest importance, being the only original document that has come down to us in this form embodying the geographical views of its author with those of his gifted contemporaries, Toscanelli, Columbus, &c. This globe represents with some slight modifications most of the disproportions of the Ptolemaic geography, into which is incorporated information evidently derived from the travels of Marco Polo and Sir J. Maundeville. It was executed by Behaim, assisted by Holtzschuer, while on a visit to his native city (1491–3), after a sojourn of five years at the Azores. It is still preserved in the house of his ancestors at Nuremberg. An exact and authenticated facsimile of it, mounted on a stand, is preserved in the Bib. Nat. de Paris, Section Géographique, No. 393.[1]

The Laon globe of 1493, in the possession of M. Leonce Leroux of the Administration Centrale de la Marine à Paris, is made of red copper engraved, about the size of a 36-pounder cannon ball, and pierced by a socket which at a former period held an axis. It has all the appearance of having formed part of the apparatus of an astronomical clock. On the globe are engraved many circles. The first meridian, as in the globe of Behaim, passes through Madeira. In the northern hemisphere meridian lines are drawn at every 15th degree; these meridians are again crossed by certain parallels of latitude corresponding somewhat to the seven climates usually found on maps of the period. Neither meridians nor parallels are to be traced on the southern hemisphere. Although this globe bears a legend upon it dated 1493, it is evident that the general geographical information recorded upon it is earlier than that on Behaim's globe by five or six years. In all probability it was that current in Lisbon between the voyage of Diego Cam to the Zaire or Congo river, 1484–5, and that of Bartholomeu Diaz to the Cape of Good Hope in 1487. The author is unknown. A heart-shaped projection of this globe was published in the *Bulletin de la Soc. de Géog. de Paris*, 4me série, tom. 20te, 1860.

In all probability the earliest post-Columbian globe extant is the one now preserved in the Lenox Library, New York. It was found in Paris some twenty-five years ago by Mr Richard M. Hunt, who, upon learning its value, presented it to the Lenox Library, of which he is the architect. This globe is of copper, about 4½ inches in diameter and engraved. It is pierced for an axis, and probably, like the Laon sphere, formed the principal feature of an astronomical clock or armillary sphere. The date assigned to the Lenox globe by Mr Henry Stevens, who first recognized its importance, and had an accurately drawn projection made of it in the Coast Survey Bureau at Washington in 1869, is about 1506–7. A comparison of that projection, now published in reduced facsimile for the first time (see fig. 2), with several contemporary maps and globes, serves to show the accuracy of the date assigned to it, as also to suggest its French origin. The author is unknown.

[1] For other reproductions of it see J. C. Doppelmayr, *Historische Nachricht von den Nürnbergischen Mathematicis und Künstlern*, Nuremberg, 1730; Dr F. W. Ghillany, *Geschichte des Seefahrers Ritter Martin Behaim*, Nuremberg, 1853; and Jomard, *Monuments de la Géographie*, Paris, 1854.

The next globe that demands attention is the famous one made at Bamberg in 1520 by Johann Schöner, at the cost and charges of his friend Johann Sayler. It was afterwards taken to Nuremberg by Schöner, where it is still preserved in the town library. The importance attached to this globe is that hitherto it has always been regarded as the first of its kind to portray the discoveries in the New World, in combination with the notions that had previously prevailed of the space intervening between Europe and Africa on one side, and the eastern ends of Asia on the other. Schöner in this globe breaks up America into as many islands as possible. Thus North America is shown as one large island. He also represents South America as a large island, to which he applies several names, among which we observe, for the first time on a globe, the name "America." North America was not comprised under the name until a later date. Schöner's globe indicates two great series of North American discoveries, of which one, commencing with the Cabots in 1497, extended by degrees to Canada and Nova Scotia, while the other, commencing with Columbus in 1492, advanced from the Bahamas slowly northwards to Virginia and New England. Between these two points there remained a region more or less known which on this globe is indicated by open water. In depicting the east coast of Asia and the many islands there, including Japan and Java-major, the author follows the globe of Behaim. By some it has been regarded as a new edition of Behaim. There are in Germany several globes which depict the world nearly in the same manner as Schöner's. One, preserved in the city of Frankfort, bearing the same date (1520), is about 10½ inches in diameter, and has been reproduced by M. Jomard in his *Monuments de la Géographie*, pl. 15 and 16. There is also another in the library of the grand-duke of Weimar. As all these globes give to North and South America the configuration they have in Schöner, Humboldt was of opinion that they all are, with respect to America, copies of an older chart "hidden perhaps in the archives of Italy or Spain."

There is at Nancy a terrestrial globe which is also a geographical curiosity. It is of chased silver gilt, about 6 inches in diameter; the land portions are represented in fine gilding, the water by azure blue enamel. One of the

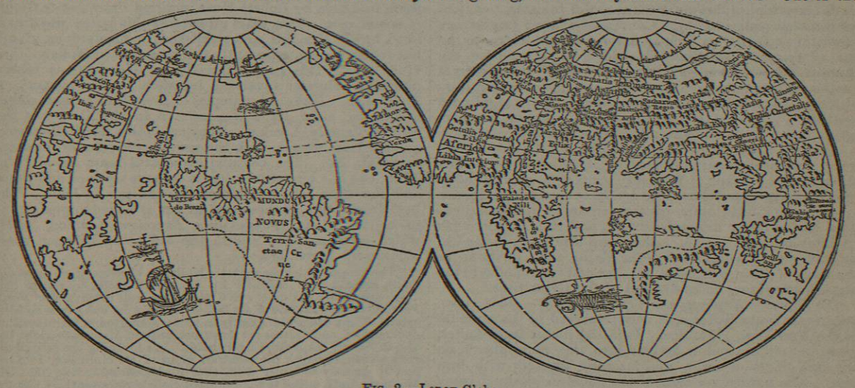

Fig. 2.—Lenox Globe.

hemispheres opens outwards horizontally, the interior being also gilt. It formerly served the purpose of a pyx on the altar of the church of Notre-Dame-de-Sion, to which church it was offered by Charles IV., duke of Lorraine, on his return in 1663. It is now preserved in the town library. It has all the appearance of having been made at a period immediately following the execution of the curious heart-shaped map by Oronce Finé of 1531, found in the Paris edition of Grynæus, 1532. In this map and the globe at Nancy we find the New World still regarded as an extension of eastern Asia or the Indies, the geography of Marco Polo being apparently mixed up with that of Cortez in Mexico. A stereographic projection of this globe was published in *Mem. de la Soc. Roy. de Nancy*, vol. viii., 1836.

There is another globe somewhat larger than the preceding, made of copper engraved, known as the De Bure globe. It has no date, but its geographical features in the main bear a close resemblance to the globe at Nancy. It is supposed to be of Spanish origin. It is preserved in the Bib. Nat. de Paris, Section Géographique, No. 427.

In the same section, No. 394, is preserved the Ecuy globe, made of brass. The word "Rhotomagi" (Rouen) is appended to the title, whence it seems to be of French origin. We have on this globe the first indications of a separation between East Asia and North America. The date appears to be about 1540.

In 1541 the illustrious Gerard Mercator constructed and published at Louvain a terrestrial globe, and in 1551 a companion celestial globe.[1] These are without doubt the most important monuments of the kind of the 16th century. They were to be found in nearly all the universities and libraries of Europe, in the private libraries of the rich, and the class room of the teacher of navigation. We also know from Blundeville's *Exercises* that up to the date of 1592 they were in common use in England. Six pairs at least of these globes were sold for Mercator by Camerarius of Nuremberg; others we know were sold at the book-fairs of Frankfort-on-the-Main; and Mercator himself presented one pair to the university of Louvain, of which he was a student and a master of arts. Yet only two sets of the original globes are known now to exist in Europe—one in the royal library at Brussels, discovered in 1868, the

[1] At a later period Mercator also made for Charles V. a pair of globes, the terrestrial one of wood, the celestial one of glass; these were destroyed in the subsequent troubles in the Low Countries.

other in the imperial court library at Vienna, discovered in 1875. These globes are about 2 feet high, and when first mounted on stands with all their accessories of meridians, horizons, &c., must have presented a noble appearance. They are only known to us by facsimiles of gores reproduced from the originals in their natural size, published at Brussels in 1875, with an introduction to their history by Dr J. Van Raemdonck. A comparison of the terrestrial globe with all those that preceded it shows it to be a monument at once of learning and of science, worthy of the greatest scientific geographer of his age.[1] The authors used by Mercator in his configurations of the continents of the Old World were chiefly Ptolemy and Marco Polo. For representing the New World he evidently acquainted himself with the narratives of all the most recent voyages, maps, and charts that were to be had in his time. These were used with the greatest possible skill and discrimination; and in consequence we have the best delineation of the world on a globe that it was possible to produce at the period. In Mercator's time the imperfect knowledge of pilots in general, and the defects of their charts in plano, made terrestrial globes much more useful to navigators than we can well realize to-day. Convinced of their importance Mercator neglected nothing in order to adapt them to the use of seamen; he therefore added to his globes the rhumbs hitherto found only on plain charts. He added yet another improvement, delineating about thirty leading stars of the principal constellations according to their magnitudes and their positions in the heavens. These important improvements appear to be quite peculiar to the globes of Mercator.

An examination of the celestial globe of 1551 also reveals many improvements introduced by Mercator in his delineation of the heavens. Without counting a great number of stars as yet unresolved into symbolical groups, Mercator gives us 934 fixed stars, distributed in 51 constellations. Two of the latter are entirely new, and are not met with on later celestial globes. These are Antinous, formed of six stars on the equator below the Eagle, and Cincinnus, or the Lock of Hair, formed of one star and two nebulæ in the north hemisphere, under the tail of the Great Bear.[2]

The Globe of Euphrosynus Ulpius of 1542.—This globe, apparently made in Rome, is now preserved in the museum of the New York Hist. Soc. It is 15½ inches in diameter, made of copper, and is divided into two hemispheres on the line of the equator, and fastened together with iron pins. The normal position of the globe in its stand being vertical, the north pole with its hour-circle is surmounted by an iron cross. It is encompassed by a horizon, upon which are engraved the signs of the zodiac. The height of the whole apparatus, with its stand of oak, is 3 feet 8 inches. It was executed by Euphrosynus Ulpius, a name unknown to geographers, and is dedicated to Cardinal Marcellus Cervinus, D.D., who, thirteen years later, was elevated to the Roman see, under the title of Marcellus II., and survived his election only twenty-two days. The first meridian line passes through the Canaries; the remaining ones are repeated at intervals of 30 degrees. Great prominence is given to the line of demarcation between Spain and Portugal in the New World, laid down by Pope Alexander VI. The geographical features peculiar to this globe are two, evidently copied from the Verrazano map of 1529,—the legend found upon it recording the voyage made by Verrazano on behalf of Francis I. in 1524, and the rude line drawn south-east from about 57° to 36° N. lat. The latter, common to both map and globe, gave rise to the curious conception of the "Mare Verrazano," the origin of which has exercised the minds of geographers from Hakluyt down to our day.[3]

In the South Kensington Museum is a celestial globe 7½ inches in diameter, made of gilt metal (it is supposed for Rudolph II.), by G. Roll and J. Reinhold at Augsburg, dated 1584.

Mollineux Globes of 1592.—The true successor of Mercator in the art of globe-making was neither J. F. Van Langren, Jodocus Hondius, nor W. J. Blaeu, as has been supposed, but an Englishman named Emerie Mollineux, the friend of Hakluyt, and of John Davis of Arctic fame. The earliest notice we have of the terrestrial globe made by him is the prospective one of its intended publication, to be found at the end of the preface to the 1st edition of Hakluyt's *Voyages* of 1589. The "comming out of the very large and most exact terrestriall globe" of Mollineux there referred to, with its companion celestial one, was accomplished in 1592. At the same time appeared a manual in English for their use, by Thomas Hood of Trinity College, Cambridge; and in 1594 appeared another manual, written expressly for them in Latin by Robert Hues, entitled *Tractatus de Globis et eorum usu*. Two years afterwards this latter was translated by J. Hondius, and published in Amsterdam, giving rise to the notion, apparently still prevalent in Holland, that Hues wrote this book expressly for Hondius,—a bibliographical blunder involving injustice to the memory of Mollineux. The only examples of these once famous globes known to exist are now preserved in the library of the Middle Temple, London. They are both 2 feet in diameter, mounted on stands, with the usual accessories of horizon, meridian, &c. The celestial globe still bears the date of 1592, but the terrestrial appears to have received additions, and the date has been altered by the pen to 1603. The best description of these two globes is a contemporary one to be found in Blundeville's *Exercises*, London, 1594, which enables us to realize the difference between these globes and Mercator's :—

"The mappe which covereth Mr Molineux his terrestriall globe differeth greatly from Mercator his terrestriall globe, by reason that there are found out divers new places, as well towards the North Pole as in the East and West Indies, which were unknowne to Mercator. They differ also greatly in names, longitudes, latitudes, and distances of such places set down not only in Mercator's globe but also in divers maps more lately made. As touching the map of the stars which covereth the celestiall globe of Mr Molineux, I do not find it greatly to differ from that of Mercator, saving that Mr Molineux hath added to his celestiall globe certain southern images, as the Crosse, &c. In the great terrestriall globe the voyage, as well of Sir F. Drake as of Mr Th. Candish, is set down and shewed by help of two lines, the one red, and the other blew, whereof the red line doth show what course Sir Francis observed in all his voyage, as well outward as homeward; and the blew line showeth in like manner the voyage of Master Candish, and in that globe is also set down how farre Sir Martin Furbisher discovered towards the north parts. Nothing is set down in this globe but only the ontermost end of his voyage, named Forbisher's Straights, having in N. lat. about 63 degrees."[4]

From a later inscription on the terrestrial globe we learn that it was still further repaired in 1818 by Messrs J. & W. Newton, globe makers, of Chancery Lane. These globes are of special interest as the first of the kind made in England and by an Englishman.

In the same year J. Van Langren, and Jodocus Hondius five years later (1597), put upon record their intention of bringing out pairs of globes; but no globes of their manufacture are known to exist of a date anterior to the 17th century. To Mollineux succeeds William Jansson Blaeu (1571–1638), a celebrated mathematician, map-drawer, and publisher of Amsterdam, who secured a considerable reputation by publishing terrestrial and celestial globes, which excelled in beauty and accuracy everything that had preceded them. He was succeeded by his son John, editor of the well-known *Atlas Major* in 11 vols. folio. The elder Blaeu constructed globes in three sizes, the largest measuring 27 inches, the next about 14½ inches, the smallest about 7½ inches in diameter. The bodies of the globes were usually made of wood, covered with plastic composition upon which the maps were pasted in gores, thus admitting of corrections being made from time to time. In consequence of this no examples of his globes are known to exist without additions of the 17th century. Mr P. J. K. Baudet, who wrote the *Life and Works of W. J. Blaeu*, Utrecht, 1871, notwithstanding his utmost exertions, could find in Holland only two pairs, one in the astronomical observatory at Leyden, the other in the physical museum at Amsterdam, the latter being of the smallest size. Another pair, however, of the smallest size, dated 1603, are in the possession of Mr Henry Stevens; and a pair of the medium size, belonging to Mr Fred. Müller of Amsterdam, were exhibited at the geographical congress held in Paris in 1875. Of the last pair, the celestial globe bears the date of 1603. The terrestrial globe, though still bearing the date of the first edition of 1599, has received corrections of a much later date, embodying the geographical results of the first Dutch expedition to the East Indies under Houtman in 1598, and those of Oliver Van Noort in the same year, and of Le Maire in 1616. From a report presented to the French minister of public instruction by M. E. Cortambert in 1855 we learn that a pair of fine globes by Blaeu is preserved in the Bibliotheque de Bourges. Two pairs of the 27-inch globes of Blaeu's heirs have recently been found, the first in the library of Trinity House, Tower Hill, the second in the British Museum, of date about 1645. In their main features the globes of Blaeu coincide more or less with several well-known maps published at this period, and with others to be found in the atlases of Mercator and Hondius.

The only remaining globes of the 16th century known to us are two pairs by A. F. Van Langren; the first, preserved in the Bib. Nat. de Paris, Sect. Géog., No. 405; the second in the Bibliothèque de Grenoble, found by M. E. Cortambert in 1855. In the latter library is also to be seen a curious terrestrial globe in MS., made by some monks of the Grande Chartreuse; it is undated, but is supposed to be of the 17th century.

It remains to notice briefly the few globes of a later period that are remarkable either for their historical interest, peculiar form, or great size. In the Academy of Sciences at St Petersburg there are or were four that call for notice. The first is a terrestrial one, 3 feet in diameter, made at Pleskow by a deacon named Karpow Maximow. It is supposed to have been the first made in Russia. This is accompanied by a planetary 2½ feet in diameter, presented to Peter the Great by the company of English merchants established in Russia. Here is also preserved a large terrestrial globe of copper, made in 1664 by the heirs of W. J. Blaeu; it is 7 feet in diameter, and was brought from Moscow about 1747. In the same academy is preserved the famous Gottorp globe; it is a hollow sphere 11 feet in diameter, containing a table and seats for twelve persons. It was made by A. Bush in 1654, under the direction of Olearius, from designs found among the papers of Tycho Brahe, and was not finished until 1664. The outside represents the terrestrial globe, the interior showing the heavens; the stars are distinguished according to their respective magnitudes by gilt nails of various sizes. It was presented to Peter the Great by Frederick IV. of Denmark in 1713. The Czar was so pleased with his acquisition that he had it transported by water to Revel, and thence on rollers and sledges to his new capital. Being partly burnt in 1747, it was repaired again 1751, and adjusted to the horizon of St Petersburg, the meridian and horizon being made by an English mechanic named Scott.

The two largest complete globes existing are those preserved in the "Salle des Globes" in the Bibliothèque Nationale of Paris. They are each 12 feet in diameter, and were made under the direction of the famous Italian geographer Coronelli in 1683, by order of Cardinal d'Estrées, the Spanish ambassador, and presented by him to Louis XIV. They are made of wood, very solid, and are covered with cloth or canvas on which the configurations have been drawn by an able artist, particularly those on the celestial globe. The meridians and horizons are of bronze, the latter are sustained by eight columns of the same material, and the former by two bronze feet highly ornamented. Between the brackets that form the feet of the meridians is placed, under each globe, a compass in marble and bronze; the ascent to these is by five steps which encircle each globe. On the celestial globe painted blue are marked all the fixed stars, and their constellations with the paths of the comets, also the places of all the planets at the moment of the birth of Louis XIV. This last event is alluded to also in a hyperbolical inscription to be seen on a copper plate to be found on it. The geography of the terrestrial globe is based upon that of Sanson; the sea being painted in deep blue, and the land portions being white, the inscriptions upon it are very legible. There is also to be seen on it a bust of the king placed above a dedication somewhat like that on the celestial globe. Although these globes are without any great scientific value, they serve to indicate the astronomical and geographical knowledge prevalent in France at the end of the 17th century. A good illustration of these globes, accompanied by a detailed account of their history, by M. C. Letort of the Bibliothèque Nationale, will be found in *La Nature*, No. 116, August 21, 1875. In the Bib. Mazarine is preserved a terrestrial globe 8 feet in diameter, known as the Louis XVI. globe. It is made of copper engraved, the names of places being inlaid with black, and is mounted on a temporary wooden structure, the beautiful accessories of bronze cast for it never having been finished or utilized; they are, however, to be seen in another part of the library. We learn from a MS. description of this globe, also preserved here, that it was made for Louis XVI., himself no mean geographer, by the direction of Vergennes in 1784. The geography of it is based upon that of D'Anville, corrected by Robert de Vaugondy and Le Clerc; it also indicates the net results of all the voyages round the world made up to this period.

About 1764 Dr Roger Long of Cambridge, professor of astronomy and master of Pembroke, erected in an outbuilding of his hall a sphere 18 feet in diameter. The concave interior was lined with tin, upon which was depicted all the stars and constellations visible in England on the horizon of Cambridge. The lower part of the sphere was cut off at the diameter of 13 feet, and the truncated meridians were screwed down on to a circle which ran on rollers of lignum vitæ, the whole being movable by simple machinery provided for the purpose. It was capable of holding thirty persons, and had an entrance by six steps placed over the South Pole. In the centre was placed a planetarium. Although it is said funds were left for its preservation, it appears to have fallen into neglect and decay.

To these succeed in order of size the globes known as "Georamas." One exhibited in Paris in 1844 was 30 feet in diameter; another by Delanhard erected in 1823 was 40 feet in diameter; of the last the proprietor published a

[1] According to Dr F. Wieser, a third example of it is preserved at Weimar.

[2] A pair of Mercator's globes reproduced in facsimile, natural size, were conspicuous features in the Belgian section of the exhibition connected with the geographical congress held in Paris in 1875.

[3] The history of this curious geographical puzzle will shortly be dealt with by Mr Henry Stevens, to whom we are indebted for much information respecting this globe. A projection of a portion of it is to be seen in the *Mag. of American History*, vol. iii. p. 17, Jan. 18. 9.

[4] This last remark does not appear to be quite accurate, as John Davis says:—"How far I proceeded doth appear upon the globe made by Master Emery Mullineux" (*Hydrographical Description*, London, 1595).

description. Then follows Wyld's well known "great globe," erected in Leicester Square, London, 60 feet in diameter. The largest appears to have been the one erected by Colonel Langlois in Paris in 1825, on the Champs Elysées. This was 120 feet in diameter. As has been truly said, these structures served more to satisfy curiosity than to impart scientific instruction. (C. H. C.)

Manufacture.—The manufacture of artificial globes has changed but little in character during the last hundred years. Such improvements as have been introduced have reference either to the quality of the maps or to the mode of mounting the globes. The number of sizes manufactured has also been increased. The diameter has always been used to indicate the size of the globes, and those now produced by the various makers vary from 1 to 36 inches.

The process of manufacture differs little if at all in the sizes of globes ranging between 3 and 25 inches. Thus supposing, for example, a 12-inch globe (the ordinary school globe) is required to be made, a spherical mould measuring some quarter of an inch less in diameter is prepared on which to form hemispherical caps that are to constitute a hollow foundation for the globe. This mould, made preferably hollow for lightness, and having a central axle terminating in poles, is well greased on the surface to enable it to resist damp. To form the caps, strips of white paper, damped in water, are first applied to the mould to form a coating thereon. Upon this coating is applied brown paper saturated with paste, and alternate layers of white and brown paper are added, until the required thickness of paper, say $\frac{1}{16}$th of an inch, is obtained. The change of colour is adopted simply as a guide to the workman, that he may know when he has completed a coating of paper. The mould thus covered is put aside to dry, and after two or three days the paper covering is severed into two hemispherical caps, which are then drawn off from the mould.

A wooden axle furnished with poles (which will eventually form the north and south poles of the globe) is provided, of such a length as will enable the caps, when fitted over the poles, to meet at their severed edges. By means of glue these edges are joined up, and the caps are firmly attached to the ends of the axle. Thus a hollow sphere of rude outline is formed, measuring somewhat less than 12 inches in diameter. The next operation is to bring this sphere to the required diameter for the globe, and to make it perfectly true. For this purpose the ball is coated with a plastic composition of whiting, boiled oil, and glue, and passed under the action of a steel semicircle fitted with bearings for receiving the poles of the ball, and retaining the same in place while the ball is being slowly rotated. By applying to the ball repeated coatings of this composition, and removing all superfluities by means of the gauging edge of this steel semicircle, a smooth spherical surface is eventually obtained. When the ball is finished and hard, it is tested in loose bearings to see whether it will remain quiescent in all positions. If it shows a tendency to run round, the ball is balanced by the introduction of a counterweight at the highest part of its periphery. When the ball is balanced, and the hole made good by which the counterweight was introduced, the surface is polished, after which it is ready to receive the map. For 12-inch globes the maps of the earth and of the heavens are engraved on steel or copper plates in 12 gores, measuring each 30 degrees in width, and extending from pole to pole, or more usually to the 70th degree of latitude, the remaining portion of the maps being made up by north and south pole plates. This arrangement is somewhat modified for larger globes. Thus, for globes above 15 inches in diameter, the gores are divided in the line of the equator, and they are also divided longitudinally for say one-fourth of their length at the 15th degree, in order to facilitate the laying down of the maps evenly upon the spherical surface. Preparatory to covering the sphere with the map, it is marked with lines corresponding to the equator, parallels of latitude, and lines of longitude on the map, such lines serving as a guide for the workman. The gores of the map having been carefully cut out, they are damped and laid down in proper order in a pile upon a pasting board. The workman then covers his polished ball, for the length and breadth of a gore, with paste, or, more properly, a preparation of starch, and having coated with starch the uppermost gore of the pile, he with an ivory knife lifts that gore, and lays it upon the pasted portion of the ball, fitting it to the lines marked thereon, and smoothing down creases, at the same time taking care that the latitude and longitude lines of the gore correspond exactly with the lines on the ball. Having laid down this gore in place, he next applies a second gore in like manner, taking care that the two gores shall join each other, and not expose any portion of the underlying surface. In this way the workman proceeds until all the gores are in place, and he finishes the pasting of the ball by applying the pole papers which fit respectively on to the opposite ends of the gores. The map has next to be sized, preparatory to its being coloured, in order to form a resist to the varnish which is subsequently to be applied to the globe. The map is tinted and outlined with water colours, and a coat of varnish is then applied. When this is dry the globe is ready for mounting; after which the varnishing operation is completed by the application in a heated room of several coats of spirit varnish following quickly the one on the other. Some skill is requisite in laying on the varnish, so as to obtain a surface as clear and smooth as glass. This result is unfortunately evanescent, as the best varnish is liable to discolour and to crack, and thereby obscure to some extent the legibility of the underlying map. After varnishing the globe will be fit to handle in from four to six days. For the purpose of mounting the globe a flat ring, termed the brazen meridian, is provided, and bearings are formed thereon to receive the poles of the globe. This ring is divided on its face into 360 degrees, the numbering of these degrees being from 0 (which corresponds with the equator) to 90 at the poles on one half of the ring, and on the other half the numbering starts from the poles at 0, running up to 90, which corresponds with the equator. Fitted to the poles, and capable of turning thereon, are hour circles, which underlie the brazen meridian, and are divided and numbered to correspond with the 24 hours of the day and night. The frame for the reception of the globe and ring is formed with a wooden horizon, which constitutes an imaginary line dividing the globe into two equal parts, the portion above the horizon being the visible half, and that below the horizon the invisible half of the sphere. This horizon is covered, like the globe, with papers which are varnished to protect them from injury. The horizon papers near their inner edge are divided into 360 degrees, by which are reckoned the azimuth and the amplitude; they also indicate the points of the compass in the space called the circle of the winds. The horizon of the frame is notched to receive the brass meridian, which rests in a step-bearing fitted to the central pillar or block of the frame, and is held therein by a screw stop, which, entering an annular groove in the back of the meridian, leaves the ring free to turn round in the frame, for the purpose of rectifying the globe, or bringing its axis to any desired angle with the horizon. The fitting of the globe is completed by the quadrant of altitude, consisting of a thin flexible slip of brass, jointed to a clamping nut, which is intended to embrace the brass meridian, and may be adjusted thereon by a tightening screw. This flexible strip or blade is divided off into 90 degrees, corresponding to those on the equator, and is intended to measure distances between any two places upon the curved surface of the earth, or the altitude of the sun, a star, or any planetary body in the heavens, and for this purpose its graduations are numbered from 0 to 90. A useful appendage to the globe frame is a mariner's compass, which facilitates the adjustment of the globes to their true polar position.

The value of a globe, whether terrestrial or celestial, depends mainly on the quality of the map with which it is covered. Before the present century, English globes were not only poor specimens of the engraver's art, but they showed little attention to accuracy of detail. Now, however, they rank in quality with, if they do not surpass, the best foreign maps, notwithstanding that little encouragement is given to their manufacture. Specimens of globe plates published at the latter end of the 17th century in Italy are yet to be seen, which are a marvel of the cosmographer's art. Under the patronage of the Venetian republic, P. Coronelli, cosmographer to the republic, published a terrestrial and celestial globe of the unprecedented size of 4 feet in diameter, which embodied the utmost scientific knowledge of the time, and in the constellations of the celestial globe showed the finest quality of line engraving at its best period. The composition of these figures served as a basis for the remodelling of the constellations on English globes some 40 years since, at which time the drawing of the figures was not merely barbarous, but absurd. Whether these fine globes were ever manufactured it is now difficult to ascertain, but none are known to exist except a celestial globe produced by the late Mr William Newton, to whom the globe manufacture is indebted for such improvements as have been introduced during the present century, and another which is preserved in the Bibliothèque Nationale of Paris, bearing the name of Deuvez as the maker.

An amusing illustration of the difficulties which attend the delineator of globe plates is to be found in the preface of a book published in 1686, for its author, Mr J. Moxon, entitled *A Tutor to Astronomy and Geography*. Moxon appears to have been a globe-maker, and in expatiating on the improvements to be found in his new terrestrial globe, he says:—"California is found to be an island, though formerly supposed to be part of the main continent, whose north-west shore was imagined to thrust itself forth close to the coasts of Cathaio, and so make the supposed straits of Anian." On his globe, therefore, the peninsula was converted into an island. Precisely the same difficulties are now experienced by globe-makers; and those who have watched, for example, the varied forms which the lakes in Central Africa have taken during the last 25 years will understand at what risk the globe-maker corrects his costly plates, to bring them up to the current geographical knowledge.

The inconvenience attendant on the transport of large globes, manufactured as above explained, not to speak of their excessive cost, led to the introduction of flexible or compressible globes, both on the Continent and in the United States. It does not appear that they have been extensively manufactured, for at the best they were but toys, but they certainly displayed great ingenuity in their construction. A French manufacturer used a spherical bladder as a base for his globe, affixing to it rigid poles, and covering it with a map printed on soft white leather, which map was applied in the same way as the maps on the ordinary globe. By inflating the bladder through a mouth-piece which was fitted with a stop-cock and constituted also one of the poles, the spherical form of the globe was obtained; and by discharging the air, the globe could be compressed into a small space. A frame composed of detached pieces was also provided for this globe, to permit of its being used for working problems thereon. When not required for use, the globe and its fittings could be packed into a very small compass. The best globes of this class were to be seen in the American department of the 1851 Exhibition. These measured 24 inches in diameter, and were manufactured by the late Mr Goodyear, of india-rubber fame; but they never obtained a market in England, and were evidently intended for reference globes only.

Some 50 years ago, the late Mr William Newton designed a pocket globe of some merit. It was mounted in a spherical case, which, opening at a centre line, disclosed the globe mounted in a brass ring and within a fixed horizon. Upon this globe, measuring 3 inches in diameter, numerous problems could be worked with tolerable accuracy. His last and best improvement was what he termed the "Newtonian Globe." It was designed chiefly for common schools, and was set upon an iron pillar, which avoided the cost of a wooden frame. The principal object, however, of the author was to convey to children, in the most simple manner, an elementary acquaintance with the construction and movements of the heavenly bodies. The author's design may be thus briefly explained. The Newtonian globes are hung in stationary rings or meridians, and are capable of turning upon their axes or poles for the purpose of showing the real diurnal motion of the earth and the apparent diurnal motion of the heavens, according to the Newtonian system or real structure of the universe. In place of a wooden horizon, a sliding annular plate is substituted. On the terrestrial globe this plate acts as a terminator to indicate the line of demarcation between day and night. The globe is so mounted upon its pedestal that the axis always lies in its true inclined position, and points to the north polar star in the heavens. A small brass ball representing the sun is made to slide upon the meridian, and it is carried by an arched arm, which connects it with the annular terminator. This ball is adjustable to correspond to the declination or perpendicular position of the sun north or south of the equator, according as the sun's declination varies from day to day throughout the year; and the terminator follows the motions of the sun. Upon the celestial globe a similar sliding annular plate marks the visible horizon of any place on the earth's surface, and shows what part of the heavens would be there seen at a given time; it also assists in illustrating the rising and setting of the sun and moon at different seasons and periods of the year, and the apparent diurnal rotation of the planets and fixed stars. These globes have been well appreciated in the north of Europe, but as they are not in conformity with English school books, they have had little success in the United Kingdom. (A. V. N.)

GLOBE-FISH or SEA-HEDGEHOG. By these names some sea-fishes are known, which have the remarkable faculty of inflating their stomachs with air. They belong to the genera *Diodon* and *Tetrodon*. Their jaws resemble the sharp beak of a parrot, the bones and teeth being coalesced into one mass with a sharp edge. In the Diodonts there is no mesial division of the jaws, whilst in the Tetrodonts such a division exists, so that they appear to have two teeth above and two below. By means of these jaws they are able to break off branches of corals, and to masticate other hard substances on which they feed. Usually they are of a short, thick, cylindrical shape, with powerful fins (fig. 1).

FIG. 1.—*Diodon maculatus.*

Their body is covered with thick skin, without scales, but provided with variously formed spines, the size and extent of which vary in the different species. When they inflate their capacious stomachs with air, they assume a globular form, and the spines protrude, forming a more or less formidable defensive armour (fig. 2). A fish thus blown out turns over and floats belly upwards, driving before the wind and waves. Many of these fishes are highly poisonous when eaten, and fatal accidents have occurred from this cause. It appears that they acquire poisonous qualities from their food, which frequently consists of decomposing or poisonous animal matter, such as would impart, and often does impart, similar deleterious qualities to other fish. They are most numerous between the tropics and in the seas contiguous to them, but a few species live in large rivers, as, for instance, the *Tetrodon fahaka*, a fish well known to all travellers on the Nile. Nearly 100 different species are known.

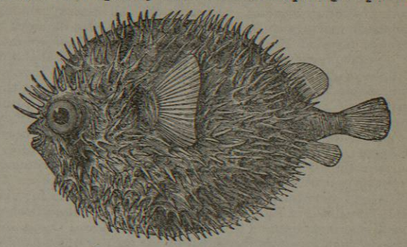

FIG. 2.—*Diodon maculatus* (inflated).

GLOBIGERINA. See FORAMINIFERA.

GLOGAU (sometimes called Gross or Great Glogau, to distinguish it from Klein or Little Glogau, in the government of Oppeln), is a fortified town of Prussia at the head of a circle in the Lower Silesian government of Liegnitz, situated partly on an island and partly on the left bank of the Oder, about 80 miles S.E. of Frankfort. Among its more important buildings are the cathedral, in the Gothic style, and a castle in the Renaissance style, now used as a courthouse; and it also possesses a new town-house, a synagogue, a poorhouse, an orphanage, a military hospital, two gymnasia, and several libraries. Situated as it is on a navigable river and at a junction of two or three railway lines, Glogau carries on an extensive trade, which is fostered by a variety of local industries, dealing with tobacco, beer, oil, sugar, vinegar, bone-meal, earthenware, &c. One of its publishing firms—that of Flemming & Company—has attained a wide reputation for maps. In 1871 the population of Glogau, inclusive of the garrison, amounted to 18,266,—of whom 6039 were Roman Catholics and 947 Jews; and in 1875 it was stated at 18,062.

In the beginning of the 11th century Glogau, even then a populous and fortified town, was able to withstand a regular siege by the emperor Henry V.; but in 1157 the duke of Silesia, finding he could not hold out against Frederick Barbarossa, set the place on fire. In 1252 the town, which had been raised from its ashes by Henry the Bearded, became the capital of a principality of Glogau, which continued till 1506, when town and district were united to the Bohemian crown. In the course of the Thirty Years' War Glogau suffered greatly. The inhabitants, who had become Protestants soon after the Reformation, were dragooned into conformity by Wallenstein's soldiery; and the Jesuits received permission to build themselves a church and a college. Captured by the Protestant allies in 1632, and recovered by the Imperialists in 1633, the town was again captured by the Swedish general Torstenson in 1642, and continued in Protestant hands till the peace of Westphalia in 1648. In 1741 the Prussians took the place by storm, and during the Seven Years' War it formed an important centre of operations for the Prussian forces. After the battle of Jena it fell into the hands of the French; and they have reason to be proud of the gallant defence made by Laplane, who held out against the Russian and Prussian besiegers, after the battle of Katzbach (August 26, 1813), till the 17th of the following April.

GLOSS, GLOSSOGRAPHER, GLOSSARY, GLOSSATOR. The Greek word γλῶσσα, meaning originally a tongue, hence a language or dialect, gradually came to denote especially any obsolete, foreign, provincial, technical, or otherwise peculiar word or use of a word (see Arist., *Rhet.* iii. 3, 2); and the making of collections and explanations of such γλῶσσαι was at a comparatively early date a well-recognized form of literary activity. Even in the 5th century, among the many writings of Democritus of Abdera was included a treatise entitled Περὶ Ὁμήρου ἢ ὀρθοεπείης καὶ γλωσσέων. It was not, however, until the Alexandrian period that the γλωσσογράφοι became very numerous. Of many of these it is probable that even the names have perished; but in the writings of Athenæus alone (*c.* 250 A.D.) allusions are to be found to no fewer than thirty-five. Among the earliest may be mentioned Philetas of Cos (d. *c.* 290 B.C.), the elegiac poet, to whom Aristarchus dedicated the treatise πρὸς Φιλητᾶν; he was the compiler of a lexicographical work, arranged probably according to subjects, and entitled Ἄτακτα or Γλῶσσαι (sometimes ἄτακτοι γλῶσσαι). Next came his disciple Zenodotus of Ephesus (*c.* 280 B.C.), one of the earliest of the Homeric critics and the compiler of Γλῶσσαι Ὁμηρικαί; Zenodotus in turn was succeeded by his greater pupil Aristophanes of Byzantium (*c.* 200 B.C.), whose great compilation περὶ λέξεων (still partially preserved in that of Pollux), is known to have included Ἀττικαὶ λέξεις, Λακωνικαὶ γλῶσσαι, and the like. From the school of Aristophanes issued more than one glossographer of name,—Diodorus, Artemidorus (γλῶσσαι, and a collection of λέξεις διψαρτυτικαί), Nicander of Colophon (γλῶσσαι, of which some twenty-six fragments still survive), and Aristarchus, the famous critic, whose numerous labours included an arrangment of the Homeric vocabulary (λέξεις) in the order of the books. Contemporary with the last named was Crates of Mallos, who, besides making some new contributions to Greek lexicography and dialectology, was the first to create at Rome a taste for similar investigations in connexion with the Latin idioms. From his school proceeded Zenodotus of Mallos, the compiler of Ἐθνικαὶ λέξεις or γλῶσσαι, a work said to have been designed chiefly to support the views of the school of Pergamus as to the allegorical interpretation of Homer.[1] Of later date were Didymus (Chalkenteros, *c.* 50 B.C.), who made collections of λέξεις τραγωδουμέναι, κωμικαί, &c.; Apollonius Sophista (*c.* 20 B.C.), whose Homeric *Lexicon* has come down to modern times; and Neoptolemus, known distinctively as ὁ γλωσσογράφος. Coming down to the beginning of the first century of the Christian era we find Apion, a grammarian and rhetorician at Rome during the reigns of Tiberius and Claudius, following up the labours of Aristarchus and other predecessors with γλῶσσαι Ὁμηρικαί, and a treatise περὶ τῆς Ῥωμαϊκῆς διαλέκτου; Heliodorus or Herodorus was another almost contemporary glossographer; Erotian also, during the reign of Nero, prepared a special glossary for the writings of Hippocrates, still preserved. To this period also Pamphilus, the author of the λειμών, from which Diogenian and Julius Vestinus afterwards drew so largely, most probably belonged. In the following century ono of the most prominent workers in this department of literature was Ælius Herodianus, whose treatise περὶ μονήρους λέξεως has been edited in modern times, and whose ἐπιμερισμοί we still possess in an abridgment; other names are those of Pollux, of Diogenian (λέξις παντοδαπή), of Julius Vestinus (ἐπιτομὴ τῶν Παμφίλου γλωσσῶν), and especially that of Phrynichus, who flourished towards the close of the 2d century. His *Eclogæ nominum et verborum Atticorum* has frequently been edited. To the 4th century belongs Ammonius of Alexandria (*c.* 389), who wrote περὶ ὁμοίων καὶ διαφόρων λέξεων, a dictionary of words used in senses different from those in which they had been employed by older and approved writers. Of somewhat later date is the well-known Hesychius, whose often-edited Λεξικὸν rightly superseded all previous works of the kind; Cyril, the celebrated patriarch of Alexandria, also contributed somewhat to the advancement of glossography by his συναγωγὴ τῶν πρὸς διάφορον σημασίαν διαφόρως τονουμένων λέξεων; the names of Orus and Orion, of Philoxenus, and of the two Philemons also belong to this period. The works of Photius, Suidas, and Zonaras, as also the *Etymologicum Magnum*, to which might be added the *Lexica Seguerianæ* and the *Lexica Segueriana*, have already been referred to (DICTIONARY, vol. vii. p. 183). In Latin lexicology the most prominent name is that of Festus, whose only extant work, however, is but an epitome of the treatise of Verrius Flaccus *De Verborum Significatu*. This last-named author had himself been preceded by Varro (*De Lingua Latina*), who in turn makes allusion to several before him "qui glossas scripserunt." The introduction of grammatical and linguistic studies into Rome is usually attributed to Crates of Mallos (*c.* 267 B.C.) mentioned above.

To a special category of technical glossaries belongs a large and important class of works relating to the law-compilations of Justinian. Although the emperor forbade under severe penalties all commentaries (ὑπομνήματα) on his legislation (*Const. Deo Auctore*, sec. 12; *Const. Tanta*, sec. 21), yet indices (Ἰνδικες) and references (παράτιτλα), as well as translations (ἑρμηνεῖαι κατὰ πόδα) and paraphrases (ἑρμηνεῖαι εἰς πλάτος), were expressly permitted, and lavishly produced. Among the numerous compilers of alphabetically arranged λέξεις Ῥωμαϊκαί or Λατεινικαί, and γλῶσσαι νομικαί (Glossæ nomicæ), Cyril and Philoxenus are particularly noted; but the authors of παραγραφαί, or σημειώσεις, whether ἔξωθεν or ἔσωθεν κείμεναι, are too numerous to mention. A collection of these παραγραφαὶ τῶν παλαιῶν, combined with νέαι παραγραφαὶ on the revised code called τὰ βασιλικά, was made about the middle of the 12th century by a disciple of Michael Hagiotheodorita. This work is known as the *Glossa Ordinaria* τῶν βασιλικῶν.[2]

In Italy also, during the period of the Byzantine ascendency, various glossæ (glosæ) and scholia on the Justinian code were produced;[3] particularly the Turin gloss (reprinted by Savigny), to which, apart from later additions, a date prior to 1000 is usually assigned. After the total extinction of the Byzantine authority in the West the study of law became one of the free arts, and numerous schools for its cultivation were instituted. Among the earliest of these was that of Bologna, where Pepo (1075) and Irnerius (1100–1118) began to give their expositions. They had a numerous following, who, besides delivering exegetical lectures ("ordinariæ" on the *Digest* and *Code*, "extraordinariæ" on the rest of the *Corpus Juris Civilis*), also wrote Glossæ, first interlinear, afterwards marginal.[4] The series of these glossators was closed by Accursius (see ACCORSO) with the compilation known as the *Glossa ordinaria* or *magistralis*, the authority of which soon became very great, so that ultimately it came to be a recognized maxim, "Quod non agnoscit glossa, non agnoscit curia."[5] For some account of the glossators on the canon law, see vol. v. p. 20 (CANON LAW).

Bible Glosses.—With the decay of learning and originality during the dark ages grew the necessity for making and the custom of transcribing on manuscript copies of the Vulgate various notes, explanatory or otherwise, of the text. Ultimately collections of these glosses or sets of glosses came to be made. They are distinguished as either marginal or interlinear. The most famous collection of *Glossæ marginales* was that made by Walafridus Strabus in the 9th century; it consists of notes grammatical, historical, and theological, culled from the writings of Augustine, Ambrose, Jerome, Gregory, Isidore, Bede, Alcuin, and Hrabanus Maurus, with additions by himself. The interlinear glosses (which as a rule were not so full as the marginal) were sometimes theological but more generally purely philological. A somewhat important collection of interlineal glosses belonging to the former class was made by Anselm of Laon (*c.* 1100). The philological glosses have considerable value to the linguistic student, especially those which originated in Germany during the Carolingian period. The MS. vocabularies in the libraries of St Gall, Munich, Vienna, &c., have been frequently examined of late years with results which have been fully indicated by Raumer in his treatise on the influence of Christianity upon Old High German (*Einwirkung des Christenthums auf die althochdeutsche Sprache*).[1] Some interlinear vernacular translations of portions of the Bible into the Anglo-Saxon, of the 9th and following centuries, have also been recently reprinted (see ENGLISH BIBLE).

GLOSSOP, a municipal borough of Derbyshire, is situated on the extreme northern border of the county, 14 miles E.S.E. of Manchester. It is the chief seat of the cotton manufacture in Derbyshire, and it has also woollen and paper mills, dye and print works, and bleaching greens. The town has for several years been rapidly increasing in size, and now consists of three main divisions, viz., the Old Town (or Glossop proper), Howard Town (or Glossop Dale), and Mill Town. The principal buildings are the town hall and market-house, the temperance hall, the grammar school, and the mechanics' institution. In the immediate neighbourhood is Glossop Hall, the seat of Baron Howard, lord of the manor, a picturesque old building with extensive terraced gardens. On a hill near the town is Milandra Castle, the site of a Roman station.

Glossop was granted by Henry I. to William Peverel, on the attainder of whose son it reverted to the crown. In 1157 it was gifted by Henry II. to the abbey of Basingwerk. Henry VIII. bestowed it on the earl of Shrewsbury, and it now belongs to the Howards. It was made a municipal borough in 1866. The population in 1871 was 17,046.

GLOUCESTER, a county in the west midland district of England, bounded on the N. by Worcester and Warwick, on the S. by Somerset, on the E. by Oxford and Wilts, and on the W. by Hereford and Monmouth. The river Wye forms the western boundary line, the Stratford Avon part of the northern, the Bristol Avon the south-western, and the Thames for some miles the south-eastern. The shape of the county is irregularly elliptical, its greatest length in direct line from Bristol to Clifford Chambers (N.E.) being 54 miles, its greatest width from Down Ampney to Preston, near Ledbury, at right angles, 33 miles. The area, according to the tithe surveys—deducting 3000 acres of detached land incorporated by an Act of 1844 with the counties of Worcester, Warwick, and Wilts, by which they were surrounded, and 17,688 acres of water—amounts to 805,102 acres, mostly cultivable. The county contains 29 hundreds, among which are grouped 351 parishes, 227 tithings, liberties, and hamlets; and the parishes are arranged in 17 poor law unions for the relief of the poor, and 21 petty sessional divisions for the administration of justice and sanitary purposes. Electorally Gloucestershire is divided into the two divisions of East and West Gloucestershire, each returning two members. The latter comprises Dean Forest to the Severn bank (the "Eye between Severn and Wye" of the local proverb), and the country S. of the former river to S.E. and N.E. of Dursley, the chief polling place of the division. East Gloucestershire, comprehending the rest of the county, has its chief polling places at Gloucester and Cheltenham, and besides these boroughs, the former of which returns two members and the latter one, has within its limits the boroughs of Stroud with two members, and Tewkesbury and Cirencester with one each. West Gloucestershire, sharing with North Somerset the city of Bristol, sends two more members to parliament, so that the total representation of the county is 13 members. Gloucestershire contains 28 market-towns and 2 cities.

The population of the county in 1851 was 458,805 (218,187 males and 240,618 females); in 1861 it was 485,770 (229,009 males and 256,761 females); and in 1871 it had increased to 534,320 (251,943 males and 282,377 females). Since the first census in 1801 the population has increased by 283,917 persons, or 113 per cent.

The population of the principal towns at the census of 1871 was as follows:—

Bristol city	182,552	Tetbury	3,349
Cheltenham	41,923	Newent	3,168
Gloucester	18,341	Dursley	2,617
Stroud	7,082	Wotton-under-Edge	2,314
Cirencester	6,056	Newnham	1,483
Tewkesbury	5,409		

The county has three natural divisions, the hill, the vale, and the forest, parallel to each other north and south. (1.) The hill country, which, except the high ground of the Forest of Dean, consists wholly of the Coteswolds, a range extending from Broadway near Chipping-Campden on the north to Bath on the south, and from Birdlip hills on the west to Burford on the east, and traversing the eastern side of the county at an average elevation of 700 feet, though in parts, as at Cleeve Hill near Prestbury, it is 1134 feet above the level of the sea. It covers nearly 300,000 acres of undulating table-land, locally subdivided into the Southwolds betwixt Bath and Badminton, the Stroudwater hills betwixt Tetbury and Woodchester, and the Coteswolds proper, or the rest of the hill country northward. (2.) The Vale, or that level tract extending from the base of the Coteswolds to the east bank of the Severn, the upper or northern part of which expanse is known as the vale of Gloucester, and embraces Gloucester, Cheltenham, Tewkesbury, and some 50,000 acres; whilst the lower is the vale of Berkeley, a tract of similar area reaching from Aust Cliff on the Severn opposite the mouth of the Wye to Robin's Wood hill, two miles south-east of Gloucester. The vale of Gloucester is a continuation of the vale of Evesham. (3.) The Forest division is the peninsula lying between the Wye and the Severn, in modern times limited to the Forest of Dean, but anciently occupying all Gloucestershire west of Severn, and covering some 43,000 acres. The area of the present forest is 23,015 acres, 11,000 of which are enclosed. Its length from north to south is 20 miles, its breadth (east to west) 10 miles.

Geology.—Though the igneous rocks are little developed, the great variety of sedimentary deposits makes Gloucestershire a rich field for the geologist. At

[1] See Matthæi, *Glossaria græca*, Moscow, 1774-5

[2] See Labbé, *Veteres glossæ verborum juris quæ passim in Basilicis reperiuntur* (1606); Otto, *Thesaurus juris Romani*, vol. iii. (1697); Stephens, *Thesaurus linguæ Græcæ*, vol. viii. (1825).

[3] See Biener, *Geschichte der Novellen*, p. 229 *seq.*

[4] Irnerius himself is with some probability believed to have been the author of the BRACHYLOGUS (*q.v.*).

[5] Thus Villani (*De origine civilutis Florentinæ*) says of the Glossæ that "tantæ auctoritatis gratiæque fuere, ut consensu omnium publice approbarentur et spretis abolitisque penitus aliis solæ juxtas textus legum opositæ sunt et ubique terrarum sine controversia pro legibus observantur, ita ut propemodum nefas sit, non secus quam textui, Glossi-Accursii contraire, sicut antiqua fama referente comperi." For similar testimonies see Bayle's *Dictionnaire*, *s.v.* "Accursius" and Rudorff, *Röm. Rechtsgeschichte*, i. p. 338 (1857).

[1] Considerable interest of a similar kind attaches to the so-called *Glossæ malbergicæ* upon the Latin text of the Salic law. It was at one time held that in these glosses we have some relics of the ancient Celtic tongue; but their truly Germanic character was afterwards conclusively established by Jacob Grimm.