

end being open for charging, and the lower stopped, with the exception of a small hole for the passage of the separated metal, which is received in a cast-iron pot placed in front and heated with charcoal. The charge, about half a cwt. of ore, broken into pieces about half inch cube, occupies about half of the length and rather more than half the area of each tube. When all the tubes are charged the upper ends are stopped by sheet-iron doors, and heat is applied by means of a wood fire upon the grate. The liquid metal soon commences to flow, and is received in the pots in front. If the flow ceases through any obstruction the passage is cleared by an iron rod introduced through the aperture at the lower end. When the operation, which usually lasts about an hour, has terminated, the residues in the tubes are removed and thrown into a water trough placed behind the furnace on the charging side, and a fresh supply of ore is introduced. The bismuth collected in the pots is ladled out and cast into ingots of from 25 to 50 lb weight. In a furnace containing 11 tubes about 20 cwt. of ore may be heated daily with a consumption of 63 cubic feet of wood. In Plattner's modification the furnace is of the reverberatory form, the tubes being placed with their inclined axes in the direction of the flame, an arrangement which allows the use of a smaller fire-grate and a proportionate saving of fuel. At Joachimsthal, ores containing from 10 to 30 per cent. of bismuth are heated in a finely-ground state with scrap-iron, carbonate of soda, and a little lime and fluor-spar in earthen crucibles, which are heated until the mixture is completely fused, when the contents are poured into iron moulds of a sugar-loaf form. The bismuth collects in the point of the mould, and is covered with a cake of speiss, containing all the nickel and cobalt of the ore with about 2 per cent. of bismuth, which is reserved for further treatment; the slag filling the upper part of the mould is thrown away. If the bismuth is sufficiently rich in silver it is cupelled, and the oxide formed is subsequently reduced or revived by fusion with carbon. When argentiferous lead containing bismuth is subjected to cupellation the former metal is oxidized more rapidly than the latter, which accumulates to such an extent that it may often form a notable proportion of the litharge produced towards the end of the process, although not existing in sufficient amount to be appreciable by the ordinary processes of analysis in the original lead. This property has recently been utilized to recover a small quantity of bismuth existing in the silver ores smelted at Freiberg. The last portion of the litharge, and the hearth or test bottom from the silver refining furnace, are heated in quantities of 80 or 100 lb in earthenware pots with hydrochloric acid until complete solution of the bismuth oxide takes place, the proportion of acid and water being regulated to prevent the formation of insoluble salts. When the liquid is clear it is siphoned off to the precipitating tub, where it is thrown down as an insoluble oxychloride by the addition of a large quantity of water. By redissolving and reprecipitating, a purer material is obtained, which is then dried and reduced by fusion in iron crucibles with carbonate of soda and charcoal. The production of bismuth annually in Saxony is about 22 tons, and in Austria about 17 cwt.

The principal properties and reactions of bismuth and its compounds were described in 1739 by Pott, who gave a summary of the information contained in the earlier writers. Our more exact knowledge of the subject is due to Neumann, Hellot, Geoffroy (1753), John Davy (1812), Lagerhjelm (1815), Stromeyer, and, more recently, Schneider and Nickles. (H. B.)

BISON, a genus of Ruminant Mammals belonging to the family *Bovidae*, and comprising two widely separated species—the European and American Bisons. They are distinguished from other bovine animals by the greater breadth and convexity of their foreheads, superior length of limb, and the longer spinal processes of the dorsal vertebrae, which, with the powerful muscles attached for the support of the massive head, form a protuberance or hump on the shoulders. The bisons have also fourteen pairs of ribs, while the common ox has only thirteen. The forehead and neck of both species are covered with long, shaggy hair of a dark brown colour; and in winter the whole of the neck, shoulders, and hump are similarly clothed, so as to form a "curly felted mane." This mane in the European species disappears in summer; but in the American Bison it is to a considerable extent persistent. The European Bison (*Bison bonassus*), or Aurochs of the Germans, is the largest of existing European quadrupeds, measuring about 10 feet long, exclusive of the tail, and standing nearly 6 feet high. Formerly it was abundant throughout Europe, as is proved by its fossil remains found on the Continent and in England, associated with those of the extinct mammoth and rhinoceros. These

remains, while indicating larger proportions in the ancient aurochs than in those now living, do not, in Professor Owen's opinion, exhibit any satisfactory specific distinction. Caesar mentions the aurochs as abounding, along with the now extinct *Bos primigenius*, in the forests of Germany and Belgium, where it appears to have been occasionally captured, and afterwards exhibited alive in the Roman amphitheatres. At that period, and long after, it seems to have been common throughout Central Europe, the Caucasus, and the Carpathian Mountains. It is now only found in one of the forests of Lithuania, where it is saved from immediate extinction by the protection of the emperor of Russia, but notwithstanding this it is gradually dying out. Many years ago the Lithuanian bisons numbered over 1000, but by the year 1872 they had diminished to 528, and all attempts to domesticate them have failed. The aurochs feeds on grass and the bark of young trees. The American Bison (*Bison americanus*) has its home on the eastern slopes of the Rocky Mountains, being seldom found to the west of these, and rarely to the east of the Appalachian range. Northwards it extends to lat. 63°, and southward as far as New Mexico. Those bisons or buffaloes, as the settlers call them, roam in enormous herds over the western prairies in quest of fresh pastures, being specially fond of the tender grass that springs up after a prairie fire. The two sexes live in separate herds during the greater part of the year, although one or two aged bulls, it is said, always accompany the females. During the rutting season when the sexes come together, the bulls engage in fierce fights among themselves, and at such seasons it is highly dangerous to approach them. At other times they are shy, and retreat before man; but when wounded they become furious, and then all the dexterity of the practised hunter is needed to make good his retreat. The Indians capture them in various ways; by hunting on horseback, and shooting them with bows and arrows, or with fire-arms; by snaring them within immense enclosures of snow, which the bisons are unable to overleap; or by attracting the herd towards a precipice, and then setting it in motion from behind, so that those in front are pushed irresistibly forward and over. The American Bison, though still found in considerable numbers, is rapidly diminishing before the advance of the white settler; and should man in the meantime not succeed in domesticating it, it will probably ere long share the fate which threatens its European congener. To the Indian the bison has hitherto been indispensable as an article of food, and for the many useful purposes to which its horns, skin, and hair are applied. Its hide forms an excellent fur wrapper; its great value in this respect was proved during the Crimean war.

BITHYNIA (*Bithynia*), a province in the N.W. of Asia Minor, adjoining the Propontis, the Thracian Bosphorus, and the Euxine. According to Strabo it was bounded on the east by the River Sangarius; but the more commonly received division extended it as far as the Parthenius, which separated it from Paphlagonia, thus comprising the district on the sea-coast between these two rivers, which was inhabited by the Mariandyni. Towards the west and south-west it was limited by the River Rhyndacus, which separated it from Mysia; and on the south it adjoined the portion of Phrygia called Phrygia Epictetus, and a part of Galatia. The territory thus defined is in great part occupied by mountains and forests, but has valleys and districts near the sea-coast of great fertility. The most important of the mountain ranges is that known as the Mysian Olympus—from its proximity to that province, though properly included within the limits of Bithynia—which rises to a height of about 6400 feet. It towers in a commanding manner above the city of Broussa, while it forms a conspicuous object as seen from Constantinople, at

a distance of 70 miles. Its summits are covered with snow for a great part of the year. Eastward of this the range now called Ala-Dagh extends for above 100 miles from the River Sangarius to the confines of Paphlagonia. It adjoins throughout its course the frontiers of Phrygia and Galatia, and rises to a height of from 6000 to 7000 feet. Both of these ranges belong to that border of mountains which bounds the great table-land of Asia Minor through a great part of its extent. The country between them and the sea-coast is for the most part occupied by subordinate mountain chains, which may be regarded as underfalls or offshoots of the more lofty mountain ranges of the interior. These constitute a very rugged and broken country, covered with extensive forests, and traversed by very few lines of route, so that it is still very imperfectly known. But the broad tract which projects towards the west as far as the shores of the Bosphorus, though hilly and covered with forests, so as to be termed by the Turks Aghatch Denizi, or "The Ocean of Trees," is not traversed by anything like a mountain chain.

The western coast of Bithynia, where it adjoins the Propontis or Sea of Marmora, is indented by two deep gulfs or inlets—the northernmost, now called the Gulf of Ismid, anciently known as the Gulf of Astacus, penetrating to a distance of between 40 and 50 miles into the interior, as far as the town of Ismid, the ancient Nicomedia, which is separated by an isthmus of only about 25 miles from the Black Sea. The next, known in ancient times as the Gulf of Cius, now called the Gulf of Moudania or Gemlik, extends to about 25 miles. At its extremity is situated the small town of Gemlik, on the site of the ancient Cius, at the mouth of a valley, through which it communicated with the inland lake of Isnik, on which was situated the flourishing city of Nicæa.

According to the general testimony of ancient authors (Herodotus, Xenophon, Strabo, &c.), the Bithynians were a tribe of Thracian origin who had migrated into Asia by crossing the Bosphorus. The existence of a tribe called Thyni in Thrace is well attested, and the two cognate tribes of the Thyni and Bithyni appear to have settled simultaneously in the adjoining parts of Asia, where they expelled or subdued the previously existing races of the Mysians, Caucones, and other petty tribes, the Mariandyni alone maintaining themselves in the north-eastern part of the country. Herodotus mentions the two tribes, the Thyni and Bithyni, as existing side by side; but ultimately the latter people must have become the more important, so as to give name to the whole country. They were first subdued by Croesus, and incorporated with the Lydian monarchy, together with which they soon after fell under the dominion of Persia (546 B.C.) During the Persian empire they were included in the satrapy of Phrygia, which comprised all the countries up to the Hellespont and Bosphorus. But even before the conquest by Alexander some obscure native chiefs appear to have asserted their independence in the mountains of Bithynia, and successfully maintained it under two native princes named Bas and Zipetes, the last of whom transmitted his power to his son Nicomedes I., who was the first to assume the title of king. He became the founder of the city of Nicomedia, which soon rose to great prosperity and opulence; and during his long reign (278–250 B.C.), as well as those of his successors, Prusias I., Prusias II., and Nicomedes II. (149–91 B.C.), the kingdom of Bithynia held a considerable place among the minor monarchies of Asia. But the last king, Nicomedes III., was unable to maintain himself against the increasing power of his neighbour Mithridates, king of Pontus; and although restored to his throne by the interposition of the Roman Senate, at his death, in 74 B.C., he bequeathed his kingdom by will to the

Romans. Bithynia was now reduced into the form of a Roman province; but its limits were frequently varied, and it was commonly united for administrative purposes with the neighbouring province of Pontus, extending along the southern shore of the Black Sea as far as Trapezus or Trebizond. This was the state of things in the time of Trajan, when the younger Pliny was appointed governor of the combined provinces (103–105 A.D.), a circumstance to which we are indebted for much valuable information concerning the Roman provincial administration. Under the Byzantine empire Bithynia was again divided into two provinces, separated by the River Sangarius, to the westernmost of which the name of Bithynia was restricted.

The most important cities of Bithynia in ancient times were Nicomedia and Nicæa, which disputed with one another the rank of its capital. Both of these were founded after the time of Alexander the Great; but at a much earlier period the Greeks had established on the coast the colonies of Cius (afterwards named Prusias), on the site of the modern Gemlik; Chalcedon, at the entrance of the Bosphorus, nearly opposite Constantinople; and Heraclea, surnamed Pontica, on the coast of the Euxine, about 120 miles east of the Bosphorus. All these rose to be flourishing and important places of trade. Prusa, at the foot of Mount Olympus, which was founded by Prusias, was also a considerable town under the Roman empire, but did not attain in ancient times to anything like the importance enjoyed by the modern city of Broussa, which became the capital of the Ottoman Turks before the conquest of Constantinople, and is still (after Smyrna) the second city of Asia Minor. The only other places of importance at the present day are Ismid (Nicomedia) and Scutari, which, from its position on the Bosphorus, may be considered as a mere suburb of Constantinople.

The natural resources of Bithynia are still very imperfectly developed. Its mountains are covered with vast forests, which would furnish an almost inexhaustible supply of timber, if rendered accessible by roads. Coal also is known to exist in the neighbourhood of Erekli (Heraclea), but is not worked to any extent. The valleys which open towards the Black Sea abound in fruit trees of all kinds, while the valley of the Sangarius and the plains near Broussa and Isnik (Nicæa) are fertile and well cultivated. Extensive plantations of mulberry trees supply the silk for which Broussa has long been celebrated, and which is manufactured there on a large scale.

The principal rivers of Bithynia are the Sangarius, still called the Sakaria, which traverses the province from S. to N.; the Rhyndacus, which forms the boundary that separated it from Mysia; the Billæus (Filyas), which rises in the chain of the Ala-Dagh, about 150 miles from the sea, and after flowing by the town of Boli (the ancient Claudiopolis) falls into the Euxine, close to the ruins of the ancient Tium, about 40 miles N.E. of Heraclea. It has a course of more than 100 miles. The Parthenius (now called the Bartan), which forms the boundary of the province towards the E., is a much less considerable stream. (E. H. B.)

BITONTO, a city and bishop's see, in the province of Bari, in South Italy, on the great road from Foggia to Bari, about 12 miles from the latter town. Its cathedral, dedicated to St Valentine, is a fine building in the Italo-Gothic style; and it possesses a theological seminary, a large orphan asylum, and a hospital. The inhabitants maintain an active trade, and have extensive manufactures of olive oil. Their principal export is an excellent wine known as Zagarella. Bitonto, or Butuntum, seems from its coins to have been a place of some importance at an early period, but it makes no appearance in ancient history. In the Middle Ages its *Accademia degl' Infiammati* obtained,

considerable fame. In 1735 it was the scene of a severe battle, in which the Austrians were defeated by the Spaniards under Mortemar, in whose honour Philip V. caused a pyramid to be erected on the spot. Population in 1871, 24,978.

BITSCH (French, *BITCHE*), formerly **KALTENHAUSEN**, a town and fortress in German Lorraine, on the River Horn, at the foot of the northern slope of the Vosges, between Hagenau and Saargemund. It was originally a countship in the possession of the counts of Alsace and Flanders, but was bestowed by Frederick III. on the dukes of Lorraine, and at length passed with that duchy to France in 1738. After that date it rapidly increased, and its citadel, which had been constructed by Vauban on the site of the ducal palace, was restored and strengthened. The attack upon it by the Prussians in 1793 was repulsed, and although the Bavarians occupied the town in 1815 and 1818, they did not get possession of the fort. In the war of 1870 it was blockaded by the Germans in vain, and only surrendered in 1871, after the campaign was over. A large part of the fortification is excavated in the red-sandstone rock, and rendered bomb-proof; while a supply of water is secured to the garrison by the possession of a deep well in the interior. The inhabitants of the town, who in 1871 numbered 3047, manufacture watch-glasses and matches, and carry on a trade in grain, cattle, wood, and peats.

BITTERN, a genus of Wading Birds, belonging to the family *Ardeidae*, comprising several species closely allied to the Herons, from which they differ chiefly in their shorter neck, the back of which is covered with down, and the front with long feathers, which can be raised at pleasure. They are solitary birds, frequenting countries possessing extensive swamps and marshy grounds, remaining at rest by day, concealed among the reeds and rushes of their haunts, and seeking their food, which consists of fish, reptiles, insects, and small quadrupeds, in the twilight. The Common Bittern (*Botaurus stellaris*) is nearly as large as the heron, and is widely distributed over the eastern hemisphere. Formerly it was common in Britain, but the extensive drainage of late years has greatly diminished its numbers, and it is now a permanent resident only in the fen districts of England. The bittern in the days of falconry was strictly preserved, and afforded excellent sport. It sits crouching on the ground during the day, with its bill pointing in the air, a position from which it is not easily roused, and even when it takes wing, its flight is neither swift nor long sustained. When wounded it requires to be approached with caution, as it will then attack either man or dog with its long sharp bill and its acute claws. It builds a rude nest among the reeds and flags, out of the materials which surround it, and the female lays four or five eggs of a uniform dusky brown. During the breeding season it utters a booming noise, from which it probably derives its generic name, *Botaurus*, and which has made it in many places an object of superstitious dread. Its plumage for the most part is of a pale buff colour, rayed and speckled with black and reddish brown. The American Bittern (*Botaurus lentiginosus*) is somewhat smaller than the European species, and is found throughout the central and southern portions of North America, where it forms an article of food. It also occurs in Britain as an occasional straggler.

BITTERS, an aromatized alcoholic beverage, so named originally in the United States, where it was first used on account of its flavour and tonic influence. The drink by itself, or as an addition to unflavoured spirits, is used with considerable frequency in Europe, and especially in France it has come to be favourably regarded as a substitute for the insidious and deleterious absinthe. In the

year 1867 the daily consumption of bitters in Paris alone had reached 4000 litres. The preparation of bitters in Europe was at first a *specialité* of the Dutch, and Dutch bitters are the staple used in Great Britain. A considerable variety of recipes are in use for the preparation of Dutch bitters, but generally gentian root is the leading bitter ingredient in the beverages. The following is given as the composition of brandy bitters:—Gentian root, 4 oz.; orange peel, 5 oz.; cassia bark, 2 oz.; cardamoms, 1 oz.; and proof spirits, 1 gallon, coloured with $\frac{1}{4}$ oz. of cochineal. Bitters prepared in the great French cities—Bordeaux, Rouen, Havre, Paris, &c.—contain extracts of gentian root, bitter orange peel, and orange flowers, with a proportion of sugar, and possess an alcoholic strength of about 40°.

BITUMEN. See **ASPHALT**, vol. ii. p. 715.

BIZERTA, or **BENZERT**, a seaport of North Africa, in Tunis, 38 miles from the capital, on a gulf or salt lake of the same name, which communicates with a shallow fresh water lake in the interior, formerly called Sisara, and now the lake of Gebel Ishkel. It occupies the site of the ancient Tyrian colony Hippo Zaritus, the harbour of which, by means of a spacious pier, protecting it from the north-east wind, was rendered one of the safest and finest on this coast. This important work, however, having been neglected by the Turks, the port has been to a great extent choked up. It is still visited by small vessels, and a certain amount of trade is carried on. The exports in 1869 were valued at £19,759. The town is about a mile in circuit; it is defended by several forts. The principal employment of the inhabitants is fishing. The adjoining lake abounds in fish, particularly mullets, the roes of which, dried and formed into the substance called botargo, form a considerable article of Mediterranean commerce. N. lat. 37° 17', E. long. 9° 50'. Population, 8000.

BLACK, DR JOSEPH, a celebrated chemist, was born, in 1728, at Bordeaux, where his father—a native of Belfast, but of Scottish descent—was engaged in the wine trade. He was educated from his twelfth to his eighteenth year at a grammar school in Belfast, whence he removed, in 1746, to the university of Glasgow. There he chose medicine as his profession, and devoted himself earnestly to physical science, being encouraged and guided by Dr Cullen, who then lectured on chemistry in Glasgow, and whose liberal and original views were in unison with Black's own aspirations. From assisting in Cullen's chemical experiments he acquired the delicate manipulative skill essential to success in original scientific research.

In 1751 he went to complete his medical studies at Edinburgh, and after taking his medical degree there in 1754 revealed himself as a great scientific discoverer. At that time the causticity of the alkalies was attributed to their absorbing an imaginary fire-essence known as phlogiston, an hypothesis which Black overthrew by showing that their causticity depended on their combining with a ponderable gas, carbonic acid, which he named *fixed air*, meaning that it was found not only as a separate fluid, but as *fixed* in solid bodies. This discovery, made by Black in his twenty-fourth year, was first sketched in a treatise, *De Acido e Cibus orto, et de Magnesia*, and afterwards embodied in his work, *Experiments on Magnesia, Quicklime, and other Alkaline Substances*, which Lord Brougham has declared to be "incontestably the most beautiful example of strict inductive investigation since the *Optics* of Sir Isaac Newton."

These works revolutionized chemistry. Previous investigators imagined that atmospheric air was the sole permanently aeriform element, a belief to which even Hales, who had shown that solids contain elastic fluids, had adhered. But when Black proved that a gas not identical with atmospheric air was found in alkalies, it was made plain

that various dissimilar gases might exist, and pneumatic chemistry was founded.

Although the full value of this discovery was not immediately visible, it added so greatly to Black's reputation that in 1756 he was chosen to succeed Dr Cullen as lecturer on chemistry in Glasgow University. He was also appointed to the chair of anatomy, but, not finding its duties congenial, exchanged it for the professorship of medicine. For some time he was so assiduous in preparing his lectures as to neglect fresh investigations, and even left the examination of carbonic acid, or *fixed air*, to be afterwards completed by Cavendish. He was highly esteemed as a professor by his students and colleagues, and became, through his attention and urbanity, a very popular physician in Glasgow. From 1759 to 1763 he prosecuted inquiries resulting in his theory of *latent heat*, which may be thus summarized—A solid liquefies or a fluid vaporizes through heat uniting with the solid or fluid body, and a fluid solidifies or a gas liquefies through the loss of heat; but in no case is this increase or diminution of heat detected by the senses or the thermometer. Black therefore named that heat *latent* which alters the condition, not the temperature, of a body. He likewise proved that bodies of equal masses require different increments of heat to raise them to the same sensible temperature—a doctrine now known as the law of *specific heat*.

His theory of latent heat he corroborated by numerous experiments, but he never published a detailed account of it, an omission which enabled others to lay claim to his great discovery. Thus M. Deluc, in 1788, declared himself its author. In 1766 Black was elected to succeed Cullen in the chair of chemistry at Edinburgh University. In this office he bestowed great care on his lectures, striving to give a lucid exposition of ascertained facts rather than to effect new discoveries; and such an interest did he communicate to his subject, that chemistry was for a time, it is said, regarded as a fashionable accomplishment in the Scottish capital.

He was intimate with the great men who adorned Edinburgh society during the second half of the eighteenth century, counting among his friends Watt, Hume, Robertson, Hutton, Adam Smith, and, at a later period, Robison, Playfair, and Dugald Stewart. His constitution had always been feeble, and he was ultimately reduced to the condition of a valetudinarian, which may account for the indifference he manifested during his latter years to original research. He retired from his professorship in 1796, and on the 26th November 1799 passed away so quietly that a cup of water, which he had held in his hand, remained unspilled after he had breathed his last. At the instance of Lavoisier he had been elected a member of the Paris Academy of Sciences.

Black was singularly modest, gentle, and sincere; his philosophic tranquillity was seldom ruffled; and his sagacious diffidence was equally conspicuous in his scientific inquiries and in his social relations. He has been called the founder of modern chemistry. When he began his career that branch of knowledge had only recently been raised to the rank of a true science through the efforts of Hermann Boerhaave, and was in many quarters even regarded with suspicion as being akin to alchemy on the one hand, and to humble trades on the other. But after Black's discoveries its scope and capabilities were immensely extended, and no one could then question its claim to rank with the most important sciences. The only works of his which appeared in print during his lifetime were *Experiments on Magnesia, &c.*, *Observations on the more ready Freezing of Water that has been boiled*, and *Analysis of the Waters of some Boiling Springs in Iceland*.

His lectures on chemistry were issued after his death. (*Cf.* Prof. Robison's *Life of Black*.)

BLACK FOREST (German, **SCHWARZWALD**), an extensive upland district on the right bank of the upper Rhine, stretching from that river to the Neckar and upper Danube. See **BADEN** and **WÜRTEMBERG**.

BLACK SEA, or **EUXINE**, the *Pontus Euxinus* of the ancients, is a large inland sea, bounded on the W. by the Turkish provinces of Rumilia, Bulgaria, and Moldavia; on the N. by South Russia, including Bessarabia, Kherson, and Taurida; on the E. by the Russian provinces of Circassia and Transcaucasia; and on the S. by the Turkish provinces of Asia Minor. It is entered from the Mediterranean through the channel of the Dardanelles or *Hellespontus*, the Sea of Marmora or *Propontis*, and the channel of Constantinople or *Thracian Bosphorus*; and it is connected with the Sea of Azoff, or *Palus Mæotis*, by the strait between the Crimea and the isle of Taman, anciently the *Cimmerian Bosphorus*, and known by the various modern names of the Strait of Kertch, of Yenikale, and of Taman.

The first navigators of Greece who ventured into this sea having been repulsed or massacred by some of the fierce tribes inhabiting its coasts, their countrymen gave it the name of *Pontus Axenos*, or "sea unfriendly to strangers." But when the repeated visits of the Greeks had rendered these tribes more familiar with strangers, and commercial intercourse had softened down the original ferocity of their character, Grecian colonies were established at different points on the shores of this sea, and the epithet *Axenos* was changed into *Euxinus*, which has the opposite import, and means "friendly to strangers." The modern name seems to have been given to it by the Turks, who, being accustomed to the navigation of the *Ægean*, the islands of which furnish numerous harbours of refuge, were appalled by the dangers of a far wider expanse of water without any shelter, subject to sudden and violent storms, and often covered with dense fogs.

The basin of the Black Sea is of an irregular ovate form, its long diameter lying nearly E. and W. Its greatest length, from the head of the Bay of Burghaz in Rumilia on the west to the boundary between Transcaucasia and Asiatic Turkey near Batum on the east, is about 720 miles. Its greatest breadth is in its western portion, between the estuary of the Dnieper on the north and the mouth of the Sakaria on the south, where it is 380 miles; its middle portion is narrowed, by the projection of the Crimean peninsula on the north and of the coast line of Anatolia between Cape Kerempe and Sinope on the south, to 160 miles; but further east it widens out again between the Strait of Kertch on the north and the mouth of the Kizil Irmak (the ancient *Halys*) on the south, to 260 miles. Its total area, including the Sea of Azoff, is about 172,500 square miles. The western coast line of the Black Sea, for some distance northwards from the Bosphorus, is high and rocky, having ranges of hills at its back; and the water rapidly deepens to from 30 to 40 fathoms. Between their northern extremity and the range of the Balkans (the ancient *Hæmus*), which extends east and west, terminating in Cape Emineh, there is a large bay, named after the town of Burghaz at the head of it, which affords a safe anchorage for large ships, the only one on this coast. Between Cape Emineh and Varna the coast line is again low and the shore shallow; and the same condition extends, with but little interruption, along the low-lying region called the Dobrudscha, which extends to the mouth of the Danube. This great river discharges itself by seven mouths, among swampy islands and shifting banks; and the quantity of *detritus* brought down by it is so large as not only to form a very extensive bar, but also to require the con-