

an English watchmaker established in Paris, was the first who in that city attempted the construction of chronometers for finding the longitude; and this he did in 1724. In 1736 the chronometers of the English artist Harrison were tried at sea. In France, however, there were no chronometer-makers of note after Sully, till Pierre le Roy and Ferdinand Berthoud, between whom there was some discussion about the priority of their discoveries and improvements. Ferdinand Berthoud's chronometers were long the most esteemed of any in France. Louis Berthoud, his nephew and successor, introduced some improvements, and made chronometers of a smaller size and therefore more portable. Berthoud was a member of the French Institute, a fellow of the Royal Society of London, and a member of the Legion of Honour. He was regular in his habits, and retained the use of his faculties to the last. He died of hydrothorax, at his country house, in the valley of Montmorency, in 1807, aged about eighty. The principal of his published works are *Essais sur l'Horlogerie*, 2^e edit., 1786, 2 vols. 4to; two Tracts on Chronometers, 1773; *De la Mesure du Temps*, 1787, 4to; a Tract on Chronometers, 1782, 4to; *Histoire de la Mesure du Temps par les Horloges*, 1802, 2 vols. 4to; *L'Art de conduire et de régler les Pendules et les Montres*, 1760, 12mo. The tract last named, containing directions suited to general readers for regulating clocks and watches, passed through several editions.

BERTINORO (identified, on conjecture, with the ancient *Forum Druentinarum*), a city of Italy, in the province of Emilia and district of Forli, the seat of the bishop of the united dioceses of Forlimpopoli and Bertinoro. It stands on a hill, below which the River Ronco flows, and is celebrated for the excellence of its wine. Population, 6540. Long. 12° 2' 30" E., lat. 44° 8' 34" N.

BERWICK, JAMES FITZJAMES, DUKE OF, marshal and peer of France, was a natural son of James, duke of York, afterwards James II. of England, by Arabella Churchill, sister of the great duke of Marlborough. He was born at Moulins, August 21, 1670. He received his education in France, studying successively at Juilly, at the College of Plessis, and at the College of Flèche. At the age of fifteen, his father having succeeded to the throne, he was sent to learn the business of a soldier under the famous general of the empire, Charles of Lorraine. He served his first campaigns in Hungary, and was present at the siege of Buda and the battle of Mohacz. In 1687 he returned to England, was made a Knight of the Garter, and created duke of Berwick. After the Revolution he served under James II. in the campaign in Ireland, was in one engagement severely wounded, and was present at the battle of the Boyne. For a short time he was left in Ireland as commander-in-chief, but his youth and inexperience unfitted him for the post, and he was a mere puppet in stronger hands. In 1692 he was recalled to France, and took service in the French army. He fought under Marshal Luxembourg in Flanders, took part in the battles of Steinkerck and Landen (Neerwinden), and was taken prisoner at the latter. He was, however, immediately exchanged for the duke of Ormond, and afterwards he served under Villeroi. In 1696 the duke of Berwick took a prominent part in a plot for a Jacobite insurrection, but the scheme came to nothing. In 1702 he served under the duke of Burgundy, and in the following year became naturalized as a Frenchman. In 1704 he first took command of the French army in Spain. So highly was he now esteemed for his courage, abilities, and integrity, that all parties were anxious to have him on their side (*Eloge*, by Montesquieu). From Spain he was recalled to take the command against the Camisards in Languedoc, and when on this expedition he is said to have carried out

with remorseless rigour the orders which he received from Versailles. About this time he was created marshal of France. He was then sent again to Spain to retrieve the affairs of that kingdom, and to prop up the tottering throne. In April 1707 he won the great victory of Almanza, an Englishman at the head of a French army, over the earl of Galway (comte de Ruvigny), a Frenchman at the head of an English army. The victory established Philip V. on the throne of Spain, although neither he nor his rival, the archduke, was present at the battle. Berwick was made a peer of France and grandee of Spain. In 1708 he became commander-in-chief of the armies of France in Spain, in Flanders, on the Rhine, and on the Moselle. Through the four following years he gained fresh laurels by his masterly defence of Dauphiné, and in 1713 he returned to Spain and took Barcelona. Three years later he was appointed military governor of the province of Guienne. In 1718 he found himself under the necessity of once more entering Spain with an army; and this time he had to fight against Philip V., the king who owed chiefly to his courage and skill the safety of his throne. One of the marshal's sons, known as duke of Liria, was settled in Spain, and was counselled by his father not to shrink from doing his duty and fighting for his sovereign. Many years of peace followed this campaign, and Marshal Berwick was not again called to serve in the field till 1733. He advised and conducted in 1734 the siege of Philipsburg on the Rhine, and while the siege was going on was killed by a cannon-shot, June 12 of that year. Cool, self-possessed, and cautious as a general, Marshal Berwick was at the same time not wanting in audacity and swiftness of action in a real crisis. He was careful of the lives of his men, and was also a rigid disciplinarian. Lord Bolingbroke pronounced him the best great man that ever existed. Montesquieu said, "In the works of Plutarch I have seen at a distance what great men were; in Marshal Berwick I have seen what they are." He married in 1695 a daughter of the earl of Clanricarde, by whom he had the son already mentioned. He married a second wife in 1699, by whom he had another son, known as Marshal Fitz-James. The *Mémoires* of Marshal Berwick, revised, annotated, and continued by the Abbé Hosk, were published by the marshal's grandson in 1778. An untrustworthy compilation bearing the same title had been published about forty years earlier.

BERWICK-UPON-TWEED, a seaport town and municipal and parliamentary borough, at the mouth of the Tweed, in 55° 46' N. lat. and 1° 59' W. long., 300 miles N. by W. from London, and 47 E.S.E. from Edinburgh. Berwick proper is built chiefly on the declivity and flat summit of an elevation rising abruptly from the north side of the river. The liberties of the borough, commonly called "Berwick Bounds," containing an area of nearly eight square miles, extend to the N. and W., and form the N.E. extremity of England. The borough also includes (since 1835) the townships of Tweedmouth and Spittal on the south side of the river,—the latter a fishing and watering place on the coast, the former a manufacturing village connected with Berwick by a bridge. The town has a pleasing appearance from the neighbouring heights, especially at full tide,—sea and river, ramparts, bridges and pier, buildings ancient and modern, and the red-tiled roofs of the houses contributing to the view. The principal streets are wide, well built, and well paved, there being a remarkable absence, in so ancient a town, of narrow streets and old houses.

Berwick is one of the few remaining walled towns in the United Kingdom. The present ramparts were built in the reign of Elizabeth. To the north and east they are formed of earth faced with stone; bastions with cavaliers are

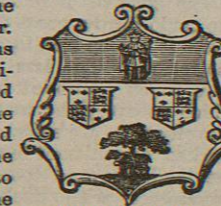
placed at intervals, and a ditch, now dry, extends to the river. Fronting the river are four-gun and six-gun batteries defending the entrance to the harbour, and a twenty-two-gun battery commanding the south side. These ramparts which are perforated by five gateways, are



Plan of Berwick-upon-Tweed.

generally in good repair, but since 1822 have been destitute of guns save for volunteer practice. The circuit is about 1 mile 3 furlongs; that of the older walls was more than 2 miles. The ruins of the latter, built by Edward I., and also surrounded by a ditch, enclose the suburbs of Castlegate, and the Greens,—the fishermen's quarter. The Bell Tower, from which alarms were given, and which is least dilapidated, has been recently secured from further decay. Between the extremity of these old walls and the Tweed are the remains of the old castle, which was allowed to become a ruin after the union of the crowns. There are no traces of the churches, monasteries, or other ancient buildings of the town. The barracks, built in 1719, accommodate nearly 600 men; but they are now occupied only by militia, and the governor's house has become a private dwelling.

The chief public buildings are the town-hall finished in



Arms of Berwick.

1760, a stately building, surmounted by a spire 150 feet high, which contains a peal of eight bells; the new jail, erected in 1849; the corn exchange, which is the principal public hall, opened in 1858; a new infirmary; two assembly rooms; Masonic and Good Templar halls. The parish church is a plain Gothic building, without steeple, of the time of Cromwell. It was thoroughly and tastefully renovated in 1855. The patronage belongs to the dean and chapter of Durham. A week-day lectureship is in the patronage of the Mercers' Company, London. There are also in the borough, including Tweedmouth and Spittal, three other churches connected with the Church of England, three with the Church of Scotland, four United Presbyterian, two English Presbyterian, two Methodist, one Baptist, and one Roman Catholic. The only church building worthy of notice is Wallace Green United Presbyterian Church, opened in 1859. New cemeteries were opened at Berwick in 1855, and at Tweedmouth in 1858. The town is well supplied with educational institutions; and a local museum was established in 1867, where lectures are delivered during the winter. The town and suburbs have four public reading-rooms, and three newspapers are published. Two bridges connect the town with the south side of the Tweed. The older, which is very substantial, was finished in 1634, having taken twenty-four years in building. It has fifteen arches, and is 924 feet long, but only 17 feet wide. The other, situated a quarter of a mile up the river, is a magnificent railway viaduct, 126 feet high, with twenty-eight arches, which extends from the railway station—a castellated building on part of the site of the old castle—to a considerable distance beyond the river. This bridge was opened by Queen Victoria in 1850.

The Tweed is navigable as far as the old bridge, and the tide flows seven miles further. The entrance to the harbour has been improved and protected by a stone pier, built about sixty years ago, which stretches half a mile S.E. from the north bank of the river's mouth, and has at the extremity a lighthouse with two fixed lights. The depth of water at the bar is 17 feet at ordinary tides, 22 feet at spring tides, but the channel is narrow, a large rocky portion of the harbour on the north side being dry at low water. A long-felt want is now being supplied by the construction of a dock, which was begun at Tweedmouth, September 1873. The number of vessels belonging to the port (1875) is 25 (tonnage, 1459). There entered in 1873, 422 (tonnage, 35,049), and there cleared 424 (tonnage, 35,252). The principal exports are grain, meal, herrings, burnt ore, metal castings, manures; the imports are bones and bone-ash, manure stuffs, linseed, salt, timber, pig-iron. The sea-fisheries employ 230 boats in white fishing, 294 in herring fishing, and 52 in both. Berwick, which has long been famous for its salmon fisheries, is the headquarters of the Fishing Company, which occupies most of the stations on the neighbouring coast and for some miles up the river. The fish are mostly sent to the London market. There is an annual fair held here in the end of May, and the weekly market on Saturday. There are four banking establishments; and, on the whole, the trade of the town is increasing.

The ancient charter of the borough of Berwick was confirmed by various sovereigns from Edward I. to James I., who added new officers and privileges, but especially gifted to the burgesses all the lands within the liberties which were not private property. These lands, amounting to 3077 acres, or two-thirds of the whole, are partly divided into farms, partly into meadows occupied or let by the resident freemen and freemen's widows. The annual value of a meadow, seniority determining the allocation, ranges at present from £11, 5s. to £2, 9s. 3d. The roll of freemen contains about 1000, of whom 368 are

resident. The total rental of the corporation's property is now about £10,800. Since the Municipal Reform Act, 1835, the borough has been governed by six aldermen and eighteen councillors; and in 1842 "the power of life and death" was removed from the Quarter Sessions to the Newcastle Assizes. The custom of specially mentioning Berwick-on-Tweed after Wales, though abandoned in Acts of Parliament, is still retained in certain proclamations. The title of "county in itself" also helps to recall its ancient history. It is the seat of a Poor Law Union, and the rateable value of the borough (1875) is £53,195. Berwick has sent two members to the English parliament since the reign of Mary. The registered electors number 1285, of whom 368 may vote as freemen, about 200 being doubly qualified. Population in 1871, 8731, or, including the conjoined townships (Tweedmouth, 2809, and Spittal, 1742), 13,282.

Of the origin or early history of Berwick nothing is known. It probably sprung into importance during the long struggle between the Scots and Saxons for the possession of Lothian and the Merse. Egfrid, king of Northumbria, seeking to extend his boundary beyond the Forth, was routed at Dunnichen, 685, and driven back to the Tweed. But it was not until the battle of Carham, 1018, that the latter river was finally secured as the boundary, and Berwick obtained the frontier position to which it owes its fame. It seems rapidly to have grown in size, wealth, and influence. Its name occurs as a royal burgh in the reign of Alexander I., along with Edinburgh, Roxburgh, and Stirling, and with them, from David I., it elected the tribunal which from their number was called the "Court of the Four Burghs." The castle of Berwick was one of the strongholds given up to Henry II. of England to be security for the homage due by William the Lion as the price of his liberty, but it was restored with the others by Richard Cœur-de-Lion in 1189. At Berwick took place several of the conferences held between Edward I. and the competitors for the Scottish crown, and his decision in favour of Baliol was given in the castle, Nov. 1292. Four years later Edward marched north to punish his rebellious vassal, and began his invasion by an attack upon the town which was at once the key of the kingdom and its commercial capital. The English king, familiar with the place, and infuriated by the repulse of his fleet in the river, led the land attack in person. Being very slightly fortified the town was speedily stormed, and no mercy was shown to the inhabitants. One memorable incident is recounted. A company of trading Flemings held out against the besiegers in their fortified building, the Red Hall, until it was set on fire. They were bound by their charter to defend it to the last extremity against the English, and they perished in the flames. Berwick never recovered commercially from the massacre and pillage of this terrible Good Friday. Its efforts again to rise were hindered by the ever-renewed Border warfare, and it gradually sunk to the rank of an ordinary market town.

On Edward's return from his victorious march through Scotland, he determined to make the town impregnable with stone walls, but before his commands could be accomplished it was recaptured by the Scots as a consequence of the English defeat at Stirling Bridge. On Edward's approach the following year, however, the Scots retired, and during the remainder of his reign it continued in the hands of the English. Here, in 1305, one quarter of Wallace's body was exposed, and shortly afterwards the countess of Buchan was suspended in a cage from one of the castle towers, as a punishment for courageously performing the privilege of her family by placing the crown on King Robert Bruce at Scone. Edward II. spent the winter of 1310 at Berwick after an ineffectual invasion of Scotland. Here, too, on June 11, 1314, the great English army assembled which was defeated a fortnight later at Bannockburn. In 1318 the town, now well fortified, was captured by Bruce, through the help of one of the garrison; a siege by Edward, which followed, rendered famous by the engines employed both in the river and land attacks, was not successful. It remained in the hands of the Scots till 1333, when it was besieged by Edward III., and the hope of relief by the Scottish army being disappointed by their defeat at Halidon Hill, about 2 miles from Berwick, the town and castle were immediately, according to agreement, delivered up to the English king. The next 130 years saw Berwick occasionally attacked by the Scots, and sometimes with success, but they held it only for short periods until 1461, when Henry VI., in gratitude for refuge after the battle of Towton, made it over to them. In 1482, during the disputes between James III. and his nobles, it surrendered to the English army, and was never retaken by the Scots. Henceforward it occupied in Scotland, in relation to England, the position for long of Calais in France—an important stronghold, the sole remnant of wide-spread conquest. This position

explains the possession by Berwick, until the union of the crowns, of a civil and military establishment (with lord-chancellor, lord-chamberlain, Domesday Book, governors of town and castle, &c.) resembling that of a small kingdom. It was that appointed by Edward I. for all Scotland, and was ready to expand, as it had been compelled to contract its sphere, should more territory be again acquired north of the Tweed.

BERWICKSHIRE, a maritime county of Scotland, forming its S.E. extremity, bounded N.E. by the German Ocean, N. by Haddington, W. by Midlothian, S.W. by Roxburgh, S. by the Tweed, which separates it from Northumberland, and S.E. by the liberties of the town of Berwick. Its greatest length from E. to W. is $31\frac{1}{2}$ miles; its greatest breadth $19\frac{1}{2}$; area about 464 square miles, or 297,161 acres. It is naturally divided into three districts, *Lauderdale*, or the valley of the Leader, in the W.; *Lammermuir*, the upland district occupied by the hills of that name, in the N.; and the *Merse* (probably a corruption of "March" or borderland), the largest district, occupying the S.E. of the county. The Lammermuirs are a range of round backed hills, whose average height is about 1000 feet, while the highest summit, Says Law, reaches 1753 feet. From these hills the Merse stretches to the S. and E., and is a comparatively level tract of country, traversed, however, from N.W. to S.E. by distinct parallel ridges. The coast line is lofty, rocky, and precipitous, broken by ravines, and not accessible, except at Eyemouth harbour, for small vessels, and at one or two other places for fishing-boats. St Abb's Head, a peninsular promontory with a lighthouse upon it, rises to nearly 300 feet. The Eye is the only river of the county which falls into the sea. The others—the Leader, the Eden, the Leet, and the Whiteadder with its tributaries, the Blackadder and the Dye—all flow into the Tweed. Of these the largest and most important is the Whiteadder, which has its source on the East-Lothian side of the Lammermuirs, and, following a sinuous course of 35 miles, falls into the Tweed within the "Bounds" of Berwick. The climate of Berwickshire is chiefly influenced by its maritime position. The winter is seldom severe in the lowland districts; but spring is generally a trying season on account of the east winds, which often continue into summer. Drainage has remedied the former excessive humidity, and the climate is now excellent, in relation both to the health of the inhabitants and to the growth of vegetation.

Berwickshire, geologically, consists of Silurian rocks in the hilly region, Devonian or Old Red Sandstone in the south-west, and carboniferous limestone in the Merse. Large masses of porphyritic and trap rock occasionally occur, of which St Abb's Head is an example. The sea-cliff to the north-west of the mouth of the Eye is formed of conglomerate or pudding-stone. There is an interesting and somewhat famous geological appearance at a point called Siccar, near Cockburnspath, where the sea has laid open very plainly the junction of the primary and secondary strata.

The soils of Berwickshire are extremely various. On the same farm a great diversity may be found. Along the rivers is a deep rich loam, resting on gravel or clay, chiefly the former. The less valuable clay soil of the Merse has been much improved by the effective system of drainage which is everywhere carried out. The more sandy and gravelly soils are suitable for the turnip crops, which are a marked agricultural feature of the county. To these soils the landlords and tenants of Berwickshire have applied themselves with such intelligence, mutual good-will, liberality, and spirit, that the county now stands in the first rank in regard to agriculture. The farms are large, and are commonly held by a nineteen years' lease. Nowhere is farming conducted more scientifically or with better success. According to the agricultural returns for 1874, the total acreage under all kinds of crops, bare fallow, and grass,

was 192,138, or more than three-fifths of the entire area. Of this, 63,526 acres were under corn crops, 34,155 under green crops, 56,940 under clover and grasses, and 36,858 permanent pasture, meadow, or grass not broken up in rotation (exclusive of heath or mountain land). The average extent of land occupied by each occupant was 194 acres. Wheat was grown on 6373 acres; barley or bere, on 21,469; oats, on 33,130; potatoes, on 2593; turnips and swedes, on 30,345. Of live stock there were 5356 horses, 16,979 cattle, 285,578 sheep, 4527 pigs. Though about the twentieth in size of the Scottish counties, Berwickshire stands fifth in the number of acres under corn crops, fifth also in green crops, and ninth in the number of sheep. The farm-buildings are convenient and well built. These include cottages for the farm-labourers, or *hinds*, and their families,—the ordinary staff consisting of a steward, a shepherd, and a number of ploughmen proportionate to the size of the farm. The farm-labourers, who are physically well developed, are as a whole a frugal, industrious, intelligent race. They are somewhat migratory in their habits, being too ready to move from place to place year after year. This feature in their character, which they may have by inheritance as *Borderers*, has admirably fitted them for colonial life, to which the lack of employment in mining or manufactures in the county has largely drawn the surplus population.

The minerals of Berwickshire are insignificant. Coal, copper ore, and ironstone exist in such small quantities that attempts to work them have been abandoned; and the limestone is at too great a distance from a coal district to warrant competition with the adjoining counties. The Tweedsalmon fisheries are productive of an important trade, and are so subject to vicissitudes that much attention has been paid to them by means of legislative enactments. The lesser rivers of the Merse are held in high esteem by anglers. Besides Eyemouth there are three villages—Burnmouth, Coldingham Shore, and Cove—engaged in the sea-fisheries, which are of considerable and increasing value. Cod, haddock, herring, ling, lobsters, and crabs are the principal produce. Berwickshire cannot boast of many manufactures. Earlstoun sends out gingham and woollen cloths. At Cumledge, also, on the Whiteadder, there is a factory for heavy woollen cloths; and four miles further down the river, at Chirnside Bridge, is one of the largest paper mills in Scotland. The other manufactures are all connected with agriculture, such as distilleries, breweries, tanneries, &c. The trade is also mainly agricultural. Fairs are held at Dunse, Lauder, Coldstream, Greenlaw, and Oldhamstocks; but the sales of cattle and sheep are now mostly accomplished at the weekly or fortnightly auction marts at Reston, Dunse, and Earlstoun. The grain markets are held at Dunse and Earlstoun. Berwick, from which the county derives its name, is still its chief market-town. There is, however, no legal or fiscal connection between the county and the borough.

The early history of Berwickshire is to a great extent bound up with that of the ancient frontier town; from its position it also suffered much during the Border wars. The most noteworthy antiquities are Coldingham Priory in the E. and Dryburgh Abbey in the S.W. They were burnt in the same year, 1545, during the barbarous incursion of the English army under the earl of Hereford. About four miles N. from Coldingham are the ruins of Fast Castle ("The Wolf's Crag" of the *Bride of Lammermoor*), situated on a peninsular cliff, 120 feet by 60, and 70 feet above the sea. A little further north is the Pease or Peaths Bridge, built by Telford, in 1786, over the deep glen which forms the celebrated pass—of old one of the strongest natural defences of Scotland. Near it is Cockburnspath Tower, once a strong fortress, now in ruins. In the west of Berwickshire, besides Dryburgh, there are, at Earlstoun, the remains of the ancient

tower "The Rhymer's Castle," the traditional residence of Thomas Learmont, commonly called "Thomas of Erceildoune or Thomas the Rhymer." About a mile from Earlstoun is Cowdenknowes, on a hill above which grew the "bonnie broom" of the old song. None of it now remains, it having been gradually encroached upon by the plough, and the last of it killed by the severe frost of 1861-62. Hume Castle, the ancient seat of the Home family, also towards the west, has a most commanding view, and is itself visible from nearly every part of the county. Traces of Roman occupation and of ancient British settlements exist in various parts of the Merse. Edin's or Etin's Hall, on Cockburn Law, about four miles north of Dunse, still goes under the name of the Pech's or Pict's House. There are many large mansions throughout the county, the principal being Thirlestane Castle (earl of Lauderdale), Mertoun House (Lord Polwarth), Mellerstain and Lennel House (earl of Haddington), Nesbit (Lord Sinclair), Dunse Castle (Hay), Wedderburn and Paxton (Milne Home), Lees (Sir John Marjoribanks), Ladykirk (Baroness Marjoribanks), Ayton Castle (Mitchell Innes), Hirsell (earl of Home). The chief towns are Greenlaw, the county town, with a population of 823; Dunse, 2618; Lauder, 1046, a royal burgh, which unites with the Haddington group of burghs in returning a member to parliament; Coldstream, 1724; and Eyemouth, 2324, the only seaport of the county. There is one sheriff for the three border counties of Berwick, Roxburgh, and Selkirk, and a sheriff-substitute holds his court in Dunse. Justice of the Peace courts are held at Coldstream and at Ayton, and a burgh court at Lauder. The county is divided into thirty-one parishes, and it returns one member to parliament. Population of Berwickshire, 36,486—males, 17,414; females, 19,072.

The fauna and flora of Berwickshire have been carefully described by the late Dr George Johnston, and further information may be obtained regarding these from the *Transactions of the Berwickshire Naturalists' Club*.

BERYL, a mineral species which includes, in addition to what are ordinarily known as beryls, the aquamarine or precious beryl and the emerald. The similarity between the beryl and the emerald was pointed out by Pliny, and the only points of distinction are the green colour of the emerald and the somewhat superior hardness of the beryl. The colour of the emerald is generally believed to be due to the presence of a minute portion of oxide of chromium, although M. Lewy asserts, from analysis of Muzo emeralds, that it is really owing to the presence of organic matter. Their composition is—

	Beryl.	Emerald.
Silica.....	67.00	68.50
Alumina.....	16.50	15.75
Glucina.....	14.50	12.50
Chromium oxide.....	0.00	0.30
Iron oxide.....	1.00	1.00
Lime.....	0.50	0.25

The metal glucinum, from its presence in the beryl, is sometimes termed beryllium. The beryl crystallizes in six-sided prisms with the crystals often deeply striated in a longitudinal direction; its hardness in the mineralogical scale is from 7.5 to 8, and its specific gravity from 2.67 to 2.732. Leaving out of account the emerald, the colours of the beryl range from blue through soft sea green to a pale honey yellow, and in some cases the stones are entirely colourless. The aquamarine is so named on account of its bluish green colour, "*qui viriditatem puri maris imitantur*" (Pliny, *N. H.*, xxxvii, 20). The chrysoberylus, chryso-prasus, and chrysolithus of ancient jewellery appear to some extent at least to have been names applied to different shades of beryl. The beryl was highly prized for use in jewellery by the Romans, by whom it was cut into six-sided prisms (*cylindri*) and mounted as ear-drops. Some of the

finest examples of ancient Greek and Roman gem engraving are found executed in beryl. "The grandest intaglio extant of the Roman period is upon an aquamarine of the extraordinary magnitude of $2\frac{1}{2}$ by $2\frac{1}{2}$ inches: the bust of Julia Titi signed by the artist ΕΥΘΑΟΣ ΕΠΟΙΕΙ. For nearly a thousand years it formed the knosp of a golden reliquary presented by Charlemagne to the abbey of St Denys, in which it was set with the convex back uppermost, being regarded as an invaluable emerald" (King's *Precious Stones, Gems, and Precious Metals*). The great abundance of aquamarine and other forms of beryl in modern times has very much depreciated its value for use in jewellery, but it is still set in bracelets, necklaces, &c., and used for seals. The finest aquamarine known is a large stone, in size and shape somewhat like a small calf's head, weighing 18 lb, the property of the emperor of Brazil. A beryl weighing 2900 lb and another of 1076 lb weight have been found at Grafton, New Hampshire, in the United States; but these gigantic stones are opaque, and of no value for jewellery. Beryl is found widely disseminated, occurring, among other localities, in Siberia, Canjargum in Hindustan, Rio San Matteo in Brazil, Ehrenfriedersdorf in Saxony, and Schlackenwald in Bohemia. In the United Kingdom it occurs in the Mourne Mountains, county Down; in the neighbourhood of Killiney, county Dublin; in county Wicklow; in several places in Cornwall; and in Aberdeenshire in the granite of Rubislaw (Davidsonite); besides occurring in the alluvium of the upper reaches of the Dee and Don. In the United States it is found in the states of New Hampshire, Maine, Massachusetts, Connecticut, and Pennsylvania.

BERZELIUS, JÖNS JAKOB, one of the most illustrious of modern chemists, was born on the 20th of August 1779, at a farm near Wälfersunda, in Östergötland, Sweden. At the age of nine he was left an orphan in the charge of his stepfather, A. Elmark of Ekeby, a learned and amiable man, gifted, too, it would seem, with some prophetic insight, for one day he said to the child, "Jakob, I think you will tread in the footsteps of Linnæus, or be another Cartouche!" From that day a desire for distinction as a man of science awoke in the child's breast. In 1793 Berzelius entered the gymnasium school at Linköping, where he made rapid progress. During his holidays, spent in the country, he met a man who instructed him in the elements of entomology, and thus gave a fresh impetus to his scientific proclivities. The latter soon developed into a passion, and under Hornstedt at Linköping progressed rapidly till he left the college in 1796, and proceeded to the University of Upsala. In 1798 he began to study chemistry under Professor Afzelius; and although in those days the lectures were without practical experiments and extremely uninteresting, he became more and more absorbed in the study. In 1800 he was called to Stockholm as assistant to the royal physician, Dr Hedin, and his success as a practical chemist began. The Italian, Volta, had in 1800 invented the galvanic battery which bears his name; and Berzelius was one of the first persons in Europe to observe the greatness of this discovery. In 1802 he published a treatise on the subject. In 1803 he became professor of physics, and by his lectures rapidly founded a new, a rational school of physiology, and threw new light on many difficult points connected with the chemical and physical characteristics of animal life. In the same year he published his *Essay on the Division of Solts through Galvanism*, in which he propounds the electro-chemical theory, the honour of first laying down which is divided between Berzelius and Davy. In conjunction with Hisinger, Berzelius then published in numbers *Treatises on Physics, Chemistry, and Mineralogy*, a work of the greatest value for science. Honour after

honour was heaped upon him; in 1810 he was called to be a member of the Medical College of Sweden; in 1808 he was elected president of the Academy of Sciences. Two years later he brought out his famous treatise *On the Fixed Proportions and Weights of Atoms*. He then took up mineralogy with special ardour, and published his *Treatise on the Blowpipe*, he set up for himself a regularly graduated chemical system of minerals, and the value of this was felt to be so great that the Royal Society of London voted him its gold medal for it. After incessant labour he retired, in 1832, from his professorship at Stockholm, having never been connected as teacher with any of the universities. In 1842, while he was engaged in a chemical experiment, an explosion took place and he was much injured, but recovered and continued to work on till the close of his days. He died August 7, 1848. After Linnæus, his is considered to be the greatest name in science of which Sweden can boast.

BES, the name of an Egyptian god, apparently the same as that of the city Bessa. He is stated to have been worshipped and to have had an oracle at Abydos according to Ammianus Marcellinus,¹ and according to others at Antinoe or Antinoopolis. The name *Bes* is found in Egyptian monuments attached to a god clad in a lion's skin, the head and skull of the animal covering his head and concealing his features; his legs are bowed like Ptah, and his whole appearance is grotesque, resembling in other respects the Greek Hercules. This god is represented at a later period in various attitudes and actions, in adoration to Harpocrates, styled his lord or master, playing on the tambourine, the triangular harp, and other musical instruments, brandishing swords, and at the Roman period armed in the paludamentum and holding a sword and buckler. Although supposed to be a form of Typhon he is quite distinct from Set, the ass or gryphon-headed god. For head attire Bes often wears a kind of cornice surmounted by four or five feathers of the hawk. He does not appear among the deities of Egypt till about the 19th or 20th dynasty, and is apparently of foreign origin, being found on the coins of Gaulos, with Phœnician legends, as if belonging to that people and a form of Baal. He appears in the *Ritual* as the guardian of the 20th Pylon or doorway of the Aahlu or Elysian fields, with his mystical names. His head generally surmounts the little cippi of Harpocrates, and some texts ally him with the god Amen. A temple in Nubia, built by Tirhakah about 690 B.C., has its columns in shape of this god. His figures and busts are common in Egyptian art of a later age, and individuals were called after him both in earlier and later times.²

BESANCON, a city of France, capital of the department of Doubs, 45 miles E. of Dijon, on the River Doubs, which flows round it on three sides. It is well protected by strong fortifications and a citadel on an almost impregnable rock, 410 feet above the river. The town is in general well built, and has three main streets running from N. to S. The principal buildings are the Gothic cathedral of St Jean, a court-house, a town-hall, the Granvelle palace, the royal college, an arsenal, a large hospital, barracks, a theatre, a library of 300,000 volumes, a museum and picture gallery, and several handsome fountains. Among the numerous Roman remains are a triumphal arch erected in honour of Crispus Cæsar, son of Constantine, a theatre, and an amphitheatre. Besançon is the see of an archbishop, has tribunals of primary jurisdiction and commerce, and is the head court for the departments of Doubs, Jura, and Haute Saône. It possesses also a university-academy, a diocesan seminary, a royal academy of science and

¹ *Ammian. Marcell.*, xix. 184; *Jablonski, Panth.*, v. c. 7; *Wilkinson, Manners and Customs*, vol. iv. p. 441.

² *Birch, Gallery of Antiquities*, p. 47.

belles lettres, a lyceum, an antiquarian museum, a society of agriculture, and schools of medicine, artillery, and design, besides two deaf and dumb institutions. The chief branch of industry is the manufacture of watches and jewellery. There are also some considerable breweries and manufactories of carpets, porcelain, hardware, Seltzer-water, artificial flowers, &c. Besançon enjoys a good position for the commerce between France and Switzerland. Population in 1872, 39,868. Long. 5° 56' 26" E., lat. 47° 14' 12" N.

Besançon is a place of great antiquity. Under the name of *Vesontio*, it was, in the time of Cæsar, the chief town of the Sequani. Under the Roman emperors it was rich and prosperous, and Aurelian especially had a great liking for the place. Many of the streets still bear the old Roman names. It was frequently destroyed and rebuilt during the Middle Ages, and the present city stands twenty feet above the original level. In the 12th century it passed with the rest of Franche-Comté to the German empire, and was made a free city by Frederick I. In 1584, Granville, the minister of Charles V. became archbishop of the see, and afterwards founded a university in the town, which existed till the Revolution. By the treaty of Westphalia, Besançon was made over to Spain, and many traces of Spanish occupation still remain. In 1660 Louis XIV. besieged it in person, and it was assigned to France by the peace of Nimègue. In 1814 and 1815 it was invested and bombarded by the allies; and in the war of 1870-71 it formed an important position in the movements of the French army.

BESKOW, BERNHARD VON, Baron, the Swedish dramatist, was born at Stockholm, April 19, 1796. Beskow's first book, *Poetical Efforts*, published in 1818, made a favourable impression with the public, and he wrote the prize poem for the Swedish Academy some years later. His dramas, however, are his chief claim to remembrance; the best are *Torkel Knutsson*, *Erik XIV.*, *Birger* and *his Race*, and *Gustavus Adolphus in Germany*. *Torkel Knutsson* is considered the finest drama that Swedish literature possesses. In the highest sense of the word, these are not, however, dramas at all, since they lack unity and fail in the development of character, but they are grandiose historical studies in a dramatic form. Beskow's poetry is over-decorated with phrases, and becomes the prey of sonorous antithesis. Besides lyrical and dramatic poetry, Baron von Beskow distinguished himself in history, philosophy, politics, and travels. In 1823 he was elected president of the Swedish Academy, and became an enthusiastic and liberal patron of national poetry and art. Cehlenschläger translated his dramas into Danish, and various persons rendered them into German. He died on the 17th of October 1868.

BESSARABIA, a government in the S.W. of European Russia, on the borders of Austria and the Danubian principalities, with an area, since the cessions of the Paris peace in 1856, of 14,577 English square miles. Till the last Eastern war Bessarabia occupied the whole space between the Dniester and the Pruth from the Austrian frontier to the Black Sea. The northern portion of Bessarabia is mountainous, the southern flat and low,—the limit between the two being marked by the so-called upper Trajan wall, an artificial elevation executed, according to some, in the end of the 2d century A.D., under Trajan, but, according to others, in the 3d century, under Probus. This wall extends from the confluence of the Botna with the Dniester to the Pruth. In northern or mountainous Bessarabia two systems of elevations may be distinguished. The first is an immediate offshoot of the Carpathians, and occupies the whole of Khoteen, or the north-western district of the government. It rises about 450 feet above the valley of the Dniester, and consists of strata of Palæozoic formation, sandstones, schists, and limestones. The second system is especially extended in the very middle of Bessarabia, and may be called the Yassa-Orgievan range. It consists of limestone of secondary formation, and its highest point is Mount Megura, about 20 miles S. of Bielitz, between Bakhmut and Poltava. The low portion of Bessarabia stretches south from the Trajan wall, with a length of 133

miles and a breadth of 33, and is well known as the Budjak steppes. The surface is perfectly level; and the soil, except in the region along the shore, consists of a thick bed of loam. The province is washed on its eastern parts by the Black Sea only for the distance of 20 miles to the south of the estuary of the Dniester. Its only seaport is that of Akerman, situated on the estuary of the Dniester. This river divides Bessarabia from Kherson and Podolia for a distance of almost 600 miles. The shores of the Dniester are in general high and steep, and numerous bars obstruct its channel, particularly at Yampol and Bakat. On the Bessarabian bank are situated the towns Khoteen, Cosoka, and Bender; and thirteen natural harbours for ships are counted along this side of the river. Among the principal tributaries are the Reuth, the Ikel, the Buik, and Botna. Another important stream is the Pruth, of which the left shore skirts the province for a distance of more than 140 miles. The navigation on the Pruth is not important; its course is impeded by bars and falls. The only important lakes in the government lie along the coast of the Black Sea in the Akerman district. Marshes extend along the Reuth and its tributaries, and there are also some along the Botna; they offer no great obstacles, however, to free communication. Bessarabia up to 1856 possessed great quantities of sedimental salt; but after the cessions of the Black Sea coast and the salt lakes, the quantity obtained, which formerly exceeded 60,000 tons, almost came to nothing. The climate of Bessarabia is temperate. The medium annual temperature of Keesheneff, 230 feet above the sea-level, is 50° Fahr.; the temperature of the warmest month, about 73°; of the coldest, about 20°. In the valley of the Dniester the climate is in general much healthier than in that of the Pruth; the climate of the north-west is much colder, and spring commences there ten days later.

In all the upper part there are forests, consisting principally of beech, oak, and sorb, besides small quantities of birch. The chief forest region lies along the heights of the Orgieff and Yassa districts about the Megura Mountains, and extends thence east to the Dniester and south-west to Keesheneff. The Khoteen hills are almost all covered with timber. The three northern districts, Khoteen, Bielitz, and Soroka, are especially suited for agriculture, and may be regarded as the granary of Bessarabia. The two intermediate districts of Orgieff and Keesheneff, though possessing a sufficiently fertile soil, are pre-eminently woodland; while the two southern, Bender and Akerman, although also fertile, have a steppe-like character, and are better adapted to the rearing of cattle.

Bessarabia, in keeping with its position near the Danube, played an important historic part in ancient times, especially in the beginning of our era, when it served as a key to the eastern approaches of the Byzantine empire. And thus, from immemorial times, nations were ceaselessly alternating with nations within its borders. The original inhabitants were the Cymri, succeeded by the Scythians. Herodotus, who had been in the Greek colonies of the Black Sea, relates that near the mouth of the Dniester (Tyra) there lived the Tyritians, possessing on the estuary of that river the town of Tyra (Oxia or, according to Pliny, Ophiusa). In the 2d century after Christ Bessarabia was occupied by the Geti and offshoots from the Bastroni, and in 106 A.D. the Geti were conquered by Trajan. After this subjugation of the land by the Romans, the present Bessarabia went along with Walachia, Moldavia, and Transylvania, to compose Dacia. In the 3d century appeared the Goths, recently converted to Christianity. In the 5th century Bessarabia was overrun by the Huns; after the Huns, in the end of the 5th century, arrived the Avars; after the Bulgarians; and last of all came the Slavonians (Lutichi and Tevertzi), who built themselves the town of Bieligorod. In the 7th century appeared the race of the Bessi from whom the country acquired its present name. In the 9th century arrived the Ugrians; in the 10th the Pechenegs; in the 11th the Kumans, the Uses, and the Polovtzi; and in the 13th the Mongolians, under the leadership of Batia. In this last century, also, the Genoese founded their colonies on the shores of the Dniester. In 1367 Bessarabia formed a part of Moldavia. In 1503 the south