

Bridgeport and New Haven), with a factory product valued at \$32,367,359 (6 7% more than in 1900). The most important manufactures are rolled brass and copper (value in 1905 \$12,599,736, or 24 3% of the total for the United States), brass-ware (value in 1905, \$7,387,228, or 42 2% of the total for the United States), clocks and watches—over a million watches are made here each year—and stamped ware (value in 1905, \$1,037,666). The manufacture of brass ware originated here in 1802 with the making of brass buttons, iron buttons covered with silver were first made here about 1760, block tin and pewter buttons about 1800, bone and ivory buttons about 1812, sheet brass in 1830, and pins and plated metals for daguerreotypes in 1842. Old fashioned tall wooden clocks were made in Waterbury in the latter part of the 18th century, and cheap watches were first made here in 1879, these were long distinctive of Waterbury, and were often called "Waterbury watches." The manufacture of cloth dates from 1814, and broadcloth was first made here in 1833. The city has a large wholesale trade and is a shipping point for dury products. The municipality owns and operates the water-works.

The township of Waterbury was incorporated in 1686, having been since its settlement in 1677 a part of Farmington township known as Mattatuck. The city of Waterbury was first chartered in 1853. The city and the township were consolidated in 1901. City elections are held biennially and the mayor, city clerk, treasurer, comptroller, city sheriff and aldermen hold office for two years. With the consent of the Board of Aldermen the mayor appoints five electors who with the mayor constitute a department of public works, appoints three electors who with the mayor, comptroller, and president of the Board of Aldermen constitute a department of finance, appoints five electors who with the mayor constitute a department of public safety, and appoints five electors who constitute a department of public health. In 1902 there was a destructive fire in the business district of the city, and during a strike of street railway employees in 1903 state troops were called out to maintain order.

WATER-DEER, a small member of the deer-tribe from northern China differing from all other *Cervidae* except the musk-deer (with which it has no affinity) by the absence of antlers in both sexes. To compensate for this deficiency the bucks are armed with long sabre like upper tusks (see DEER). The species typifies a genus, and is known as *Hydrelaphus* (or *Hydropotes*) *inermis*, but a second form has been described from Hankow under the name of *H. kreyenbergi*, although further evidence as to its claim to distinction is required. Water deer frequent the neighbourhood of the large Chinese rivers where they crouch amid the reeds and grass in such a manner as to be invisible, even when not completely concealed by the covert. When running, they arch their backs and scurry away in a series of short leaps. In captivity as many as three have been produced at a birth.

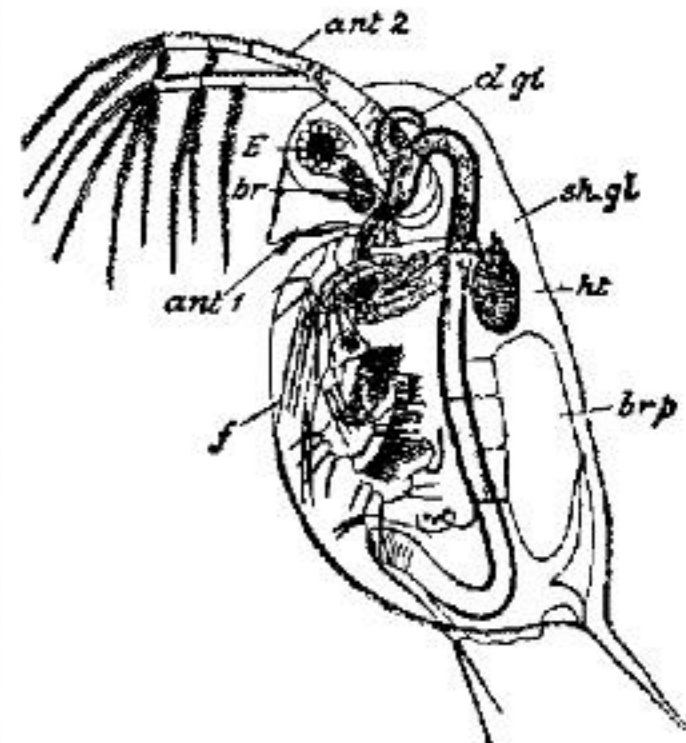
This is one of the few deer in which there are glands neither on the hock nor on the skin covering the cannon-bone. These glands probably enable deer to ascertain the whereabouts of their fellows by the scent they leave on the ground and herbage. The sub-aquatic habits of the present species probably render such a function impossible, hence the absence of the glands. The tail is represented by a mere stump. (R. L. *)

WATERFALL, a point in the course of a stream or river where the water descends perpendicularly or nearly so. Even a very small stream of water falling from any considerable height is a striking object in scenery. Such falls, of small volume though often of immense depth, are common, for a small stream has not the power to erode a steady slope, and thus at any considerable irregularity of level in its course it forms a fall. In many mountainous districts a stream may descend into the valley of the larger river to which it is tributary by way of a fall, its own valley having been eroded more slowly and less deeply than the main valley. Mechanical considerations apart the usual cause of the occurrence of a waterfall is a sudden change in geological structure. For example, if there be three horizontal strata, so laid down that a hard stratum occurs between two

soft ones, a river will be able to grade its course through the upper or lower soft strata, but not at the same rate through the intermediate hard stratum, over a ledge of which it will consequently fall. The same will occur if the course of the river has been interrupted by a hard barrier, such as an intrusive dyke of basalt, or by glacial or other deposits. Where a river falls over an escarpment of hard rock overlying softer strata, it powerfully erodes the soft rock at the base of the fall and may undermine the hard rock above so that this is broken away. In this way the river gradually cuts back the point of fall, and a gorge is left below the fall. The classic example of this process is provided by the most famous falls in the world—Niagara.

WATER-FLEA, a name given by the earlier microscopists (Swammerdam, 1669) to certain minute aquatic Crustacea of the order Cladocera, but often applied also to other members of the division Entomostraca (*q. v.*). The Cladocera are abundant everywhere in fresh water. One of the commonest species, *Daphnia pulex*, found in ponds and ditches, is less than one-tenth of an inch in length and has the body enclosed in a transparent bivalved shell. The

head, projecting in front of the shell, bears a pair of branched feathery antennae which are the chief swimming organs and propel the animal, in a succession of rapid bounds, through the water. There is a single large black eye. In the living animal five pairs of leaf-like limbs acting as gills can be observed in constant motion between the valves of the shell, and the pulsating heart may be seen near the dorsal surface, a little way behind the head. The body ends behind in a kind of tail with a double curved claw which can be protruded from the shell. The female carries the eggs in a brood-chamber between the back



Parker and Haswell's *Text-Book of Zoology*, by permission of Macmillan & Co.

	Daphnia (after Claus)	
ant 1	antennule	d gl Digestive gland
ant 2	Antenna	f Swimming feet
br	Brain	ht Heart
br p	Blood-pouch	sh gl Shell-gland
E	Eye	

of the body and the shell until hatching takes place. Throughout the greater part of the year only females occur and the eggs develop "parthenogenetically," without fertilization. When the small males appear, generally in the autumn, fertilized "winter" or "resting eggs" are produced which are cast adrift in a case of "ephippium" formed by a specially modified part of the shell. These resting eggs enable the race to survive the cold of winter or the drying up of the water.

For a fuller account of the Cladocera and of other organisms which sometimes share with them the name of "water fleas" see the article ENTOMOSTRACA. (W. I. C. A.)

WATERFORD, a county of Ireland in the province of Munster, bounded E. by Waterford Harbour, separating it from Wexford, N. by Kilkenny and by Tipperary, W. by Cork, and S. by the Atlantic. The area is 458,108 acres, or about 716 sq. m. The coast line is in some parts bold and rocky, and is indented by numerous bays and inlets, the principal being Waterford Harbour, Tramore Bay, with picturesque cliffs and some extensive caves, and noted for its shipwrecks, on account of the rocky character of its bed, Dungarvan Harbour, much frequented for refuge in stormy weather, and Youghal Harbour, partly separating county Waterford from county Cork. The surface of the county is to a large extent mountainous, providing beautiful inland scenery, especially towards the west and north-west. The Knockmealdown Mountains, which attain a height of 2600 ft., form the northern boundary with Tipperary. A wide extent of country between Clonmel and Dungarvan is occupied by the two ranges of the Comeragh and Monavallagh

Mountains, reaching a height of 2504 ft. To the south of Dungarvan there is a lower but very rugged range, called the Drum Hills. The south eastern division of the county is for the most part level. Though Waterford benefits in its communications by the important rivers in its vicinity, the only large river it can properly claim as belonging to it is the Blackwater. This river is famous for salmon fishing, and, particularly in the stretch between Cappoquin and Lismore, flows between high, well wooded banks, contrasting beautifully with the background of mountains. It enters the county east of Fermoy, and flows eastward to Cappoquin, the head of navigation, where it turns abruptly southward, to fall into the sea at Youghal Harbour. Waterford Harbour may be called the estuary of three important rivers—the Suir, the Nore and the Barrow, but neither of the two last touches the county. The Suir reaches it about 8 m from Clonmel and thence forms its northern boundary with Tipperary and Kilkenny. It is navigable to Clonmel, but the traffic lies mainly on the left bank, outside the county.

Geology—The Knockmealdown Mountains are an anticline of Old Red Sandstone, cut away at the eastern end to expose Silurian strata which are associated with an extensive series of volcanic and intrusive rocks often crushed by earth movement. The impressive scarp formed by the Old Red Sandstone conglomerate above this lower ground is called the Comeragh Mountains. The moraine-dammed cirque of Lough Coumshingaun lies in these with a precipice 1000 ft in height. The unconformity of the Old Red Sandstone on the greenish and yellowish Silurian shales is excellently seen on the north bank of the Suir at Waterford. Carboniferous Limestone is found in the floor of the synclinals on either side of the great anticline, that is in the Suir valley on the north and in the green and richly-wooded hollow of the Blackwater on the south. Rapidly repeated anticlinal and synclinal folds continue this structure across the country between Dungarvan and Youghal. Rich copper mines were worked mainly in the 19th century in the Silurian area near Bonmahon, and the region remains full of mineral promise.

Industries—The land is generally better adapted for pasturage than for tillage although there are considerable tracts of rich soil in the south eastern districts. The proportion of tillage to pasture is however roughly as 1 to 3½, though the acreage under the principal crops of oats, potatoes and turnips is on the whole fairly maintained. The numbers of cattle, sheep and poultry increase steadily, and pigs are extensively reared. The woollen manufacture except for home use is practically extinct, but the cotton manufacture is still of some importance. There are also breweries, distilleries and a large number of flour mills. The valuable deep sea and coast fisheries have distinct headquarters at Waterford and the noted salmon fisheries of the Suir and Blackwater have theirs at Waterford and Lismore respectively. Railway communication is provided by the Waterford, Dungarvan, Lismore and Co. Cork branch of the Great Southern and Western railway, traversing the county from E. to W., and by the Waterford and Tramore railway, while the city of Waterford is approached by lines of the first-named company from the N. (from Dublin) and W. (from Limerick).

Population and Administration—The population (95,702 in 1891, 87,187 in 1901) decreases at a rate about equal to the average of the Irish counties, and emigration is considerable. Nearly 95% of the total are Roman Catholics, and about 74% constitute the rural population. The chief towns are the city of Waterford (pop. 26,769), Dungarvan (4850), and Lismore (1583), Portlaw and Tramore, and Cappoquin are lesser towns. The county is divided into eight baronies. Down to the Union in 1800 the county returned two members, and the boroughs of Dungarvan, Lismore and Tallow two each. Thereafter, and before the Redistribution Act of 1885, the county returned two members, the borough of Waterford two, and Dungarvan one. The county now returns two members, for the east and west divisions respectively, while the county of the city of Waterford returns one member. Assizes are held at Waterford and quarter sessions at Lismore, Dungarvan, and Waterford. The county is mainly in the Protestant diocese of Ossory, and the Roman Catholic diocese of Waterford and Lismore.

History and Antiquities—In the 9th century the Danes landed in the district, and afterwards made a permanent settlement. Waterford was one of the twelve counties into which King John is stated to have divided that part of Ireland which he nominally annexed to the English crown. On account of the convenience of the city as a landing place, many subsequent expeditions passed through the county, directed against disaffected or rebellious

tribes. In 1444 the greater part of it was granted to James, earl of Desmond, and in 1447 it was bestowed on John Talbot, earl of Shrewsbury, who was created earl of Waterford. The county suffered severely during the Desmond rebellion, in the reign of Elizabeth, as well as in the rebellion of 1641 and during the Cromwellian period. There are in the county a considerable number of barrows, duns, cromlechs and similar relics of the ancient inhabitants. At Ardmore, overlooking the sea from Ram Head, there is a round tower 95 ft in height, and near it a huge rath and a large number of circular entrenchments. Among the old castles special mention may be made of Lismore, originally erected in 1185, but now in great part comparatively modern. The chief ecclesiastical remains are those of the chancel and nave of the cathedral of Ardmore, where a monastery and oratory were founded by St Declan in the 7th century. The see of Ardmore was abolished in the 12th century. Here are also remains of a church and oratory and a holy well. Mention should be made of the existing monastery of Mount Melleray, a convent of Trappists founded near Cappoquin in 1830, on the expulsion of the foreign members of this order from France. Schools, both free and boarding, are maintained, and there is a branch of the order at Roscrea (Co. Tipperary).

WATERFORD, a city, county of a city, parliamentary borough, seaport, and the chief town of Co. Waterford, Ireland. Pop. (1901) 26,769. It is finely situated on the south bank of the Suir 4 m above its junction with the Barrow, at the head of the tidal estuary called Waterford Harbour, 111 m S S W from Dublin by the Great Southern and Western railway. This is the principal railway serving the city, having lines from Dublin and from the north-west, besides the trunk line between Rosslare, Waterford and Cork. Waterford is also, however, the terminus of the Dublin and South Eastern line from Dublin via New Ross, and for the Waterford and Tramore line, serving the seaside resort of Tramore, 7 m S. The Suir is crossed by a wooden bridge of thirty nine arches, and 832 ft long, connecting Waterford with the suburb of Ferrybank. The city is built chiefly along the banks of the river, occupying for the most part low and level ground except at its western extremity, and excepting the quay and the Mall, which connects with the southern end of the quay, its internal appearance is hardly of a piece with the beauty of its environs. The modern Protestant cathedral of the Holy Trinity, generally called Christ Church, a plain structure with a lofty spire, occupies the site of the church built by the Danes in 1096, in the Mall. Near it are the episcopal palace and deanery. There is a handsome Roman Catholic cathedral, and the training seminary for priests called St John's College deserves notice. The principal secular buildings are the town hall, the county and city courts and prisons, the custom house and the barracks. At the extremity of the quay is a large circular tower, called Reginald's Lower, forming at one time a portion of the city walls, and occupying the site of the tower built by Reginald the Dane in 1003. Near the summit one of the balls shot from the cannon of Cromwell while besieging the city is still embedded in the wall. Other remains of the fortifications, consisting of towers and bastions, are to be seen as in the Tramore railway sidings and in Castle Street. There are a number of hospitals and similar benevolent institutions, including the leper house founded in the reign of King John, now used practically as an infirmary. The town possesses breweries, salt houses, foundries and flour mills, and there is a large export trade in cattle, sheep and pigs, and in agricultural produce. It is the headquarters of extensive salmon and sea fisheries. Waterford is second in importance to Cork among the ports of the south coast of Ireland. There is regular communication by steamer with Cork, with Dublin and Belfast, with Fishguard, Glasgow, Liverpool, Bristol, Plymouth, Southampton, London and other ports. Local steamers ply to Duncannon, New Ross and other places on the neighbouring estuaries.

Waterford Harbour is a winding and well sheltered bay formed by the estuary of the river Suir, and afterwards by the joint estuary of the Nore and Barrow. Its length to the sea is about 15 m. Its entrance is 3 m wide, and is lighted by a fixed light

on the ancient donjon of Hook Tower (130 ft in height) and others. The quay, at which there is a depth of 22 ft of water at low tide, was enlarged in 1705 by the removal of the city walls, and is about $1\frac{1}{2}$ m in length. At Ferrybank, on the Kilkenny side of the river, there is a shipbuilding yard with patent ship and graving dock. By the Suir there is navigation for barges to Clonmel, and for sailing vessels to Carrick-on-Suir, by the Barrow for sailing vessels to New Ross and thence for barges to Athy, and so to Dublin by a branch of the Grand Canal, and by the Nore for barges to Inistoge. The shores of the harbour are picturesque and well-wooded, studded with country residences and waterside villages, of which Passage and Duncannon are popular resorts of the citizens of Waterford.

Anciently Waterford was called *Cuan-na-groth*, the haven of the sun. By early writers it was named Menapia. It is supposed to have existed in very early times, but first acquired importance under the Danes, of whom it remained one of the principal strongholds until its capture by Strongbow in 1171. On the 18th of October 1172 Henry II landed near Waterford, and he here received the hostages of the people of Munster. It became a cathedral city in 1096. The Protestant dioceses of Cashel, Emly, Waterford and Lismore were united in 1833. Prince John, afterwards king of England, who had been declared lord of Ireland in 1177, landed at Waterford in 1185. After ascending the English throne he granted it a fair in 1204, and in 1206 a charter of incorporation. He landed at Waterford in 1210, in order to establish within his nominal territories in Ireland a more distinct form of government. The city received a new charter from Henry III in 1232. Richard II landed at Waterford in October 1394 and again in 1399. In 1447 it was granted by Henry VI to John Talbot, earl of Shrewsbury, who was created earl of Waterford. In 1497 it successfully resisted an attempt of Perkin Warbeck to capture it, in recognition of which it received various privileges from Henry VII, who gave it the title of *urbs intacta*. In 1603, after the accession of James I to the English crown, the city, along with Cork, took a prominent part in opposition to the government and to the Protestant religion, but on the approach of Mountjoy it formally submitted. From this time, however, the magistrates whom it elected refused to take the oath of supremacy, and, as by its charter it possessed the right to refuse admission to the king's judges, and therefore to dispense with the right of holding assizes, a rule was obtained in the Irish chancery for the seizure of its charter, which was carried into effect in 1618. In 1619 an attempt was made to induce Bristol merchants to settle in the city and undertake its government, but no one would respond to the invitation, and in 1626 the charter was restored. The city was unsuccessfully attacked by Cromwell in 1649, but surrendered to Ireton on the 10th of August 1650. After the battle of the Boyne James II embarked at it for France (July 1690). Shortly afterwards it surrendered to William, who sailed from it to England. It sent two members to parliament from 1374 to 1885, when the number was reduced to one. In 1898 it was constituted one of the six county boroughs having separate county councils.

WATERFORD, a village of Saratoga county, New York, U.S.A., on the W bank of the Hudson river, near the mouth of the Mohawk river, and about 10 m N of Albany. Pop (1900) 3146, of whom 474 were foreign-born; (1905) 3134; (1910) 3245. Waterford is served by the Delaware & Hudson railway, and is at the junction of the Erie and the Champlain divisions of the great barge canal connecting Lake Erie and Lake Champlain. There was a settlement here probably as early as 1630, and Waterford was laid out in 1784, and was incorporated as a village in 1794.

WATERHOUSE, ALFRED (1830-1905), English architect was born at Liverpool on the 19th of July 1830, and passed his professional pupilage under Richard Lane in Manchester. His earliest commissions were of a domestic nature, but his position as a designer of public buildings was assured as early as 1859 by success in the open competition for the Manchester assize courts. This work marked him not only as an adept in the planning of a complicated building on a large scale, but also as a champion of

the Gothic cause. Nine years later, in 1868, another competition secured for Waterhouse the execution of the Manchester town-hall, where he was able to show a firmer and perhaps more original handling of the Gothic manner. The same year brought him the rebuilding of part of Caius College, Cambridge, not his first university work, for Balliol, Oxford, had been put into his hands in 1867. At Caius, out of deference to the Renaissance treatment of the older parts of the college, the Gothic element was intentionally mingled with classic detail, while Balliol and Pembroke, Cambridge, which followed in 1871, may be looked upon as typical specimens of the style of his mid career—Gothic tradition (European rather than British) tempered by individual taste and by adaptation to modern needs. Girton College, Cambridge, a building of simpler type, dates originally from the same period (1870), but has been periodically enlarged by further buildings. Two important domestic works were undertaken in 1870 and 1871 respectively—Eaton Hall for the duke, then marquis, of Westminster, and Heythrop Hall, Oxfordshire, the latter, a restoration, being of a fairly strict classic type. Iwerne Minster for Lord Wolverton was begun in 1877. In 1865 Waterhouse had removed his practice from Manchester to London, and he was one of the architects selected to compete for the Royal Courts of Justice. He received from the government without competition, the commission to build the Natural History Museum, South Kensington, a design which marks an epoch in the modern use of terra-cotta. The new University Club—a Gothic design—was undertaken in 1866, to be followed nearly twenty years later by the National Liberal Club, a study in Renaissance composition. Waterhouse's series of works for Victoria University, of which he was made LL.D. in 1895, date from 1870, when he was first engaged on Owens College, Manchester. Yorkshire College, Leeds, was begun in 1878; and Liverpool University College in 1885. St Paul's School, Hammer-smith, was begun in 1881, and in the same year the Central Technical College in Exhibition Road, London. Waterhouse's chief remaining works in London are the new Prudential Assurance Company's offices in Holborn, the new University College Hospital, the National Provincial Bank, Piccadilly, 1892, the Surveyors' Institution, Great George Street, 1896, and the Jenner Institute of Preventive Medicine, Chelsea, 1895. For the Prudential Company he designed many provincial branch offices, while for the National Provincial Bank he also designed premises at Manchester. The Liverpool Infirmary is Waterhouse's largest hospital, and St Mary's Hospital, Manchester, the Alexandra Hospital, Khyll, and extensive additions at the general hospital, Nottingham, also engaged him. Among works not already mentioned are the Salford gaol, St Margaret's School, Bushey, the Metropole Hotel, Brighton, Hove town-hall, Alloa town-hall, St Elizabeth's church, Reddish, the Weigh House chapel, Mavfair, and Hutton Hall, Yorks. He died on the 22nd of August, 1905.

Waterhouse became a fellow of the Royal Institute of British Architects in 1861 and president from 1888 to 1891. He obtained a *grand prix* for architecture at the Paris Exposition of 1867, and a *Rappel* in 1878. In the same year he received the Royal gold medal of the Royal Institute of British Architects, and was made an associate of the Royal Academy of which body he became a full member in 1885 and treasurer in 1898. He became a member of the academies of Vienna (1869), Brussels (1886), Antwerp (1887), Milan (1888) and Berlin (1889), and a corresponding member of the Institut de France (1893). After 1886 he was constantly called upon to act as assessor in architectural competitions and was a member of the international jury appointed to adjudicate on the designs for the west front of Milan Cathedral in 1887. In 1890 he served as architectural member of the Royal Commission on the proposed enlargement of Westminster Abbey as a place of burial. From 1891 to 1902 when he retired, his work was conducted in partnership with his son Paul Waterhouse.

WATERHOUSE, JOHN WILLIAM (1847-), English painter, was the son of an artist, by whom he was mainly trained. As a figure painter he shows in his work much imaginative power and a very personal style, and his pictures are for the most part illustrations of classic myths treated with attractive fantasy. An able draughtsman and a fine colourist, he must be ranked among the best artists of the British school. He was