

his son Phraates IV. successor, but was soon afterwards killed by him (37 B.C.; Dio. Cass. 49.23; Justin 42.4; Plut. *Crassus*, 33). Plutarch relates that Orodes understood Greek very well; after the death of Crassus the *Bacchae* of Euripides were represented at his court (Plut. *Crass.* 33).

2. ORODES II., raised to the throne by the magnates after the death of Phraates V. about A.D. 5, was killed after a short reign "on account of his extreme cruelty" (Joseph. *Ant.* xviii. 2, 4). (ED. M.)

**OROGRAPHY** (Gr. *ὄρος*, mountain, *γράφειν*, to write), that part of physical geography which deals with the geological formation, the surface features and description of mountains. The terms "oreography," "orology" and "oreology" are also sometimes used.

**ORONTES**, the ancient name of the chief Syrian river, also called DRACO, TYPHON and AXIUS, the last a native form, from whose revival, or continuous employment in native speech, has proceeded the modern name 'Asi ("rebel"), which is variously interpreted by Arabs as referring to the stream's impetuosity, to its unproductive channel, or to the fact that it flows away from Mecca. The Orontes rises in the great springs of Labweh on the east side of the Buka'a, or inter-Lebanon district, very near the fountains of the southward-flowing Litani, and it runs due north, parallel with the coast, falling 2000 ft. through a rocky gorge. Leaving this it expands into the Lake of Homs, having been dammed back in antiquity. The valley now widens out into the rich district of Hamah (*Hamah-Epiphaneia*), below which lie the broad meadow-lands of Ghāb, containing the sites of ancient Apamea and Larissa. This central Orontes valley ends at the rocky barrier of Jisr al-Hadid, where the river is diverted to the west, and the plain of Antioch opens. Two large tributaries from the N., the Afrin and Kara Su, here reach it through the former Lake of Antioch, which is now drained through an artificial channel (Nahr al-Kowsit). Passing N. of the modern Antakia (Antioch) the Orontes plunges S.W. into a gorge (compared by the ancients to Tempe), and falls 150 ft. in 10 m. to the sea just south of the little port of Suedia (anc. *Seleucia Pieriae*), after a total course of 170 m. Mainly un-navigable and of little use for irrigation, the Orontes derives its historical importance solely from the convenience of its valley for traffic from N. to S. Roads from N. and N.E., converging at Antioch, follow the course of the stream up to Homs, where they fork to Damascus and to Coele-Syria and the S.; and along its valley have passed the armies and traffic bound to and from Egypt in all ages. (See ANTIOCH and HOMS.) (D. G. H.)

**OROPUS**, a Greek seaport, on the Euripus, in the district Παιραϊκή, opposite Eretria. It was a border city between Boeotia and Attica, and its possession was a continual cause of dispute between the two countries; but at last it came into the final possession of Athens, and is always alluded to under the Roman empire as an Attic town. The actual harbour, which was called Delphinium, was at the mouth of the Asopus, about a mile north of the city. A village still called Oropo occupies the site of the ancient town. The famous oracle of Amphiaraus was situated in the territory of Oropus, 12 stadia from the city. The site has been excavated by the Greek Archaeological Society; it contained a temple, a sacred spring, into which coins were thrown by worshippers, altars and porticoes, and a small theatre, of which the proscenium is well preserved. Worshippers used to consult the oracle of Amphiaraus by sleeping on the skin of a slaughtered ram within the sacred building.

**OROSIUS, PAULUS** (fl. 415), historian and theologian, was born in Spain (possibly at Braga in Galicia) towards the close of the 4th century. Having entered the Christian priesthood, he naturally took an interest in the Priscillianist controversy then going on in his native country, and it may have been in connexion with this that he went to consult Augustine at Hippo in 413 or 414. After staying for some time in Africa as the disciple of Augustine, he was sent by him in 415 to Palestine with a letter of introduction to Jerome, then at Bethlehem. The

ostensible purpose of his mission (apart, of course, from those of pilgrimage and perhaps relic-hunting) was that he might gain further instruction from Jerome on the points raised by the Priscillianists and Origenists; but in reality, it would seem, his business was to stir up and assist Jerome and others against Pelagius, who, since the synod of Carthage in 411, had been living in Palestine, and finding some acceptance there. The result of his arrival was that John, bishop of Jerusalem, was induced to summon at his capital in June 415 a synod at which Orosius communicated the decisions of Carthage and read such of Augustine's writings against Pelagius as had at that time appeared. Success, however, was scarcely to be hoped for amongst Orientals who did not understand Latin, and whose sense of reverence was unshocked by the question of Pelagius, *et quis est mihi Augustinus?* All that Orosius succeeded in obtaining was John's consent to send letters and deputies to Innocent of Rome; and, after having waited long enough to learn the unfavourable decision of the synod of Diospolis or Lydda in December of the same year, he returned to north Africa, where he is believed to have died. According to Genadius he carried with him recently discovered relics of the protomartyr Stephen from Palestine to Minorca, where they were efficacious in converting the Jews.

The earliest work of Orosius, *Consultatio sive commonitorium ad Augustinum de errore Priscillianistarum et Origenistarum*, explains its object by its title; it was written soon after his arrival in Africa, and is usually printed in the works of Augustine along with the reply of the latter, *Contra Priscillianistas et Origenistas liber ad Orosium*. His next treatise, *Liber apologeticus de arbitrii libertate*, was written during his stay in Palestine, and in connexion with the controversy which engaged him there. It is a keen but not always fair criticism of the Pelagian position from that of Augustine. The *Historiae adversum Paganos* was undertaken at the suggestion of Augustine, to whom it is dedicated. When Augustine proposed this task he had already planned and made some progress with his own *De civitate Dei*; it is the same argument that is elaborated by his disciple, namely, the evidence from history that the circumstances of the world had not really become worse since the introduction of Christianity. The work, which is thus a pragmatical chronicle of the calamities that have happened to mankind from the fall down to the Gothic period, has little accuracy or learning, and even less of literary charm to commend it; but it was the first attempt to write the history of the world as a history of God guiding humanity. Its purpose gave it value in the eyes of the orthodox, and the *Historiae*, *Ormesia*, or *Ormistia* as it was called, no one knows why (from Or[osius] M[undus] Hist[oria] or from *de miseria mundi?* see Möerner, p. 180, for list of guesses), speedily attained a wide popularity. Nearly two hundred MSS. of it have survived. A free abridged translation by King Alfred is still extant (Old English text, with original in Latin, edited by H. Sweet, 1883). The *editio princeps* of the original appeared at Augsburg (1471); that of Haverkamp (Leiden, 1738 and 1767) has now been superseded by C. Zangemeister, who has edited the *Hist.* and also the *Lib. apol.* in vol. v. of the *Corp. scr. eccl. Lat.* (Vienna, 1882), as well as an edit. min. (Leipzig, Teubner, 1889). The "sources" made use of by Orosius have been investigated by T. de Möerner (*De Orosii vita ejusque hist. libr. vii. adversum Paganos*, 1844); besides the Old and New Testaments, he appears to have consulted Caesar, Livy, Justin, Tacitus, Suetonius, Florus and a cosmography, attaching also great value to Jerome's translation of the *Chronicles* of Eusebius.

**ORPHAN**, the term used of one who has lost both parents by death, sometimes of one who has lost father or mother only. In Law, an orphan is such a person who is under age. The Late Lat. *orphanus*, from which the word, chiefly owing to its use in the Vulgate, was adopted into English, is a transliteration of ὀρφανός, in the same sense, the original meaning being "bereft of," "destitute," classical Lat. *orbus*. The Old English word for an orphan was *steopcild*, stepchild. By the custom of the city of London, the lord mayor and aldermen, in the Court of Orphans, have the guardianship of the children still under age of deceased freemen. Orphans' courts exist for the guardianship of orphans and administration of their estates in Delaware, Maryland, New Jersey and Pennsylvania in the United States. In other states these are performed by officers of the Probate Court, known as "surrogates," or by other titles.

**ORPHEUS**, in Greek legend, the chief representative of the art of song and playing on the lyre, and of great importance in the religious history of Greece. The derivation of the name is uncertain, the most probable being that which connects it with

ὄρφ- ("dark," ὄρφιναιός, ὄρφιν). In accordance with this, Orpheus may have been originally a god of darkness; or the liberator from the power of darkness by his gift of song; or he may have been so called because his rites were celebrated by night (cf. Dionysus Nyctelius). It is possible, but very improbable, that Orpheus was an historical personage; even in ancient times his existence was denied. According to Maass, he was a chthonian deity, the counterpart of Dionysus, with whom he is closely connected; J. E. Harrison, however, regards him as a religious reformer from Crete, who introduced the doctrine of *ecstasis* without intoxication amongst the Thracians and was slain by the votaries of the frenzied ritual. S. Reinach sees in him the fox roaming "in the darkness," to the Thracians a personification of the wine-god, torn in pieces by the Bassaræ (fox-maidens). Although by some he was held to be a Greek, the tradition of his Thracian origin was most generally accepted. His name does not occur in Homer or Hesiod, but he was known in the time of Ibycus (c. 530 B.C.), and Pindar (522-442 B.C.) speaks of him as "the father of songs." From the 6th century onwards he was looked upon as one of the chief poets and musicians of antiquity, the inventor or perfecter of the lyre, who by his music and singing was able not only to charm the wild beasts, but even to draw the trees and rocks from their places, and to arrest the rivers in their course. As one of the pioneers of civilization, he was supposed to have taught mankind the arts of medicine, writing and agriculture. As closely connected with religious life, he was an augur and seer; practised magical arts, especially astrology; founded or rendered accessible many important cults, such as those of Apollo and Dionysus; instituted mystic rites, both public and private; prescribed initiatory and purificatory ritual. He was said to have visited Egypt, and to have become acquainted there with the writings of Moses and with the doctrine of a future life.

According to the best-known tradition, Orpheus was the son of Oeagrus, king of Thrace, and the muse Calliope. During his residence in Thrace he joined the expedition of the Argonauts, whose leader Jason had been informed by Chiron that only by the aid of Orpheus would they be able to pass by the Sirens unscathed. His numerous services during the journey are described in the *Argonautica* that goes under his name. But the most famous story in which he figures is that of his wife Eurydice. While fleeing from Aristæus, she was bitten by a serpent and died. Orpheus went down to the lower world and by his music softened the heart of Pluto and Persephone, who allowed Eurydice to return with him to earth. But the condition was attached that he should walk in front of her and not look back until he had reached the upper world. In his anxiety he broke his promise, and Eurydice vanished again from his sight. The story in this form belongs to the time of Virgil, who first introduces the name of Aristæus. Other ancient writers, however, speak of his visit to the underworld; according to Plato, the infernal gods only "presented an apparition" of Eurydice to him.

After the death of Eurydice, Orpheus rejected the advances of the Thracian women, who, jealous of his faithfulness to the memory of his lost wife, tore him to pieces during the frenzy of the Bacchic orgies. His head and lyre floated "down the swift Hebrus to the Lesbian shore," where the inhabitants buried his head and a shrine was built in his honour near Antissa. The lyre was carried to heaven by the Muses, and was placed amongst the stars. The Muses also gathered up the fragments of his body and buried them at Leibethra below Olympus, where the nightingales sang over his grave, while yet another legend places his tomb at Dium, near Pydna in Macedonia. Other accounts of his death are: that he killed himself from grief at the failure of his journey to Hades; that he was struck with lightning by Zeus for having revealed the mysteries of the gods to men; or he was torn to pieces by the Maenads for having abandoned the cult of Dionysus for that of Apollo.

According to Gruppe, the legend of the death of Orpheus is a late imitation of the Adonis-Osiris myth. Osiris, like Orpheus, is torn in pieces, and his head floats down every year from Egypt to Byblus; the body of Attis, the Phrygian counterpart of Adonis, like that of Orpheus, does not suffer decay. The story is repeated

of Dionysus; he is torn in pieces, and his head is carried down to Lesbos. Without going so far as to assert that Orpheus is a hypothesis of Dionysus, there is no doubt that a close connexion existed between them from very early times. According to Frazer, these traditions may be "distorted reminiscences" of the practice of human sacrifice, especially of divine kings, the object of which was to ensure fertility in the animal and vegetable worlds. Orpheus, in the manner of his death, was considered to personate the god Dionysus, and was thus the representative of the god torn to pieces every year, a ceremony enacted by the Bacchæ in the earliest times with a human victim, afterwards with a bull to represent the bull-formed god. A distinct feature of this ritual was *ὠμοφαγία* (eating the flesh of the victim raw), whereby the communicants imagined that they consumed and assimilated the god represented by the victim, and thus became filled with the divine ecstasy. A. W. Bather (*Journ. Hell. Studies*, xiv. p. 254) sees in the myth an allusion to a ritual, the object of which is the expulsion of death or winter. It is possible that the floating of the head of Orpheus to Lesbos has reference to the fact that the island was the first home of lyric poetry, and may be symbolical of the route taken by the Aeolian emigrants from Thessaly on their way to their new home in Asia Minor.

The name of Orpheus is equally important in the religious history of Greece. He was the mythic founder of a religious school or sect, with a code of rules of life, a mystic eclectic theology, a system of purificatory and expiatory rites, and peculiar mysteries. This school is first observable under the rule of Peisistratus at Athens in the 6th century B.C. Its doctrines are founded on two elements: the Thracio-Phrygian religion of Dionysus with its enthusiastic orgies, its mysteries and its purifications, and the tendency to philosophic speculation on the nature and mutual relations of the numerous gods, developed at this time by intercourse with Egypt and the East, and by the quickened intercourse between different tribes and different religions in Greece itself. These causes produced similar results in different parts of Greece. The close analogy between Pythagoreanism and Orphism has been recognized from Herodotus (ii. 81) to the latest modern writers. Both inculcated a peculiar kind of ascetic life; both had a mystical speculative theory of religion, with purificatory rites, abstinence from beans, &c.; but Orphism was more especially religious, while Pythagoreanism, at least originally, inclined more to be a political and philosophical creed.

The rules of the Orphic life prescribed abstinence from beans, flesh, certain kinds of fish, &c., the wearing of a special kind of clothes, and numerous other practices and abstinences. The ritual of worship was peculiar, not admitting bloody sacrifices. The belief was taught in the homogeneity of all living things, in the doctrine of original sin, in the transmigration of souls, in the view that the soul is entombed in the body (*σῶμα σῆμα*), and that it may gradually attain perfection during connexion with a series of bodies. When completely purified, it will be freed from this "circle of generation" (*κύκλος γενέσεως*), and will again become divine, as it was before its entrance into a mortal body.

The chief ceremonies of the nightly ritual were sacrifice and libation; prayer and purification; the representation of sacred legends (e.g. the myth of Zagreus, the chief object of worship, who was identified with most of the numerous gods of the Orphic pantheon); the rape of Persephone; and the descent into Hades. These were introduced as a "sacred explanation" (*ἔρπος λόγος*) of the rules and prescriptions. To these also belong the rite of *ὠμοφαγία*, and the communication of liturgical formulae for the guidance of the soul of the dead man on his way to the underworld, which also served as credentials to the gods below. Some of the so-called "Orphic tablets," metrical inscriptions engraved on small plates of gold, chiefly dating from the 4th and 3rd centuries B.C., have been discovered in tombs in southern Italy, Crete and Rome.

It does not appear, however, that a regularly organized or numerous Orphic sect ever existed, nor that Orphism ever became popular; it was too abstract, too full of symbolism. On the other hand, the genuine Orphics, a fraternity of religious ascetics, found unscrupulous imitators and impostors, who preyed upon the credulous and ignorant. Such were the Orpheotelestæ or Metragyrtæ, wandering priests who went round the country with an ass carrying the sacred properties (Aristophanes, *Frogs*, 159) and a bundle of sacred books. They promised an easy expiation for crimes to both living and

dead on payment of a fee, undertook to punish the enemies of their clients, and held out to them the prospect of perpetual banqueting and drinking-bouts in Paradise.

A large number of writings in the tone of the Orphic religion were ascribed to Orpheus. They dealt with such subjects as the origin of the gods, the creation of the world, the ritual of purification and initiation, and oracular responses. These poems were recited at rhapsodic contests together with those of Homer and Hesiod, and Orphic hymns were used in the Eleusinian mysteries.<sup>1</sup> The best-known name in connexion with them is that of Onomacritus (*q.v.*), who, in the time of the Peisistratidae, made a collection (including forgeries of his own) of Orphic songs and legends. In later times Orphic theology engaged the attention of Greek philosophers—Eudemus the Peripatetic, Chrysippus the Stoic, and Proclus the Neoplatonist, but it was an especially favourite study of the grammarians of Alexandria, where it became so intermixed with Egyptian elements that Orpheus came to be looked upon as the founder of mysticism. The "rhapsodic theogony" in particular exercised great influence on Neoplatonism. The Orphic literature (of which only fragments remain) was united in a corpus, called τὰ Ὀρφικά, the chief poem in which was ἡ τοῦ Ὀρφέως Θεολογία. It also included a collection of Orphic hymns, liturgical songs, practical treatises, and poems on various subjects. The so-called *Orphic Poems*, still extant, are of much later date, probably belonging to the 4th century A.D.; they consist of: (1) an *Argonautica*, glorifying the deeds of Orpheus on the "Argo," (2) a didactic poem on the magic powers of stones, called *Lithica*, (3) eighty-seven hymns on various divinities and personified forces of nature. Some of these hymns are probably earlier (1st and 2nd centuries). The Orphic poems also played an important part in the controversies between Christian and pagan writers in the 3rd and 4th centuries after Christ; pagan writers quoted them to show the real meaning of the multitude of gods, while Christians retorted by reference to the obscene and disgraceful fictions by which the former degraded their gods.

**BIBLIOGRAPHY.**—C. A. Lobeck's *Aglaophamus* (1829) is still indispensable. Of more modern writings on Orpheus and Orphism the following may be consulted. The articles by O. Gruppe in Roscher's *Lexikon der Mythologie* and by P. Monceaux in Daremberg and Saglio's *Dictionnaire des antiquités*; "Orphica" in Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed., 1891), by L. C. Purser; J. E. Harrison, *Prolegomena to the Study of Greek Religion* (2nd ed., 1908, with a critical appendix by Gilbert Murray on the Orphic tablets); E. Rohde, *Psyche*, ii. (1907), and article in *Heidelberger Jahrbücher* (1896); E. W. Maass, *Orpheus* (1895); S. Reinach, "La mort d'Orphée" in *Cultes, mythes, et religions*, ii. (1906); O. Gruppe, *Griechische Mythologie*, ii. (1906), pp. 1028-1041; T. Gomperz, *Greek Thinkers*, i. (Eng. trans., 1901), pp. 84-90, 123-147; E. Gerhard, *Über Orpheus und die Orphiker* (1861); A. Dieterich, *Nekyia* (1893), pp. 72-108, 136-162, 225-232; O. Kern, *De Orpheo, Epimenidis, Pherecydis theogoniis* (1888); O. Gruppe, *Die rhapsodische Theogonie* (1890); A. Dieterich, *De hymnis Orphicis* (1891); G. F. Schömann, *Griechische Alterthümer*, ii. (ed. J. H. Lipsius, 1902), p. 378; P. Stengel, *Die griechischen Kultusaltertümer* (1898), p. 150.

There is an edition of the Orphic Fragments and of the poems by E. Abel (1885). The *Argonautica* has been edited separately by J. W. Schneider (1803), the *Lithica* by T. Tyrwhitt (1791), and there is an English translation of the *Hymns* by T. Taylor (re-printed, 1896).

On the representations of Orpheus in heathen and Christian art (in which he is finally transformed into the Good Shepherd with his sheep), see A. Baumeister, *Denkmäler des klassischen Alterthums*, ii. p. 1120; P. Knapp, *Über Orpheusdarstellungen* (Tübingen, 1895); F. X. Kraus, *Realencyklopädie des christlichen Alterthums*, ii. (1886); J. A. Martigny, *Dictionnaire des antiquités chrétiennes* (1889); A. Heussner, *Die altchristlichen Orpheusdarstellungen* (Leipzig, 1893); and the articles in Roscher's and Daremberg and Saglio's *Lexicons*.

The story of Orpheus, as was to be expected of a legend told both by Ovid and Boetius, retained its popularity throughout the middle ages and was transformed into the likeness of a northern fairy tale. In English medieval literature it appears in three somewhat different versions: *Sir Orpheo*, a "lay of Brittany" printed from the Harleian MS. in J. Ritson's *Ancient English Metrical Romances*, vol. ii. (1802); *Orpheo and Heurodis* from the Auchinleck MS. in David Laing's *Select Remains of the Ancient Popular Poetry of Scotland* (new ed., 1885); and *Kyng Orfew* from the Ashmolean MS. in J. O. Halliwell's *Illustrations of Fairy Mythology* (Shakespeare Soc., 1842). The poems show traces of French influence.

(J. H. F.; X.)

**ORPHREY**, gold or other richly ornamented embroidery, particularly an embroidered border on an ecclesiastical vestment (see VESTMENTS). The word is from O. Fr. *orfreis*, mod. *orfroi*, from med. Lat. *aurifrisium*, *aurifrigium*, &c., for *auriphrygium*,

<sup>1</sup> For Orphism in relation to the Eleusinian and other mysteries see MYSTERY.

*aurum*, gold, and *phrygium*, Phrygian; a name given to gold-embroidered tissues, also known as *vestes Phrygiae*, the Phrygians being famous for their skill in embroidering in gold.

**ORPIMENT** (*auripigmentum*), arsenic trisulphide, As<sub>2</sub>S<sub>3</sub>, or yellow realgar (*q.v.*), occurring in small quantities as a mineral crystallizing in the rhombic system and of a brilliant golden-yellow colour in Bohemia, Peru, &c. For industrial purposes an artificial orpiment is manufactured by subliming one part of sulphur with two of arsenic trioxide. The sublimate varies in colour from yellow to red, according to the intimacy of the combination of the ingredients; and by varying the relative quantities used many intermediate tones may be obtained. These artificial preparations are highly poisonous. Formerly, under the name of "king's yellow," a preparation of orpiment was in considerable use as a pigment, but now it has been largely superseded by chrome-yellow. It was also at one time used in dyeing and calico-printing, and for the unhairing of skins, &c.; but safer and equally efficient substitutes have been found.

**ORPINGTON**, a town in the Dartford parliamentary division of Kent, England, 13½ m. S.E. of London, and 2½ m. S. by E. of Chislehurst, on the South-Eastern & Chatham railway. Pop. (1901), 4259. The church (Early English) contains some carved woodwork and ancient brasses. An old mansion called the Priory dates in part from 1393. The oak-panelled hall and the principal rooms are of the 15th century. In 1873 John Ruskin set up at Orpington a private publishing house for his works, in the hands of his friend George Allen. Fruit and hops are extensively grown in the neighbourhood. From its pleasant situation in a hilly, wooded district near the headwaters of the Cray stream, Orpington has become in modern times a favourite residential locality for those whose business lies in London. A line of populous villages extends down the valley between Orpington and Bexley—St Mary Cray (pop. 1894), St Paul's Cray (1207), Foots Cray (an urban district, 5817), and North Cray.

**ORRERY**,<sup>2</sup> CHARLES BOYLE, 4TH EARL OF (1676-1731); the second son of Roger, 2nd earl, was born at Chelsea in 1676. He was educated at Christ Church, Oxford, and soon distinguished himself by his learning and abilities. Like the first earl, he was an author, soldier and statesman. He translated Plutarch's life of Lysander, and published an edition of the epistles of Phalaris, which engaged him in the famous controversy with Bentley. He was three times member for the town of Huntingdon; and on the death of his brother, Lionel, 3rd earl, in 1703, he succeeded to the title. He entered the army, and in 1709 was raised to the rank of major-general, and sworn one of her Majesty's privy council. At the battle of the Wood he acted with distinguished bravery. He was appointed queen's envoy to the states of Brabant and Flanders; and having discharged this trust with ability, he was created an English peer, as Baron Boyle of Marston, in Somersetshire. He received several additional honours in the reign of George I.; but having had the misfortune to fall under the suspicion of the government he was committed to the Tower, where he remained six months, and was then admitted to bail. On a subsequent inquiry it was found impossible to criminate him, and he was discharged. He died on the 28th of August 1731. Among the works of Roger, earl of Orrery, will be found a comedy, entitled *As you find it*, written by Charles Boyle. His son John (see CORK, EARLS OF), the 5th earl of Orrery, succeeded to the earldom of Cork on the failure of the elder branch of the Boyle family, as earl of Cork and Orrery.

**ORRERY, ROGER BOYLE**, 1ST EARL OF (1621-1679), British soldier, statesman and dramatist, 3rd surviving son of Richard Boyle, 1st earl of Cork, was born on the 25th of April 1621, created baron of Broghill on the 28th of February 1627, and educated at Trinity College, Dublin, and, according to Wood,

<sup>2</sup> The orrery, an astronomical instrument—consisting of an apparatus which illustrates the motions of the solar system by means of the revolution of balls moved by wheelwork—invented, or at least constructed, by Graham, was named after the earl.