

ENCYCLOPÆDIA BRITANNICA.

ROTHE

ROTHE, RICHARD (1799-1867), theologian, was born at Posen, January 28, 1799, of parents in a good position. After passing through the grammar schools of Stettin and Breslau, he studied theology in the universities of Heidelberg and Berlin (1817-20) under Daub, Schleiermacher, and Neander, the philosophers and historians Hegel, Creuzer, and Schlosser, exercising a considerable influence in shaping his thought. From 1820 to 1822 he was in the clerical seminary at Wittenberg, and spent the next year in private study under his father's roof at Breslau. In the autumn of 1823 he was appointed chaplain to the Prussian embassy in Rome, of which Baron Bunsen was the head. This post he exchanged in 1828 for a professorship in the Wittenberg seminary, and hence in 1837 he removed to Heidelberg as professor and director of a new clerical seminary; in 1849 he accepted an invitation to Bonn as professor and university preacher, but in 1854 he returned to Heidelberg as professor of theology and member of the Oberkirchenrath, a position he held until his death, August 20, 1867. Rothe's mental and religious development was one of continuous progress. As a youth he was the subject of deep religious feeling, with a decided bent towards a supernatural mysticism; his chosen authors were those of the romantic school, and Novalis remained his life through a special favourite. In Berlin and Wittenberg he came under the influence of Pietism as represented by such men as Stier and Tholuck, though the latter pronounced him a "very modern Christian." He afterwards himself confessed that, though he had been a sincere, he was never a happy Pietist. In Rome, where he enjoyed the intimate friendship of Bunsen, and studied church history under the broadening influence of classical and ecclesiastical art, his mind broke loose from the straitened life and narrow views of Pietism and he learned to look at Christianity in its human and universalistic aspects. From that time he began to develop and work out his great idea, the inseparable relation of religion and morals, finding in the latter the necessary sphere and the realization of the idea of the former. He began then, and particularly after the revolution of July 1830, likewise to give a more definite form to his peculiar view of the relations of church and state. In consequence of this

enlargement of his ideas of the world, religion, morals, Christianity, the church and the state, Rothe gradually found himself out of harmony with the Pietistic thought and life of Wittenberg, and his removal to Heidelberg in 1837 and the publication of his first important work (*Anfänge der christlichen Kirche*) in that year coincide with the attainment of the principal theological positions with which his name is associated. During the middle period of his career (1837-61) he led the life of a scholastic recluse, taking no active public part in ecclesiastical affairs in any way. During the last six years of his life (1861-67), partly owing to his liberation from great domestic cares and partly to the special circumstances of the church in Baden, he came forward publicly and actively as the advocate of a free theology and of the *PROTESTANTENVEREIN* (*q.v.*). This important change in Rothe's practice was preceded by the publication of a valuable series of theological essays (in the *Studien und Kritiken* for 1860), afterwards published in a separate volume (*Zur Dogmatik*, Gotha, 1st ed. 1863, 2d ed. 1869), on revelation and inspiration more particularly. These essays were a very searching examination of the relation of revelation to Scripture, and provoked much hostile criticism in quarters previously friendly to Rothe, where the relation was usually treated as almost one of identity. In consequence of this publication, and his advocacy of the programme of the *Protestantenverein*, he was classed at the end of his life amongst the more decided theological liberals rather than with the moderate orthodox party, amongst whom so many of his personal friends were to be found.

Rothe was one of the most if not the most profound and influential of modern German theologians next to Schleiermacher. Like the latter he combined with the keenest logical faculty an intensely religious spirit, while his philosophical tendencies were rather in sympathy with Hegel than Schleiermacher, and theosophic mysticism was more congenial to him than the abstractions of Spinoza, to whom Schleiermacher owed so much. He classed himself amongst the theosophists, and energetically claimed to be a convinced and happy supernaturalist in a scientific age. A peculiarity of his thought was its systematic completeness and consistency; aphoristic, unsystematic,

timidly halting speculation was to him intolerable. Though his own system may seem to contain extremely doubtful or even fantastic elements, it is allowed by all that it is in its general outlines a noble massive whole, constructed by a profound, comprehensive, fearless, and logical mind. Another peculiarity of his thought was the realistic nature of his spiritualism: his abstractions are all real existences; his spiritual entities are real and corporeal; his truth is actual being. Hence Rothe, unlike Schleiermacher, lays great stress, for instance, on the personality of God, on the reality of the worlds of good and evil spirits, and on the visible second coming of Christ. Hence his religious feeling and theological speculation demanded their realization in a kingdom of God coextensive with man's nature, terrestrial history, and human society; and thus his theological system became a *Theologische Ethik*. It is on the work published under this title that Rothe's permanent reputation as a theologian and ethical writer will rest. The first edition, in three volumes, was published in 1845-48, and remained twelve years out of print before the second (1867-71, in five volumes) appeared. It was the author's purpose to rewrite the whole, but he had completed the first two volumes only of the new edition when death overtook him. The remainder was reprinted from the first edition by Prof. Holtzmann, with the addition of some notes and emendations left by the author.

This work begins with a general sketch of the author's system of speculative theology in its two divisions, theology proper and cosmology, the latter falling into the two subdivisions of *Physik* (the world of nature) and *Ethik* (the world of spirit). It is the last subdivision with which the body of the work is occupied. After an analysis of the religious consciousness, which yields the doctrine of an absolute personal and spiritual God, Rothe proceeds to deduce from his idea of God the process and history of creative development, which is eternally proceeding and bringing forth, as its unending purpose, worlds of spirits, partially self-creative and sharing the absolute personality of the Creator. As a thorough-going evolutionist Rothe regards the natural man as the consummation of the development of physical nature, and obtains spirit as the personal attainment, with divine help, of those beings in whom the further creative process of moral development is carried on. His theory leaves the natural man, without hesitation, to be developed by the natural processes of animal evolution. The attainment of the higher stage of development is the moral and religious vocation of man; this higher stage is self-determination, the performance of every human function as a voluntary and intelligent agent or as a person, having as its cosmical effect the subjection of all material to spiritual existences. This personal process of spiritualization is the continuation of the eternal divine work of creation. Thus the moral life and the religious life coincide, and when normal are identical; both have the same aim and are occupied with the same task, the accomplishment of the spiritualization of the world. "Piety, that it may become truth and reality, demands morality as its fulfilment, as the only concrete element in which the idea of fellowship with God is realized; morality, that it may find its perfect unfolding, requires the aid of piety, in the light of which alone it can comprehend its own idea in all its breadth and depth." Rothe follows Schleiermacher in dividing his ethical system into the three parts of the doctrine of moral ends (*Güterlehre*), or the products of moral action, the doctrine of virtue (*Tugendlehre*), or of the power producing moral good, and the doctrine of duty (*Pflichtenlehre*), or the specific form and manner in which that power obtains its results. The process of human development Rothe regards as necessarily taking an abnormal form and passing through the phase of sin. This abnormal condition necessitates a fresh creative act, that of salvation, which was, however, from the first part of the divine plan of development. As a preparation for this salvation supernatural revelation was required for the purifying and revivification of the religious consciousness, and the Saviour Himself had to appear in human history as a fresh miraculous creation, born of a woman but not begotten by a man. In consequence of His supernatural birth the Saviour, or the second Adam, was free from original sin. By His own moral and religious development He made possible a relation of perfect fellowship between God and man, which was the new and highest stage of the divine creation of mankind. This stage of development inaugurated by the Saviour is attained by means of His kingdom or the community of salvation, which is both moral and religious, and in the first instance and temporarily only religious—that is, a

church. As men reach the full development of their nature, and appropriate the perfection of the Saviour, the separation between the religious and the moral life will vanish, and the Christian state, as the highest sphere of human life representing all human functions, will displace the church. "In proportion as the Saviour Christianizes the state by means of the church must the progressive completion of the structure of the church prove the cause of its abolition." The decline of the church is therefore not to be deplored, but recognized as the consequence of the independence and completeness of the Christian life. It is the third section of his work—the *Pflichtenlehre*—which is generally most highly valued, and where his full strength as an ethical thinker is displayed, without any mixture of theosophic speculation.

Since Rothe's death several volumes of his sermons and of his lectures (on dogmatics, the history of homiletics) and a collection of brief essays and religious meditations under the title of *Stille Stunden* (Wittenberg, 1872) have been published. See F. Nippold, *Richard Rothe, ein christliches Lebensbild* (3 vols., Wittenberg, 1873-74); Schenkel, "Zur Erinnerung an Dr. R. Rothe," in the *Allgemeine kirchliche Zeitschrift*, 1867-68; Holtzmann, "Richard Rothe," in the *Jahrbuch des Protestantentums*, 1869; Schwarz, *Zur Geschichte der neuesten Theologie* (4th ed., Leipzig, 1869, pp. 417-444); Pfeiderer, *Religionsphilosophie auf geschichtlicher Grundlage* (2d ed., Berlin, 1884, vol. 1, pp. 611-615). (J. F. S.)

ROTHERHAM, a market-town and municipal borough in the West Riding of Yorkshire, is situated at the junction of the Rother with the Don navigation, on several railway lines, 5 miles north-east of Sheffield. The parish church of All Saints, occupying the site of a building dating from Anglo-Saxon times, was erected in the reign of Edward IV., and is a good specimen of Perpendicular. Among the other principal public buildings are the new market-hall, the post office, the court-house, the temperance hall, St George's Hall, the council hall, and the corporation offices. There are a large number of educational and literary institutions, including the grammar school founded in 1483, the people's charity school, the Independent college, the mechanics' institute, the free library, and the literary and scientific society. There is a large hospital, besides almshouses and various other charities. The town possesses extensive iron, steel, and brass works, potteries, glass works, breweries, saw mills, and rope yards. The population of the municipal borough (area 5995 acres) in 1881 was 34,782.

The town is of Roman origin, and was of some importance in Anglo-Saxon times. In the time of Edward the Confessor it possessed a market and a church. Mary queen of Scots stayed a night at Rotherham while a prisoner, as did also Charles I. when in the hands of the Scots. During the Civil War it sided with the Parliament. It was taken possession of by the Royalists in 1643, but after the victory of Marston Moor was yielded up to a detachment of the Parliamentary forces. The townships of Rotherham and Kimberworth were incorporated as a municipal borough in August 1871, the adjacent suburbs being included in 1879. The corporation act as the sanitary authority, and own the waterworks, gasworks, and markets. They have introduced a system of main drainage, and have also provided a public park and a free library.

ROTHERSAY, a royal burgh, and the principal town of the county of Bute, Scotland, is situated in the island of Bute, at the head of a well-sheltered and spacious bay in the Firth of Clyde, 40 miles W. of Glasgow and 18 S.W. of Greenock, with which there is frequent communication by steamers. The bay affords good anchorage in any wind, and there are also a good harbour and pier. The town is the headquarters of an extensive fishing district, and is much frequented as a watering place. Besides two hydropathic establishments, it has several hotels and numerous lodging houses. Facing the bay there is an extensive esplanade. In the centre of the town are the ruins of the ancient castle, supposed by some to have been erected in 1098 by Magnus Barefoot, and by others at the same date by the Scots to defend themselves against the Norwegians. The village which grew up round the castle was made a royal burgh by Robert III., who created his eldest son David duke of Rothersay. During the Commonwealth the castle was garrisoned by Cromwell's troops. It was burned by the followers of Argyll in 1685, and remained neglected till the rubbish was cleared away by the marquis of Bute in 1816. The principal

modern buildings are the aquarium, the town-hall and county buildings, the public halls, the academy, and the Thomson institute. The corporation consists of a provost, three bailies, a dean of guild, a treasurer, and twelve councillors. The population of the royal burgh in 1871 was 8027 and in 1881 it was 8291.

ROTHSCHILD, the name of a Jewish family which has acquired an unexampled position from the magnitude of its financial transactions. The original name was Bauer, the founder of the house being **MAYER ANSELM** (1743-1812), the son of Anselm Moses Bauer, a small Jewish merchant of Frankfort-on-the-Main. His father wished him to become a rabbi, but he preferred business, and ultimately set up as a money lender at the sign of the "Red Shield" (*Rothschild*) in the Frankfort Judengasse. He had already acquired some standing as a banker when his numismatic tastes obtained for him the friendship of William, ninth landgrave and afterwards elector of Hesse-Cassel, who in 1801 made him his agent. In the following year Rothschild negotiated his first great Government loan, ten million thalers for the Danish Government. When the landgrave was compelled to flee from his capital on the entry of the French, he placed his silver and other bulky treasures in the hands of Rothschild, who, not without considerable risk, took charge of them and buried them, it is said in a corner of his garden, whence he dug them up as opportunity arose for disposing of them. This he did to such advantage as to be able afterwards to return their value to the elector at 5 per cent. interest. He died at Frankfort 19th September 1812, leaving ten children, five sons and five daughters. Branches of the business were established at Vienna, London, Paris, and Naples, each being in charge of one of the sons, the chief of the firm always residing at Frankfort, where, in accordance with the wish of the founder, all important consultations are held. By a system of cooperation and joint counsels, aided by the skilful employment of subordinate agents, they obtained unexampled opportunities of acquiring an accurate knowledge of the condition of the financial market, and practically embraced the whole of Europe within their financial network. The unity of the interests of the several members of the firm has been preserved by the system of intermarriages, which has been the general practice of the descendants of the five brothers, and the house has thus grown in solidity and influence with every succeeding generation. Each of the brothers received in 1815 from Austria the privilege of hereditary landowners, and in 1822 they were created barons by the same country. The charge of the Frankfort house devolved on the eldest, **ANSELM MAYER** (1773-1855), born 12th June 1773, who was chosen a member of the royal Prussian privy council of commerce, and, in 1820, Bavarian consul and court banker. The Vienna branch was undertaken by **SOLOMON** (1774-1826), born 9th December 1774, who entered into intimate relations with Prince Metternich, which contributed in no small degree to bring about the connexion of the firm with the allied powers. The third brother, **NATHAN MAYER** (1777-1836), born 16th September 1777, has, however, generally been regarded as the financial genius of the family, and the chief originator of the transactions which have created for the house its unexampled position in the financial world. He came to Manchester about 1800 to act as a purchaser for his father of manufactured goods; but at the end of five years he removed to London, where he found full scope for his financial genius. The boldness and skill of his transactions, which caused him at first to be regarded as rash and unsafe by the leading banking firms and financial merchants, latterly awakened their admiration

and envy. By the employment of carrier pigeons and of fast-sailing boats of his own for the transmission of news he was able to utilize to the best advantage his special sources of information, while no one was a greater adept in the art of promoting the rise and fall of the stocks. The colossal influence of the house dates from an operation of his in 1810. In that year Wellington made some drafts which the English Government could not meet; these were purchased by Rothschild at a liberal discount, and renewed to the Government, which finally redeemed at par. From this time the house became associated with the allied powers in the struggle against Napoleon, it being chiefly through it that they were able to negotiate loans to carry on the war. Rothschild never lost faith in the ultimate overthrow of Napoleon, his all being virtually staked on the issue of the contest. He is said to have been present at the battle of Waterloo, and to have watched the varying fortunes of the day with feverish eagerness. Being able to transmit to London private information of the allied success several hours before it reached the public, he effected an immense profit by the purchase of stock, which had been greatly depressed on account of the news of Blücher's defeat two days previously. Rothschild was the first to popularize foreign loans in Britain by fixing the rate in sterling money and making the dividends payable in London and not in foreign capitals. Latterly he became the financial agent of nearly every civilized Government, although persistently declining contracts for Spain or the American States. He did not confine himself to operations on a large scale, but on the contrary made it a principle to despise or neglect no feasible opportunity of transacting business, while at the same time his operations gradually extended to every quarter of the globe. He died 28th July 1836, and was succeeded in the management of the London house by his son **LIONEL** (1808-1879), born 22d November 1808, whose name will always be associated with the removal of the civil disabilities of the Jews. He was elected a member for the City of London in 1847, and again in 1849 and 1852, but it was not till 1858 that the joint operation of an Act of Parliament and a resolution of the House of Commons, allowing the omission from the oath of the words to which as a Jew he conscientiously objected, rendered it possible for him to take his seat. He continued to represent the city of London till 1874. **JACOB** (1792-1868), the youngest of the original brothers, was intrusted with the important mission of starting the business in Paris after the restoration of the Bourbons, for whom he negotiated large loans. At the Revolution of 1848 he was a heavy loser, and had also to be protected for a time by a special guard. It was by his capital that the earliest railroads were constructed in France; the profits he obtained from the speculation were very large. He died 15th November 1868. The Naples branch was superintended by another of the brothers, **KARL** (1780-1855). It was always the least important of the five, and after the annexation of Naples to Italy in 1860 it was discontinued.

See *Das Haus Rothschild*, 1858; Picciotto, *Sketches of Anglo-Jewish History*, 1875; Francis, *Chronicles and Characters of the Stock Exchange*, 1853; Treskow, *Biographische Notizen über Nathan Meyer Rothschild nebst seinem Testament*, 1837; Roqueplan, *Le Baron James de Rothschild*, 1868.

ROTHWELL, an urban sanitary district in the West Riding of Yorkshire, situated in a pleasant valley four miles south of Leeds. It is of great antiquity, and soon after the Conquest was granted as a dependency of the castle of Pontefract to the Lacys, who erected at it a baronial residence of which there are still some remains. The church of the Holy Trinity is an old structure in

the Later English style with embattled parapet. There are a mechanics' institute and a working men's club. Coal and stone are obtained in the neighbourhood, and the town possesses match works and rope and twine factories. The population of the urban sanitary district (area 3302 acres) in 1871 was 3733, and in 1881 it was 5105.

ROTIFERA. The *Rotifera* (or *Rotatoria*) form a small, in many respects well-defined, but somewhat isolated class of the animal kingdom. They are here treated of separately, partly on account of the difficulty of placing them in one of the large phyla, partly on account of their special interest to microscopists.

Now familiarly known as "wheel animalcules" from the wheel-like motion produced by the rings of cilia which generally occur in the head region, the so-called rotatory organs, they were first discovered by Leeuwenhoek (1),¹ to whom we also owe the discovery of *Bacteria* and ciliate *Infusoria*. Leeuwenhoek described the *Rotifer vulgaris* in 1702, and he subsequently described *Melicerta ringens* and other species. A great variety of forms were described by other observers, but they were not separated as a class from the unicellular organisms (*Protozoa*) with which they usually occur until the appearance of Ehrenberg's great monograph (2), which contained a mass of detail regarding their structure. The classification there put forward by Ehrenberg is still widely adopted, but numerous observers have since added to our knowledge of the anatomy of the group (3). At the present day few groups of the animal kingdom are so well known to the microscopist, few groups present more interesting affinities to the morphologist, and few multicellular animals such a low physiological condition.

General Anatomy.—The *Rotifera* are multicellular animals of microscopic size which present a cœlom. They are bilaterally symmetrical and present no true metameric segmentation. A head region is generally well marked, and most forms present a definite tail region. This tail region has been termed the "pseudopodium." It varies very much in the extent to which it is developed. It attains its highest development in forms like *Philodina*, which affect a leech-like method of progression and use it as a means of attachment. We may pass from this through a series of forms where it becomes less and less highly developed. In such forms as *Brachionus* it serves as a directive organ in swimming, while in a large number of other forms it is only represented by a pair of terminal styles or flaps. In the sessile forms it becomes a contractile pedicle with a suctorial extremity. A pseudopodium is entirely absent in *Asplanchna*, *Triarthra*, *Polyarthra*, and a few other genera. The pseudopodium, when well developed, is a very muscular organ, and it may contain a pair of glands (fig. 2, A, *gl*) which secrete an adhesive material.

The surface of the body is covered by a firm homogeneous structureless cuticle. This cuticle may become hardened by a further development of chitin, but no calcareous deposits ever take place in it. The cuticle remains softest in those forms which live in tubes. Among the free-living forms the degree of hardening varies considerably. In some cases contraction of the body merely throws the cuticle into wrinkles (*Notommata*, *Asplanchna*); in others definite ring-like joints are produced which telescope into one another during contraction; while in others again it becomes quite firm and rigid and resembles the carapace of one of the *Entomostraca*; it is then termed a "lorica." The lorica may be prolonged at various points into spines, which may attain a considerable length. The surface may be variously modified, being in some cases smooth, in others

¹ These numbers refer to the bibliography at p. 8.

marked, dotted, ridged, or sculptured in various ways (fig. 1, K). The curved spines of *Philodina aculeata* (fig. 1, *o*) and the long rigid spines of *Triarthra* are further developments in this direction. The so-called setæ of *Polyarthra* on the other hand are more complex in nature, and are moved by muscles, and thus approach the "limbs" of *Pedalion*.

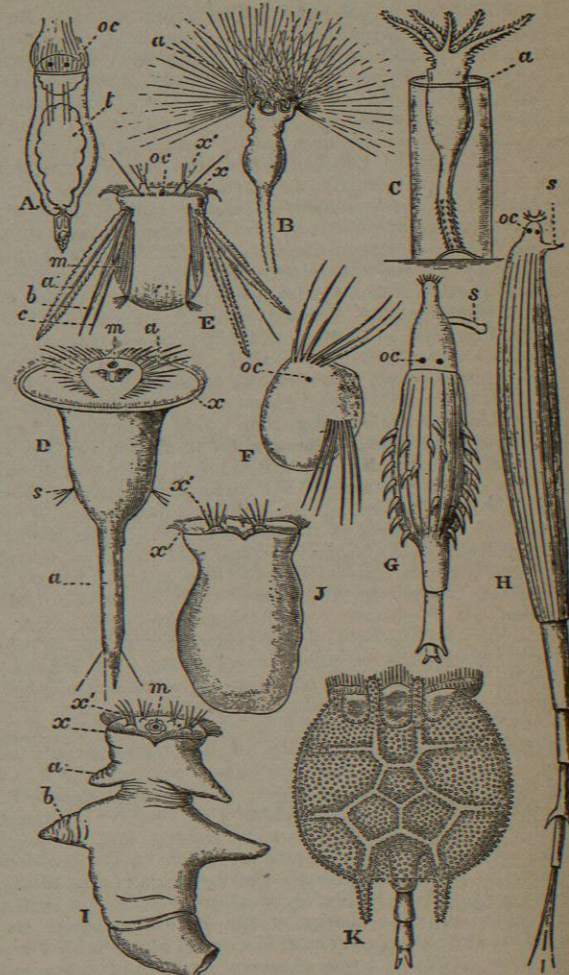


FIG. 1.—A, *Floscularia campanulata*, an adult male, drawn from a dead specimen (after Hudson); *t*, testis; *oc*, eye-spots. B, *Floscularia appendiculata*, an adult female (after Gegenbaur); *a*, the ciliated flexible proboscis. C, *Stephanoceros eichhornii*; *a*, the urceolus. D, *Microcodon clavus*, ventral view (after Grenacher); *m*, mouth; *a*, bristles; *x*, architroch; *s*, lateral sense-organs. E, *Polyarthra platyptera*; *oc*, eye-spot; *x'*, isolated tufts representing a cephalotroch; *x*, branchiostoch; *a*, *b*, and *c*, three pairs of appendages which are moved by the muscles *m*. F, another figure of *Polyarthra*, to show the position which the appendages may take up. G, *Philodina aculeata*; *oc*, eye-spot; *s*, calcar. H, *Actinurus neptunus*. *oc*, eye-spot; *s*, calcar. I, *Asplanchna sieboldii*, male, viewed from the abdominal surface: *a*, anterior short arms; *b*, posterior longer arms; *m*, mouth; *x'*, cephalotrochic tufts; *x*, branchiostoch. J, *Asplanchna sieboldii*, female; letters as before. K, *Notus quadricornis*, to show the extent to which the lorica may become sculptured. (All, except where otherwise stated, from Pritchard.)

Several genera present an external casing or sheath or tube which is termed an "urceolus." In *Floscularia* and *Stephanoceros* the urceolus is gelatinous and perfectly hyaline; in *Conochilus* numerous individuals live in such a hyaline urceolus arranged in a radiating manner. The urceolus, which is secreted by the animal itself, may become covered with foreign particles, and in one species, the well-known *Melicerta ringens*, the animal builds up its urceolus with pellets which it manufactures from foreign

particles, and deposits in a regular oblique or spiral series, and which are cemented together by a special secretion. The urceolus serves as a defence, as the animal can by contracting its stalk withdraw itself entirely within the tube.

Locomotor Organs.—While, as mentioned above, several genera or individual species present long spines, these become movable, and may be spoken of as appendages, in two genera only. In *Polyarthra* (fig. 1, E, F) there are four groups of processes or plumes placed at the sides of

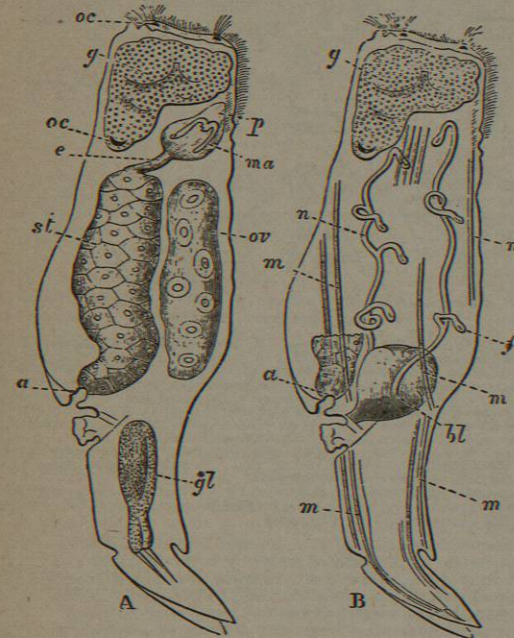


FIG. 2.—*Floscularia appendiculata*. A and B represent the same animal, some of the organs being shown in one figure and some in the other. *oc*, eye-spots; *g*, nerve ganglion; *p*, pharynx (the mouth should be shown opening opposite the letter); *ma*, the maxillæ; *e*, oesophagus; *st*, stomach; *a*, anus, opening the cloaca; *gl*, mucous glands in the pseudopodium; *n*, nephridia; *f*, flame-cells; *m*, muscles.

the body, each of which groups can be separately moved up and down by means of muscular fibres attached to their bases, which project into the body. The processes themselves are unjointed and rigid. In *Pedalion* (fig. 3), a remarkable form discovered by Dr C. J. Hudson in 1871 (12, 13, 14, and 15), and found in numbers several times since, these appendages have acquired a new and quite special development. They are six in number. The largest is placed ventrally at some distance below the mouth. Its free extremity is a plumose fan-like expansion (fig. 3, A, *a*, and H). It is (in common with the others) a hollow process into which run two pairs of broad, coarsely transversely striated muscles. Each pair has a single insertion on the inner wall—the one pair near the free extremity of the limb, the other near its attachment; the bands run up, one of each pair on each side and run right round the body forming an incomplete muscular girdle, the ends approximating in the median dorsal line. Below this point springs the large median dorsal limb, which terminates in groups of long setæ. It presents a single pair of muscles attached along its inner wall which run up and form a muscular girdle round the body in its posterior third. On each side is attached a superior dorso-lateral and an inferior ventro-lateral appendage, each with a fan-like plumose termination consisting of compound hairs, found elsewhere only among the *Crustacea*; each of these

is moved by muscles running upwards towards the neck and arising immediately under the trochal disk, the inferior ventro-lateral pair also presenting muscles which form a girdle in the hind region of the body. Various other muscles are present: there are two complete girdles in the neck region immediately behind the mouth; there are also muscles which move the hinder region of the body. In addition to these the body presents various processes which are perhaps some of them unrepresented in other Rotifers. In the median dorsal line immediately below the trochal disk there is a short conical process presenting a pair of muscles which render it capable of slight movement. From a recess at the extremity of this process spring a group of long setose hairs the bases of which are connected with a filament probably nervous in nature. This doubtless represents a structure found in many Rotifers, and variously known as the "calcar," "siphon," "tentaculum," or "antenna." This calcar is double in *Tubularia* and *Melicerta*. It is very well developed in the genera *Rotifer*, *Philodina*, and others, and is, when so developed, slightly retractile. It appears to be represented in many forms by a pit or depression set with hairs. The calcar has been considered both as an intromittent organ and a respiratory tube for the admission of water. It is now, however, universally considered to be sensory in nature. Various forms present processes in other parts

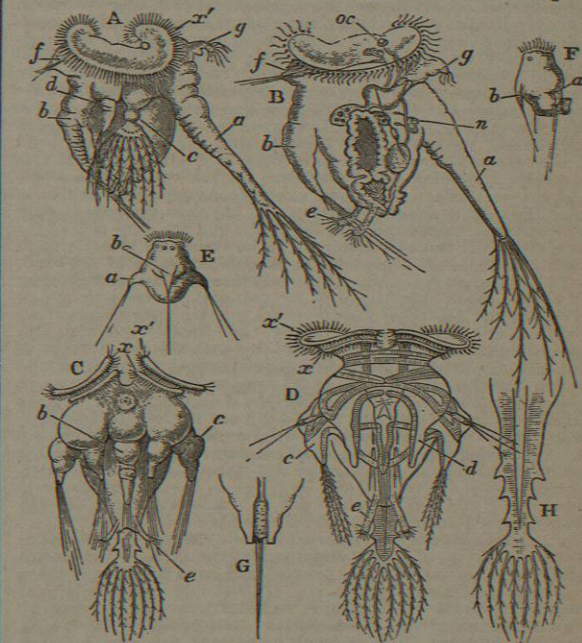


FIG. 3.—*Pedalion mira*. A, Lateral surface view of an adult female: *a*, median ventral appendage; *b*, median dorsal appendage; *c*, inferior ventro-lateral appendage; *d*, superior dorso-lateral appendage; *e*, dorsal sense-organ (calcar); *g*, "chin"; *x*, cephalotroch. B, lateral view, showing the viscera: *oc*, eye-spots; *n*, nephridia; *e*, ciliated processes, probably serving for attachment; other letters as above. C, ventral view; *x'*, cephalotroch; *x*, branchiostoch; other letters as above. D, ventral view, showing the musculature (cf. text). E, dorsal view of a male; *a*, lateral appendages; *b*, dorsal appendage. F, lateral view of a male. G, enlarged view of the sense-organ marked *f*. H, enlarged view of the median ventral appendage. (All after Hudson.)

of the body which have doubtless a similar function, e.g., *Microcodon* (fig. 1, D, *s*) with its pair of lateral organs. *Pedalion* presents a pair of ciliated processes in the posterior region of the body (fig. 3, B, *c*, and D, *e*), which it can apparently use as a means of attachment; Dr Hudson states that he has seen it anchored by these and swimming round and round in a circle. They possibly re-

present the flaps found on the tail of other forms. *Pedalion* also has a small ciliated muscular process (fig. 3, A, g) placed immediately below the mouth, and termed a "chin," which appears to be merely a greater development of a sort of lower lip which occurs in many Rotifers.

Muscular System.—All the *Rotifera* present a muscular system which is generally very well developed. Transverse striation occurs among the fibres to a varying extent, being well marked in cases where the muscle is much used. The muscles which move the body as a whole are arranged as circular and longitudinal series, but they are arranged in special groups and do not form a complete layer of the body-wall as in the various worms. Some of the longitudinal muscles are specially developed in connexion with the tail or pedicle. Other muscles are developed in connexion with special systems of organs,—the trochal disks, the jaw apparatus, and the reproductive system. The muscles in connexion with the trochal disk serve to protrude or withdraw it, and to move it about, when extruded, in various directions. The protrusion is probably, however, generally effected by the elasticity of the integument coming into play during the relaxation of the retractor muscles, and by a general contraction of the body wall. The tentaculiferous apparatus of *Polyzoa* and *Gephyrea* is protruded in the same manner.

Trochal Disk.—This structure is the peculiar characteristic of the class. It is homologous with the ciliated bands of the larvae of Echinoderms, Chatopods, Molluscs, &c., and with the tentaculiferous apparatus of *Polyzoa* and *Gephyrea*, and has been termed in common with these a "velum." This velum presents itself in various stages of complexity. It is found as a single circum-oral ring (*plidium*), as a single præ-oral ring (Chatopod larve), or as a single præ-oral ring coexisting with one or more post-oral rings (Chatopod larve, Holothurian larve). We may here assume that the ancestral condition was a single circum-oral ring associated with a terminal mouth and the absence of an anus, and that the existence of other rings posterior to this is an expression of metameric segmentation, i.e., a repetition of similar parts. With the development of a protostomial condition a certain change necessarily takes place in the position of this band: a portion of it comes to lie longitudinally; but it may still remain a single band, as in the larva of many Echinoderms. How have the other above-mentioned conditions of the velum come about? How has the præ-oral band been developed? Two views have been held with regard to this question. According to the one view, the fact whether the single band is a præ-oral or a post-oral one depends upon the position in which the anus is about to develop. If the anus develops in such a position that mouth and anus lie on one and the same side of the band, the latter becomes præ-oral; if, however, the anus develops so that the mouth and anus lie upon opposite sides of the band, the band becomes post-oral. If we hold this view we must consider any second band, whether præ- or post-oral, to arise as a new development. The other view premises that the anus always forms so as to leave the primitive ring or "architroch" post-oral, i.e., between mouth and anus. Concurrently with the development of a prostomium this architroch somewhat changes its position and the two lateral portions come to lie longitudinally; these may be supposed to have met in the median dorsal line and to have coalesced so as to leave two rings—the one præ-oral (a "cephalotroch"), the other post-oral (a "branchiotroch"); this latter may atrophy, leaving the single præ-oral ring, or it may become further developed and thrown into more or less elaborate folds. The existing condition of the trochal disk or velum in the *Rotifera* seems to the writer of this article to bear out the latter view as to the way in which modifications of the velum may have come about.

In its simplest condition it forms a single circum-oral ring, as in *Microcodon* (fig. 1, d). The structures at the sides of the mouth in this form are stated to be bristles, and have therefore nothing to do with the velum (fig. 4, A, p). This simple ring may become thrown into folds, so forming a series of processes standing up around the mouth; this is the condition in *Stephanoceros* (fig. 4, B, p). There are, however, but few forms presenting this simple condition; and it must be remembered that the evidence for the assumption here made, that this is a persistent architroch and not a branchiotroch persisting where a cephalotroch has vanished, is not at present conclusive. This band, may, while remaining single and perfectly continuous, become prolonged around a lobe overhanging the mouth—a prostomium. This condition occurs in *Philodina* (fig. 4, E, F, p); the two sides of the post-oral ring do not meet dorsally, but are carried up and are continuous with the row of cilia lining the "wheels." There is thus one continuous ciliated band, a portion of which runs up in front of the mouth. This condition corresponds to that of the Auricularian larva. The folding of the band has become already somewhat complicated; a hypothetical intermediate condition is shown in fig. 4, C, D. The next stage in the advancing complexity is that the prostomial portion of the band (fig. 4, C, H, p) becomes separated as a distinct ring, a cephalotroch; we find such a stage in *Lacinularia* (fig. 4,

C, H), where both cephalotroch and branchiotroch remain fairly simple in shape. In *Melicerta* (fig. 4, I, J) both cephalotroch and branchiotroch are thrown into folds. Lastly, we find that in such forms as *Brachionus* the cephalotroch becomes first convoluted and

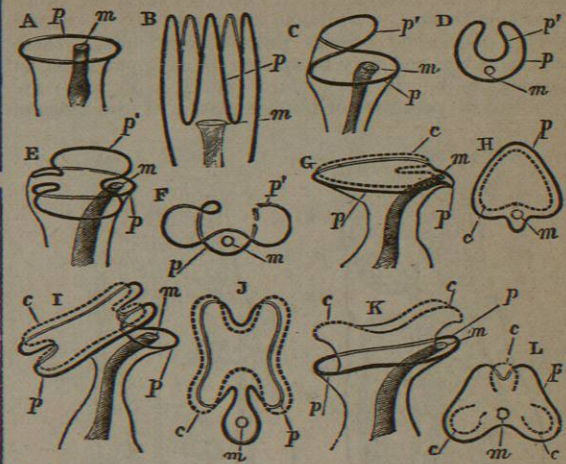


FIG. 4.—Diagrams of the Trochal Disk. A, *Microcodon*; B, *Stephanoceros*; the mouth lies in the centre of a group of ten acles. C, hypothetical intermediate form between *Microcodon* and *Philodina*, showing the development of a prostomial portion of the velum. D, dorsal view of the same. E, *Philodina*. F, dorsal view of the same. G, *Lacinularia*; the dotted line represents the portion of the velum which has become separated as a special ring—a cephalotroch. H, dorsal view of the same. I, *Melicerta*; the dotted line represents the cephalotroch; both this and the branchiotroch have become thrown into folds. J, dorsal view of the same. K, *Brachionus*; there is a large præ-oral lobe with three ciliated regions, shown by the dotted lines c, c, a discontinuous cephalotroch. L, dorsal view of the same. m, mouth; p, p', velum; p, architroch; p', portion of the architroch which becomes carried forward to line the prostomial region, but does not become separated; c, cephalotroch. (Original.)

then discontinuous (fig. 4, K, L, c), and further it may become so reduced as to be represented only by a few isolated tufts, as in *Asplanchna* (fig. 1, i, x and x'); in such a form as *Lindia* (fig. 6, c) the branchiotroch has vanished and the cephalotroch has become reduced to the two small patches at the sides of the head.

The trochal apparatus serves the *Rotifera* as a locomotive organ and to bring the food particles to the mouth; the cilia work so as to produce currents towards the mouth.

Digestive System.—This consists of the following regions:—(1) the oral cavity; (2) the pharynx; (3) the œsophagus; (4) the stomach; (5) the intestine, which terminates in an anus. The anus is absent in one group.

The pharynx contains the *mastax* with its teeth; these are calcareous structures, and are known as the *trophi*. In a typical mastax (8, 9) (*Brachionus*, fig. 5, A) there are a median anvil or *incus* and two hammer-like portions, *mallei*. The *incus* consists of two *rami* (e) resting upon a central *fulcrum* (f); each malleus consists of a handle or *manubrium* (c) and a head or *uncus* (d), which often presents a comb-like structure. Fig. 5 shows some of the most important modifications which the apparatus may exhibit. The parts may become very slender, as in *Diglena forcipata* (fig. 5, B); the mallei may be absent, as in *Asplanchna* (fig. 5, C), the rami being highly developed into curved forceps and movable one on the other; or, the manubria being absent and the fulcrum rudimentary, the rami may become massive and subquadrate, as in *Philodina* (fig. 5, D). All the true Rotifers possess a mastax. Ehrenberg's group of the *Agomphina* consisted of a heterogeneous collection of forms, —*Ichthydium* and *Chætonotus* being *Gastrotricha*, and *Cyphonautis*

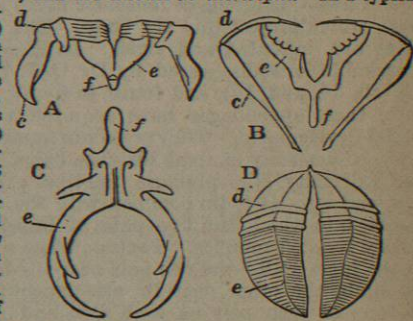


FIG. 5.—Trophi of various forms: A, *Brachionus*; B, *Diglena forcipata*; C, *Asplanchna*; D, *Philodina*. f, fulcrum, and c, e, rami, forming the *incus*; c, manubrium, and d, uncus, forming the malleus. (After Hudson.)

a *Polyzoan* larva, while *Enteroplexa* is probably a male Rotifer, and, like the other males, in a reduced condition. There is no reason for considering this mastax as the homologue of either the gastric mill of Crustaceans on the one hand or the teeth in the Chatopods' pharynx on the other; it is merely homoplastic with these structures, but has attained a specialized degree of development. Both the pharynx and the œsophagus which follows it are lined with chitin. The œsophagus varies in length and in some genera is absent (*Philodina*), the stomach following immediately upon the pharynx. The stomach is generally large; its wall consists of a layer of very large ciliated cells, which often contain fat globules and yellowish-green or brown particles, and outside these a connective tissue membrane; muscular fibrillæ have also been described. Very constantly a pair of glands open into the stomach, and probably represent the hepato-pancreatic glands of other Invertebrates.

Following upon the stomach there is a longer or shorter intestine, which ends in the cloaca. The intestine is lined by ciliated cells. In forms living in an urceolus the intestine turns round and runs forward, the cloaca being placed so as to debouch over the margin of the urceolus. The cloaca is often very large; the nephridia and oviducts may open into it, and the eggs lodge there on their way outwards; they are thrown out, as are the faecal masses, by an eversion of the cloaca. *Asplanchna*, *Notommatata sieboldii*, and certain species of *Ascomorpha* are said to be devoid of intestine or anus, excrementitious matters being ejected through the mouth (11).

Nephridia.—The coelom contains a fluid in which very minute corpuscles have been detected. There is no trace of a true vascular system. The nephridia (fig. 2, B, n) present a very interesting stage of development. They consist of a pair of tubules with an intracellular lumen running up the sides of the body, at times merely sinuous, at others considerably convoluted. From these are given off at irregular intervals short lateral branches, each of which terminates in a flame-cell precisely similar in structure to the flame-cells found in Planarians, Trematodes, and Cestodes; here as there the question whether they are open to the coelom or not must remain at present undecided. At the base these tubes open either into a permanent bladder which communicates with the cloaca or into a structure presenting apparently no advance in its development upon the contractile vacuole of a ciliated Infusorian.

Nervous System and Sense-Organs.—Various structures have been spoken of as nervous which are now acknowledged to have been erroneously so described (18). There is a supra-œsophageal ganglion which often attains considerable dimensions, and presents a lobed appearance (fig. 2, A and B, g). Connected with this are the eye-spots, which are seldom absent. Where these are most highly developed a lens-like structure is present, produced by a thickening of the cuticle. In the genus *Rotifer* and other forms these are placed upon the protrusible portion of the head, and so appear to have different positions at different moments. The number of eye-spots varies from one to twelve or more. They are usually red, reddish-brown, violet, or black in colour. Other structures are found which doubtless act as sense-organs. The calcar above-mentioned generally bears at its extremity stiff hairs which have been demonstrated to be in connexion with a nerve fibril. On the ventral surface of the body just below the mouth a somewhat similar structure is often developed—the chin. There are besides at times special organs, like the two lateral organs in *Microcodon* (fig. 1, D, s), which no doubt in common with the calcar and chin have a tactile function.

Reproductive Organs and Development.—The *Rotifera* were formerly considered to be hermaphrodite, but, while the ovary was always clear and distinct, there was always some difficulty about the testis, and various structures were put forward as representing that organ. One by one, however, small organisms have been discovered and described as the males of certain species of Rotifers, until at the present time degenerated males are known to occur in all the families except that of the *Philodinidae*. The male Rotifers are provided with a single circlet of cilia (a peritroch), a nerve ganglion, eye-spots, muscles, and nephridial tubules all in a somewhat reduced condition, but there is usually no trace of mouth or stomach, the main portion of the body being occupied by the testicular sac. There is an aperture corresponding with the cloaca of the female, where the testis opens into the base of an eversible penis. The males of *Floscularia* are shown in fig. 1. The male of *Pedalion mira* possesses rudimentary appendages. The ovary is usually a large gland lying beside the stomach connected with a short oviduct which opens into the cloaca. The ova often present a reddish hue (*Philodina roscola*, *Brachionus rubens*), due doubtless, like the red colour of many Crustacean ova, to the presence of tetronerythrin.

Up to the present our embryological knowledge of the group is very incomplete. Many Rotifers are known to lay winter and summer eggs of different character. The winter eggs are provided with a thick shell and probably require fertilization. Two or three of them are often carried about attached to the parent (*Brachionus*, *Notommatata*), but they are usually laid and fall into the mud, there to remain till the following spring. The summer eggs are of two kinds, the so-called male and female ova, both of which are stated to develop parthenogenetically. They may be carried about in

large numbers in the cloaca or oviduct or attached to the body of the parent. The female ova give rise to female and the male ova to male individuals. Male individuals are only formed in the autumn in time to fertilize the winter ova.

Habitat and Mode of Life.—The *Rotifera* are distributed all over the earth's surface, inhabiting both fresh and salt water. The greater number of species inhabit fresh water, occurring in pools, ditches, and streams. A few species will appear in countless numbers in infusions of leaves, &c., but their appearance is generally delayed until the putrefaction is nearly over. Species of *Rotifer* and *Philodina* appear in this way. A few marine forms only have been described—*Brachionus mulleri*, *B. heptatonus*, *Synchæta baltica*, and others.

A few forms are parasitic. *Albertia* lives in the intestine of the earthworm; a form has been described as occurring in the body-cavity of *Synapta*; a small form was also observed to constantly occur in the velar and radial canals of the freshwater jelly-fish, *Limnocolidium*. *Notommatata parasitica* leads a parasitic existence within the hollow spheres of *Volvox globator*, sufficient oxygen being given off by the *Volvox* for its respiration.

Many Rotifers exhibit an extraordinary power of resisting drought. Various observers have dried certain species upon the slide, kept them dry for a certain length of time, and then watched them come to life very shortly after the addition of a drop of water. The animal draws itself together, so that the cuticle completely protects all the softer parts and prevents the animal itself from being thoroughly dried. This process is not without parallel in higher groups; e.g., many land snails will draw themselves far into the shell, and secrete a complete operculum, and can remain in this condition for an almost indefinite amount of time. The eggs are also able to withstand drying, and are probably blown about from place to place. The *Rotifera* can bear great variations of temperature without injury.

Since their removal from among the *Protozoa* various attempts have been made to associate the *Rotifera* with one or other large phylum of the animal kingdom. Huxley, insisting upon the importance of the trochal disk, put forward the view that they were "permanent Echinoderm larvæ," and formed the connecting link between the *Nemertidae* and the Nematoid worms. Ray Lankester proposed to associate them with the *Chatopoda* and *Arthropoda* in a group *Appendiculata*, the peculiarities in the structure of *Pedalion* forming the chief reason for such a classification. There is, however, no proof that we thus express any genetic relationship. The well-developed coelom, absence of metameric segmentation, persistence of the trochal disk in varying stages of development, and the structure of the nephridia are all characters which point to the *Rotifera* as very near representatives of the common ancestors of at any rate the *Mollusca*, *Arthropoda*, and *Chatopoda*. But the high development of the mastax, the specialized character of the lorica in many forms, the movable spines of *Polyarthra*, the limbs of *Pedalion*, and the lateral appendages of *Asplanchna*, the existence of a diminutive male, the formation of two varieties of ova, all point to a specialization in the direction of one or other of the above mentioned groups. Such specialization is at most a slight one, and does not justify the definite association of the *Rotifera* in a single phylum with any of them.

Classification.—The following classification has been recently put forward by Dr C. T. Hudson (19).

CLASS ROTIFERA.

Order I.—Rhizota.

Fixed forms; foot attached, transversely wrinkled, non-retractile, truncate.

- Fam. 1. FLOSCULARIADÆ. *Floscularia*, *Stephanoceros*.
- Fam. 2. MELICERTADÆ. *Melicerta*, *Cephalosiphon*, *Megalotrocha*, *Limnias*, *Æcistes*, *Lacinularia*, *Conochilus*.

Order II.—Bdelloida.

Forms which swim and creep like a leech; foot retractile, jointed, telescopic, termination furcate.

Fam. 3. PHILODINAE. Philodina, Rotifer, Callidina.

Order III.—Ploima.

Forms which swim only.

Grade A. ILLORICATA.

- Fam. 4. HYDATINAE. Hydatina, Rhinops.
Fam. 5. SYNCHETADE. Syncheta, Polyarthra.
Fam. 6. NOTOMMATAE. Notommata, Diglena, Furcularia, Scaridium, Pleurotrocha, Distemma.
Fam. 7. TRIARTHRAE. Triarthra.
Fam. 8. ASPLANCHNAE. Asplanchna.

Grade B. LORICATA.

- Fam. 9. BRACHIONIDE. Brachionus, Notois, Anuraea, Sacculus.
Fam. 10. PTERODINAE. Pterodina, Pompholyx.
Fam. 11. EUCLANIDE. Euclanias, Salpina, Diplaz, Monostyla, Colurus, Monura, Metopodia, Stephanops, Monocerca, Mastigocerca, Dinocaris.

Order IV.—Scirtopoda.

Forms which swim with their ciliary wreath, and skip by means of hollow limbs with internal locomotor muscles.

Fam. 12. PEDALIONIDE. Pedalion.

The above list includes only the principal genera. There are, however, a number of forms which could not be placed in any of the above families.

ABERRANT FORMS.

Trochosphaera equatorialis (fig. 6, c), found by Semper in the Philippine Islands, closely resembles a monotrochal polychaetous

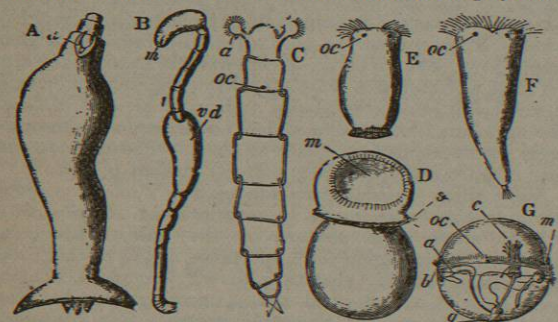


FIG. 6.—Various aberrant forms. A, Balatro calvus (after Claparède); a, mastax. B, Sison nebulosus (after Claus); m, mouth; vd, position of the aperture of the vas deferens. C, Lindia torulosa; a, ciliated processes at the sides of the head representing cephalotroch; oc, eye-spots. D, E, and F, Apsilus lentiformis (after Mecznikow). D, adult female with expanded proboscis; m, position of the mouth; s, lateral sense-organs. E, young free-swimming female. F, adult male. G, Trochosphaera equatorialis (after Semper); m, mouth; g, ganglion; a, anus; b, velum; oc, eye-spot; c, muscles.

larva while possessing undoubtedly Rotifer characters. Mecznikow has described a remarkable form, Apsilus lentiformis (fig. 6, D, E, and F), the adult female of which is entirely devoid of cilia but possesses a sort of retractile hood; the young female and the males are not thus modified. Claparède discovered fixed to the bodies of small Oligochaetes a curious non-ciliated form, Balatro calvus (fig. 6, A), which has a worm-like very contractile body and a well-developed mastax. As mentioned above, the ciliation is reduced to a minimum in the curious worm-like form Lindia (fig. 6, C). Sison nebulosus (fig. 6, B), living on the surface of Nebalia, which was described originally by Grube, is the same form as the Saccobdella nebulosus, which was supposed by Van Beneden and Hesse to be a leech. It has been shown by Claus to be merely an aberrant Rotifer. Of the curious aquatic forms Ichthydium, Chaetonotus, Turbanella, Dasyditis, Cephalidium, Chaetura, and Hemidasys, which Mecznikow and Claparède included under the name Gastrotricha, no further account can be given here. They are possibly allied to the Rotifera but are devoid of mastax and trochal disk.

The following are some of the more important memoirs etc., on the Rotifera. (1) Leeuwenhoek, Phil. Trans. 1701-1704. (2) Ehrenberg, Die Infusiothierchen als vollkommene Organismen, 1838. (3) M. F. Dujardin, Hist. Nat. des Zoophytes Infusoires, 1841. (4) W. C. Williamson, "On Melicerta ringens," Quart. Jour. Micr. Sci., 1853. (5) Ph. H. Gosse, "On Melicerta ringens," Trans. Micr. Soc., 1853. (6) T. H. Huxley, "On Lacinularia socialis," Trans. Micr. Soc., 1853. (7) Fr. Leydig, "Ueber den Bau und die systematische Stellung der Räderthiere," Zeit. f. w. Zool., vi., 1854. (8) Ph. H. Gosse, Phil. Trans., 1856. (9) F. Cohn, Zeit. f. w. Zool., vii., ix., and xii. (10) Ph. H. Gosse, Phil. Trans., 1858. (11) Pritchard, Infusoria, 1861. (12, 13, 14) C. T. Hudson, "On Pedalion," Quart. Jour. Micr. Sci., 1872, and Monthly Micr. Jour., 1871 and 1872. (15) E. Ray Lankester, "On Pedalion," Quart. Jour. Micr. Sci., 1872. (16) El. Mecznikow, "On Apsilus lentiformis," Zeit. f. w. Zool., 1872. (17) C. Semper, "On Trochosphaera," Zeit. f. w. Zool., xxii., 1872. (18) K. Eckstein, "Die Rotatorien der Umgegend von Giessen," Zeit. f. w. Zool., 1883. (19) C. T. Hudson, "On an Attempt to reclassify Rotifers," Quart. Jour. Micr. Sci., 1884. (A. G. B.)

ROTROU, JEAN DE (1609-1650), the greatest tragic poet of France before Corneille, was born on August 21, 1609 at Dreux in Normandy, and died of the plague at the same place on the 28th June 1650. His family was of small means but of not inconsiderable station, and seems to have had a kind of hereditary connexion with the magistracy of the town of Dreux. He himself was "lieutenant particulier et civil," a post not easy to translate, but apparently possessing some affinity to a Scotch sheriffship substitute. Rotrou, however, went very early to Paris, and, though three years younger than Corneille, with whom he was intimately acquainted, began play-writing before him. With few exceptions the only events recorded of his life are the successive appearances of his plays and his enrolment in the band of five poets who had the not very honourable or congenial duty of turning Richelieu's dramatic ideas into shape. Rotrou's own first piece, L'Hypocondriaque, appeared when he was only seventeen. His second, La Bague de l'Oubli, an adaptation in part from Lope de Vega, was much better, much more suggestive, and much more characteristic. It is the first of several plays in which Rotrou, following or striking out for himself a way which did not lead to much for the time but which was again entered at the Romantic revival, endeavoured to naturalize in France the romantic comedy which had flourished in Spain and England instead of the classical tragedy of Seneca and the classical comedy of Terence. Corneille, as is known to readers of his early work, had considerable leanings in the same direction, and yielded but slowly and unwillingly to the pressure of critical opinion and the public taste. Rotrou's brilliant but hasty and unequal work showed throughout marks of a stronger adhesion to the Spanish (it is needless to say that neither writer is likely to have known the English) model. Cleagénor et Doristée, Diane, Les Occasions Perdues, L'Heureuse Constance, pieces which succeeded each other very rapidly, were all in the Spanish style. Then the author changed his school, and, in 1632, imitated very closely the Menæchmi of Plautus and the Hercules Cingus of Seneca. A crowd of comedies and tragi-comedies followed, and by the time he was twenty-eight (when documents exist showing the sale of two batches of them to the bookseller Quinet for the sum of 220 livres tournois) Rotrou had written nearly a score of plays. He was married in 1640, and had three children, a son and two daughters (none of whom, however, continued the name), and it seems that he went to live at Dreux. Previously, vague and anecdotal tradition describes him as having led rather a wild life in Paris, and especially as having been much addicted to gambling. Among his pieces written before his marriage were a translation of the Amphitryon under the title of Les Deux Sosies, which was not useless to Molière, Antigone, which was not useless to Racine, and Laure Persecutée (in the opposite style to these classical pieces), which has much merit. These were followed by others until, in 1646 and 1647, Rotrou produced his three masterpieces, Saint Genest, a story of Christian martyrdom containing some amusing by-play, one noble speech, and a good deal of dignified action; Don Bertrand de Cabrère, a comedy of merit; and Venceslas, which is considered in France his masterpiece, and which in a manner kept the stage till our own times. The subject (in which a father, being constrained to choose between his duty as king and his parental affection, pardons his son for a murder he has committed, but immediately abdicates as feeling himself unworthy to reign) was taken from Francisco de Rojas; the execution

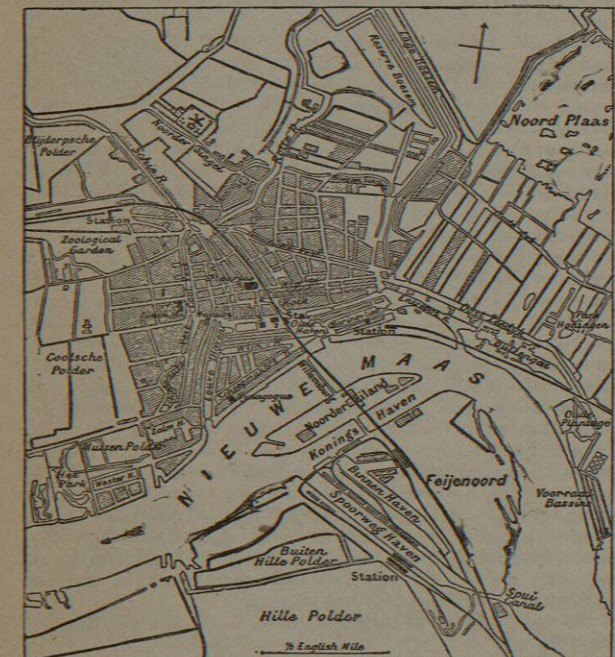
though unequal, is in parts very fine. Rotrou's death and its circumstances are known to many who never read a line of his plays. He was in Paris when the plague broke out at Dreux; the mayor fled, and all was confusion. Rotrou, reversing the conduct of Montaigne in somewhat similar circumstances, at once went to his post, caught the disease, and died in a few hours. Rotrou's great fertility (he has left thirty-five collected plays besides others lost, strayed, or uncollected), and perhaps the uncertainty of dramatic plan shown by his hesitation almost to the last between the classical and the romantic style, have injured his work. He has no thoroughly good play, hardly one thoroughly good act. But his situations are often pathetic and noble, and as a tragic poet properly so called he is at his best almost the equal of Corneille and perhaps the superior of Racine. His single lines and single phrases have a brilliancy and force not to be found in French drama between Corneille and Hugo. A complete edition of Rotrou was edited in five volumes by Viollet le Duc in 1820. In 1882 M. de Ronchaud published a handsome edition of six plays—Saint Genest, Venceslas, Don Bertrand de Cabrère, Antigone, Hercule Mourant, and Cosroes,—the latter Rotrou's last play and a remarkable one. Venceslas and Saint Genest are also to be found in the Chefs-d'œuvre Tragiques of the Collection Didot. ROTTERDAM, a city of the Netherlands in the province of South Holland, situated in 51° 55' 19" N. lat. and 4° 29' 7" E. long., on the right bank of the Nieuwe Maas at the point where it is joined by the Rotte, a small

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the south bank of the river) into those of Delfshaven, Kralingen, and Hillegersberg. A huge dyke on which stands Hoog Straat or High Street divides the triangular portion into nearly equal parts—the inner and the outer town; and the latter is cut up into a series of peninsulas and islands by the admirable system of harbours to which Rotterdam owes so much of its prosperity. The central part of the river frontage is lined by a broad quay called the Boompjes from the trees with which it is planted. From the apex of the triangle the town is bisected by a great railway viaduct (erected about 1870, and mainly constructed of iron), which is continued across the river to Fijenoord and the south bank by a bridge on a similarly grand scale, the line being the Great Southern Railway which connects Belgium and Holland and crosses the Hollandsch Diep by the Moerdijk bridge. Parallel with



Environs of Rotterdam.



Plan of Rotterdam.

stream rising near Moerkapelle. By rail it is 14 1/2 miles south-east of The Hague and 44 1/2 south of Amsterdam. As defined by its 17th-century fortifications the town was an isosceles triangle with a base of 1 1/2 miles along the river, but in modern times it has spread out in all directions beyond the limits of its own commune (which was increased in 1869 by the island of Fijenoord and part of

the railway bridge the municipality, in 1873, built a road-bridge, and apart from their ordinary function these constructions have proved a sufficient barrier to prevent the ice-blocks of the upper part of the river from descending so as to interfere with the seaward navigation. Tramways, introduced in 1880, are being gradually extended to various suburbs. While some nine or ten Protestant sects, the Roman Catholics, the Old Roman Catholics, and the Jews are all represented in Rotterdam, none of the ecclesiastical buildings are of primary architectural interest. The Groote Kerk or Laurenskerk is a Gothic brick structure of the fifteenth century with a tower 297 feet high; it has a fine rood screen and an excellent organ, and contains the monuments of Lambert Hendrikszoon, Egbert Meeuweszoon Kortenaar, Witte Corneliszoon de Witt, Johan van Brakel, Johan van Liefde, and other Dutch naval heroes. Among the more conspicuous secular buildings are the Boymans Museum, the town-house (restored in 1823-1827), the exchange (1723), the Delft Gate (1766), the court-house, the post and telegraph office (1875), the corn exchange, the seamen's home (1855), the hospital (1846), and the theatres. The Boymans Museum is mainly a picture gallery, which became the property of the town in 1847. When the building, originally erected in 1662-63 as the assembly house of Schieland, was burned down in 1864, most of the pictures perished, but the museum was restored by 1867, and the collection, steadily recruited, is again rich in the works of Dutch artists. The ground floor also contains the city archives and the city library. The maritime museum, established in 1874 by the Yacht Club, is a remarkable collection of ship models, and the Society of Experimental Philosophy has a considerable collection of instruments, books, and specimens. At the north-west corner of the town an area of several acres is occupied by the zoological garden, which dates from 1857. Besides the Erasmus Gymnasium the