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**MURCHISON (MURCHISON) Roderick Impey, Sir,**
**1st Baronet**
**(MURCHISON,**

**Roderick Impey, Sir, 1 st Baronet)**

(1792-1871)

British geologist

He strove for honour and glory. Knight of the British Crown, Baronet, Sir Roderick Impey Murchison had something to be proud of: geological science owes him the allocation of three periods of the Palaeozoic era. The "King of Siluria" became the first scientist elected to the Russian Academy of Sciences with a degree in geology.

Roderick Impey Murchison was born on February 19, 1792 in Scotland - on the Tarradale estate of the county of Ross-and-Cromarty (Ross-shire). His father, a descendant of an ancient Scottish family, worked as a doctor in India for many years. He died when the boy was 4 years old. The family predicted a military career for the child, and after graduating from primary school in Durham (County Durham) in 1805 he entered the Royal War College, Great Marlowe, near London.

Science attracted little young Roderick, but military service promised glory, and he was ready for exploits. In 1807, the young man was enlisted in an infantry regiment, took part in hostilities in Portugal and Spain, but the war with Napoleon ended. Garrison service did not attract R. Murchison; he was attracted by the high life. In 1815 he married the daughter of a general and retired with the rank of dragoon captain. The passion for travel led the young couple to Italy, and two years (1816–1818) spent there, according to the main biographer of R. Murchison, Archibald Geikie, influenced his fate more than the years of service in the army. Upon his return to his homeland in 1818, R. Murchison sold his estate in Scotland, settled in the English County of Durham and devoted himself to the main occupation of British aristocrats - hunting foxes (Geikie, 1875a).

R. Murchison was attracted to scientific pursuits by the persistence of his educated wife, as well as his acquaintance with the chemist Humphrey Davyand the geologist William Buckland. The natural science education of R. Murchison was limited to public lectures at the Royal Institute in London, which he attended since 1812. He was attracted not so much by science as by the scientific society itself. The choice fell on geology, since this kind of intellectual pursuit required constant outdoor work (Geikie, 1875a).

R. Murchison began to act with military decisiveness. In 1824 he moved to London and began to regularly attend lectures at the Royal Institution and meetings of the Geological Society of London, to which he was elected a fellow in 1825.

In the first quarter of the 19th century, England was experiencing an unprecedented scientific upsurge. Modern geology was born in the country, and the sociable R. Murchison made acquaintance with the people who stood at its origins: one of the "founding fathers" of the world's first Geological Society of London, Humphrey Davy; the first staff member of the Society, Thomas Webster; the author of the first geological map (1815) William Smith; Oxford professor William Buckland, who compiled the first consolidated stratigraphic scale for England (1823). Under his leadership, R. Murchison studied field geology and in 1825 made his first lecture at the Geological Society on Mesozoic Deposits of Southern England, "Geological sketch of the north-western extremity of Sussex, and the adjoining parts of Hants and Surrey".

The publication of the coal-bearing deposits of England and Scotland in 1826 and his work as secretary of the Geological Society (1826–1828 and 1829–1831) made the aspiring researcher famous in the scientific community.

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In 1827, R. Murchison's collaboration with A. Sedgwick began with the study of the geology of Scotland. In 1828 he visited the continent - France, Switzerland, Italy, Germany. Along with the impressions of the natural objects he saw, R. Murchison acquired new acquaintances, among them being Georges Cuvier, Jean-Baptiste Élie de Beaumont, Constant Prévost, and Nicolas Desmarest. R. Murchison travelled through the volcanic regions of France and Italy together with another amateur geologist - Charles Lyell. At first, R. Murchison shared the ideas of the future ideologist of modern geology, but later he became an opponent of the concept of uniformitarianism. In 1832, a joint article by R. Murchison and C. Lyell on the structure of the Eastern Alps "A sketch of the structure of the Eastern Alps" was published. Complex alpine tectonics led R. Murchison to conclusions about the action of catastrophic forces.

In 1830 R. Murchison again found himself in Germany, where he met Alexander von Humboldt and conducted scientific conversations with the leader of German geologists Leopold von Buch, whose views he treated with special attention.

From 1831 R. Murchison completely focused on the study of the Palaeozoic deposits of Britain. Thanks to the work of William Smith (1815–1822), secondary and tertiary deposits were identified in England. In 1822 William Conybeare and William Phillips established the ‘Outline of the geology of England and Wales’. Down the section, the "Old Red Sandstone" (Upper Silurian – Lower Carboniferous in the modern interpretation) and "quiet" greywacke strata were distinguished. The latter raised doubts about the use of the palaeontological method for establishing its age until R. Murchison found a beautiful section on the border of England and Wales with an abundant fauna, allowing him to trace the transition from the Old Red Sandstone to the underlying sediments. At the very first meeting of the British Association for the Advancement of Science in 1831, R. Murchison announced his discovery. After additional research in the 1835 article "On the Silurian System of rocks", he called the distinguished system Silurian after the Celtic Silurian tribe who inhabited the territory of Wales during the Roman Empire (Rudwick, 1974).

In 1839, R. Murchison published a monographic study on the Silurian system, ‘The Silurian System, founded on geological researches in the Counties of Salop, Hereford, Radnor, Montgomery, Carmarthen, Brecon, Pembroke, Monmouth, Gloucester, Worcester, and Stafford; with descriptions of the coal-fields and overlying formations,’ cross-sections and a coloured geological map. The work was dedicated to a friend - "To You, My Dear Sedgwick" (quoted in Herries Davies, 2007, p. 115).

Since the early 1830s, A. Sedgwick, R. Murchison, and William Lonsdale studied the sections of Devonshire and Cornwall and, on the basis of palaeontological data, came to the conclusion that the deposits, which they had previously taken as Upper Silurian, and Henry De la Beche, as Lower Carboniferous, in fact, they are of the same age as the Old Red Sandstone. In 1839 A. Sedgwick and R. Murchison declared: “For the entire thick intermediate sedimentary stratum enclosed between the Silurian and Carboniferous systems, we propose the term “Devonian system”” (Sedgwick & Murchison, 1839, p. 259).

If the Silurian system was quickly recognized by geologists, then the identification of the Devonian was called into question in England. The facies variability of the Devonian formations could not be explained. There was also a lack of palaeontological data. Strong proofs were needed, and R. Murchison found them - in Russia!

He first went to Germany, where he discovered the "greywacke" formation. An important role was played by the assumption of the idol of R. Murchison, Leopold von Buch, about the distribution of the Upper Palaeozoic deposits in the north-west of Russia (see the essay "*L. Buch*").

In Russia, the Devonian was established in 1839–1841, thanks to the work of Russian geologists, in particular G.P. Helmersen and A.I. Olivieri, and the palaeontological descriptions of the collections made by Karl Eichwald and Leopold Buch(Tikhomirov, 1963). In the 1850s, H.I. Pander proposed a three-term division of the Devonian of Russia. His work was widely recognized, and for R. Murchison he became one of the main consultants.

The decision to go to Russia was made in Paris in 1840, where a friend and comrade in European travel, Edouard Verneuil,introduced R. Murchison to the Russian geographer and economist A.K. Meyendorff, preparing an expedition to explore the industrial areas and natural resources of Russia. A.A. Keyserling and I. Blasius were already included in the expedition, they were joined by E. Verneuiland R. Murchison. In May 1840 they arrived in Berlin to consult with the members of A. Humboldt'sexpedition (1829) and, of course, with L. Buch. Back in February 1840, L. Buch sent a detailed letter to London about his vision of the geology and stratigraphy of European Russia and directly pointed out to R. Murchison the areas of distribution of Silurian, Devonian, Carboniferous and

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Jurassic deposits. L. Buchcompiled data on the geography of sections and fossil fauna in a table (Geikie, 1875a).

Upon arrival in St. Petersburg, R. Murchison enlisted the support of the Russian government. After examining the environs of the Russian capital, Lake Onega and Petrozavodsk, he decided to separate from the group of A.K. Meyendorff to engage in purely geological research. R. Murchison and E. Verneuil travelled in the north-west and central provinces of Russia accompanied by a graduate of the Institute of the Corps of Mining Engineers, N.I. Koksharov ([Murchison], 1841).

R. Murchison discovered with satisfaction that within European Russia, sediments of the Silurian, Devonian and Carboniferous periods are successively overlaid on the ancient crystalline basement. The absence of tectonic disturbance and metamorphism made it possible to establish the similarity of the Palaeozoic sections of the British Isles, Russia and continental Europe (data on the Palaeozoic of Belgium and northern Germany were published by R. Murchison and A. Sedgwick in 1842 in the article “On the classification and distribution of the Older or Palaeozoic rocks of the North of Germany and of Belgium, as compared with formations of the same age in the British Isles").

R. Murchison attached great economic importance to the separation of the Silurian system. He believed that it was at this stage of geological history that organic life arose on Earth and below this boundary there could not be an accumulation of layers containing plant remains, i.e. coal. In England, where coal is the main natural wealth, R. Murchison quickly gained the authority of a specialist in this field. They also wished to use the knowledge of the English expert in Russia. The emperor was personally interested in the coals near Moscow ([Murchison], 1841, p. 57), and R. Murchison was invited to visit Russia again. The plans of the expedition also included a trip to the central provinces of Russia and the Urals.

At the end of April 1841 R. Murchison and E. Verneuil arrived in St. Petersburg. The British geologist twice met with Emperor Nicholas I. Their conversations were about the upcoming journey and the main goal of the mission - to assess the prospects for coal mining. R. Murchison also visited the Institute of the Corps of Mining Engineers and met E.I. Eichwald (Geikie, 1875a).

The expedition of 1841 was perfectly organized - transport, objects of visit, cleared sections, rock samples, geognostic maps, etc. The stay program was developed by the headquarters of the Mountain Corps engineers, and letters of assistance to R. Murchison, E. Verneuiland A.A. Keyserling and N.I. Koksharov were sent to all points of travel ([Murchison], 1841). In this regard, E.I. Eichwald emphasized the excessive generosity of the government. He recognized the achievements of the geologists of the English school and believed that R. Murchison “was especially important for us because he, during his second scientific trip through Russia and the Ural Mountains, at the expense of the Russian government, managed to determine the boundaries of most of the mountain formations of our fatherland "(Eichwald, 1846, p. 24), however," if Russian geologists had the same funds from the government as Murchison, they would also be able to contribute much more to the development of geology in Russia "(Ibid., p. 412).

The journey lasted 5 months. Moscow, the Moscow region and Donetsk coal basins, the Volga region, the Urals - the detachments moved along this route (Shatsky, 1941; Yablokov, 1954; Tikhomirov, 1963).

Of paramount importance was the establishment of a new geological system - the only one that received a Russian name. R. Murchison first saw Permian deposits in Central Russia, but despite his own doubts and the opinion of N.I. Koksharov (Shafranovsky, 1964), refrained from determining the age of the horizon. The term "Perm" (Permian system) was first used by R. Murchison in a letter addressed to a graduate of the Freiberg Mining Academy professor of the Imperial Moscow University, G.I. Fischer (von Waldheim).

The scientists were connected by friendship and active correspondence. In 1805 G.I. Fischer became the founder and director (1805–1853) of the first scientific society in Russia, the Imperial Moscow Society of Naturalists (MOIP), and in 1820 was elected a member of the Geological Society of London. In 1840 R. Murchison became a member of MOIP. In a letter about the allocation of the Permian system, R. Murchison asked G.I. Fischer to report his discovery (Geikie, 1875a), and in 1841 this was published as “Geological Observations in Russia. Letter to Fischer von Waldheim. "

A two-volume monograph by R. Murchison, E. Verneuiland A.A. Keyserling, "The geology of Russia in Europe and the Ural mountains" was published in 1845. The first summary on Russia is the result of collective labour. R. Murchison, when writing the first, geological, volume used the data of H.I. Pander, G.I. Shchurovsky, G.P. Helmersen,

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 F.F. Wangenheim von Qualen, S.S. Kutorga, and G.I. Fischer von Waldheim. Minerals were described by N.I. Koksharov. Definitions for the second, paleontological, volume were carried out by A. d'Orbigny, W. Lonsdale, R. Owen, and L. Agassiz. The map was compiled according to G.A. Abikha, E.I. Eichwald, and G.P. Helmersen.

In 1849, a book by R. Murchison, E. Verneuiland A.A. Keyserling was published in Russian - "Geological Description of European Russia and the Ural Ridge" translated by A.D. Ozersky, with notes and new data. The first monograph on the geology of Russia became a textbook for many generations of researchers.

The most important results of the research of R. Murchison's expedition in Russia include the determination of the formation time of the Ural ridge, the compilation of the first geological map of European Russia and the Urals on a scale of 150 versts [1 verst = 1.0668 km] to 1 inch. R. Murchison gave a generally correct analysis of the geological structure of the Donetsk coal basin (Yablokov, 1954), optimistically assessed the prospects of coal near Moscow, although, as follows from the report of N.I. Koksharov to the chief of staff of the Corps of Mining Engineers: “Tula province presents many signs of finding coal, but at the same time it does not give much hope to discover this combustible material as solid as the English” ([Murchison], 1841, fol. 153ob).

R. Murchison made interesting conclusions about the geological structure of European Russia - he identified the Moscow and Donetsk tectonic depressions, separated by uplifts. Palaeogeographic reconstructions were important to explain the facies variability of sediments within the coal basins of Central Russia and the Urals. The call to pay "special attention to the former geography of the earth's surface" (Murchison, Verneuil, Keyserling, 1849, part 1, p. 595) was heard. The researcher of the Russian Jurassic G.A. Trautschold in 1862 published the first palaeogeographic map in Russia entitled "Probable distribution of sea and land in Jurassic time in European Russia, presented on the basis of Murchison's geognostic map" (Soloviev, 1966).

R. Murchison, striving for scientific fame, could be proud of the result achieved in Russia. One of the reports addressed to the Chief of Staff of the Corps of Mining Engineers during his second trip to Russia contained a note about the desire of the British geologist to receive a Russian award for his work and suggested “to give Mr. Murchison the Order of St. Anne of the 2nd degree, and Mr. Verneuil St. Vladimir of the 4th grade ". On the margins, it was marked "Imperially commanded 〈.... 〉Tsarskoe Selo on May 5, 1841" ([Murchison], 1841, fol. 147). The awards were presented (Geikie, 1875a).

In the summer of 1845 R. Murchison and E. Verneuilarrived in St. Petersburg to personally hand over their work to Nicholas I. The Emperor appreciated the work of the scientists - all members of the expedition became members of the Imperial St. Petersburg Academy of Sciences. But the first was R. Murchison.

On September 5, 1845, at a meeting of the Physics and Mathematics Department, the consent of the President of the Academy was given to the proposal of the adjunct G.P. Helmersen on the election of R. Murchison to the number of honorary members "in respect of his noted works on geology and important discoveries made by him during his three-time journey across Russia and presented in a scientific creation presented by him personally to the Emperor" (Protocols OS IAN, 1845, No. IX, § 92). The candidate was elected unanimously. On September 6, 1845, the General Meeting approved this decision (ibid.).

Thanks to R. Murchison, the specialty "geology" was included in the list of disciplines of the Imperial St. Petersburg Academy of Sciences. A unique decision on the membership of R. Murchison was made on September 19, 1845: a foreign scientist was elected an ordinary academician (Minutes of meetings of the FMO IAN, 1845, No. XIV, § 230). “On October 24, 1845, Nicholas I, by a decree to the Governing Senate of September 21, for special merits in the field of geological surveys on the territory of Russia, which enriched the country with new discoveries, ordered that R.I. Murchison have the rights and advantages of an ordinary academician and consider him in active service at the Academy of Sciences”(cited from: Letopis of the Russian Academy ..., 2002, p. 338).

In 1848 A.A. Keyserling was elected a corresponding member of the Academy (since 1887 - ordinary academician). E. Verneuil received the title of Corresponding Member of the Imperial St. Petersburg Academy of Sciences in 1856 (see the essay "*E. Verneuil*").

As a reciprocal gesture, we can consider the election of the Russian academician G.P. Helmersen to the British scientific societies: Honorary Fellow of the Royal Geographical Society (1846), Correspondent of the Geological Society of London (1851).

R. Murchison sent the research results to St. Petersburg. So, in 1849 G.P. Helmersen introduced the members of the academic assembly to his work on the geological structure of the Alps, Apennines and the Carpathians (1848), written after a trip to

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 Europe in 1847–1848. (1848) (Annals of the Russian Academy ..., 2002). The Imperial Russian Geographical Society published information about R. Murchison's research through the Royal Geographical Society: about gold and mercury deposits in California (1851), world gold reserves (1852), and the development of geographical science (1853). In 1867, an English geologist was elected to the Imperial Mineralogical Society in St. Petersburg.

After the death of Murchison, N.I. Koksharov noted that he "constantly retained feelings of sincere affection and gratitude for the country in which he found complete cordiality and hospitality" (cited in Radovsky, 1956, p. 259).

The successes achieved in Russia significantly increased the self-esteem of R. Murchison, who did not suffer from excessive modesty, and made him extremely intolerant of the statements of his opponents (Rudwick, 1974). He loved to be called "King of the Silurians" and "Lord of the Greywackes" (Herries Davies, 2007). In *Darwin*there is a description that "the good that Murchison brought geology by his classification of ancient formations, cannot be overestimated; however, he was far from having a philosophical mindset. He was very kind-hearted and tried extremely hard to be of service to anyone. The extent to which his admiration for the social position of a person reached was ridiculous, and he showed this feeling and his vanity with the spontaneity of a child. Once, with extraordinary glee, he told a large circle of people in the halls of the Geological Society, among whom there were many who were not very close to him, how Tsar Nicholas, being in London, stroked him on the shoulder and said, referring to his geological works, “ My friend, Russia is grateful to you! ”” (Darwin, 1957, p. 113).

R. Murchison did not accept new ideas well. He criticized H. De la Beche in print for his "dissent" in the Devonian stratigraphy. L. Agassizdid not accept the theory of continental glaciation, believing that only "drift" could explain the spread of ice. He more and more strongly opposed C. Lyell (Oldroyd, 1990; Herries Davies, 2007).

For those who did not share his beliefs on the uniqueness of the Silurian period, R. Murchison addressed the 1854 edition, supplemented with new data on continental Europe and America, “Siluria: A history of the oldest known rocks containing organic remains, with a brief sketch of the distribution of gold over the earth.” Until 1872, the book was reprinted four times.

But R. Murchison knew how to be grateful. He dedicated the second edition of "Siluria ..." in 1854 to his supporters E. Verneuil, A. Keyserling and Joachim Barrande. Two of them were Murchison's comrades on the expedition to Russia. Stratigraphy of Bohemia, developed by J. Barrande, formed the basis for generalizations by R. Murchison (Oldroyd, 1990). The monograph included data from Ch.I. Pander on the rich fossil fauna of the Russian Devonian.

R. Murchison strove to expand his Silurian "possessions". During a trip to Scandinavia in 1844, he classified all the rocks underlying the Silurian as "Azoic".  When J. Barrande discovered a Cambrian fauna there, Murchison simply lowered the border of the Silurian. Because of the dispute about the boundary between the Cambrian and the Silurian, he lost his "beloved" A. Sedgwick. When R. Murchison distinguished the Silurian system, A. Sedgwick proposed to attribute the underlying rocks to the Cambrian system (1835). Gradually, taking advantage of the lack of palaeontological data, R. Murchison simply “annexed” the Upper Cambrian into his Lower Silurian (Rudwick, 1974). An open conflict between these geologists flared up in 1852 after the publication of A. Sedgwick, and these former friends became enemies. A. Sedgwick did not even attend R. Murchison's funeral. Only in 1879, did Charles Lapworth "reconcile" them, identifying between the Cambrian of Sedgwick and the Silurian of Murchison a new system, the Ordovician (Herries Davies, 2007).

Only in 1855 did Murchison first receive a professional geological post - he replaced De la Beche as Director of the Geological Survey of Great Britain. In the same year, he became head of the Museum of Practical Geology in London. In 1856 he participated in the work of the Commission for the Assessment of National Coal Reserves. One of the last geological deeds of R. Murchison was the creation of the Department of Geology and Mineralogy at the University of Edinburgh. He intended to mention this in his will, but the desire to see his best student as the head of the “Murchison Chair” forced him to make a lifetime donation, and in 1871 Archibald Geikie took this post (Geikie, 1875a).

R. Murchison published about 180 scientific papers, and his services were highly appreciated in Great Britain. In 1846 he was elevated to the knighthood (Commander of the Order of the Bath), and in 1866 he received the title of baronet.

The Royal Society of London encouraged the interest in science of wealthy aristocrats, and as a young man R. Murchison was elected to the British Academy (1826), but the

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Copley Medal in 1849 was awarded for scientific merit. In a letter to the indispensable secretary of the Imperial St. Petersburg Academy of Sciences, the British geologist proudly announced that the highest award of his country was awarded to him for "establishing the Palaeozoic classification, including the Silurian system, and for my work on Russia and the Ural Mountains" (quoted from Radovsky, 1956, p. 264).

Since 1845 R. Murchison was an honorary member of the Royal Society of Edinburgh, in 1859 he was awarded the McDougall Brisbane Medal for geological research in the Northern Highlands of Scotland (Oldroyd, 1990).

R. Murchison repeatedly headed the geological and geographical section of the British Association for the Advancement of Science, and in 1846 he was elected president of the Association. He served twice as president of the Geological Society of London (1831–1833, 1841–1843). In 1864 he received the highest award of the Society, the Wollaston Medal.

The last years of R. Murchison were mainly associated with the activities of the Royal Geographical Society, of which he was one of the founders in 1830 and was elected president three times (1843–1845, 1851–1853, 1856–1859). He received Honorary Doctorates from the Universities of Cambridge, Oxford and Dublin.

In 1844 R. Murchison was elected a correspondent of the Academy of Sciences of the Institute of France in the section of mineralogy, in 1868 he received the title of a Foreign Member and the Cuvier prize. From 1839 he was a member of the Geological Society of France, a corresponding member of the Royal Academy of Sciences in Berlin (1847) and a foreign member of the Bavarian Academy of Sciences (1857)**.**

Roderick Impey Murchison died on October 22, 1871 from bronchitis in his London home. He is buried in the Brompton Cemetery next to his wife (Geikie, 1875a).

By the will of the scientist, the sum of 1000 pounds was transferred to the Geological Society of London for the creation of a foundation named after him and the establishment of a special annual Society award, the Murchison Medal. This has been awarded since 1873 (Woodward, 1907).

During his lifetime R. Murchison handed over his archive to his "spiritual son", and in 1875 Geikie published a two-volume biography, diaries and letters of R. Murchison (Geikie, 1875a).

A crater on the Moon and about 15 terrestrial objects are named after R. Murchison, including a cape on the Bootia Felix Peninsula, a mountain peak in New Zealand, one of the Queen Charlotte Islands, a river in western Australia, and a cascade of Nile waterfalls in Uganda. A peak of 3333 m in the Rocky Mountains of Canada (province of Alberta) bears the name of the British geologist.

In honour of R. Murchison, the genus of gastropods *Murchisonia*, widespread in Devonian and Carboniferous deposits, is named, as well as potassium feldspar with a golden tint, named murchisonite.

In 2005, a stone slab was installed in the courtyard of the Perm school No. 9 with inscribed words of gratitude to the Scottish geologist for assigning the name “Perm” to the last period of Palaeozoic history (Memorial Sign to R.I. Murchison, 2005). The second memorial to the scientist was opened in 2009 in the Sverdlovsk region thanks to the efforts of members of the recently created Ural-Scottish Society (Ural-Scottish Society, 2009).

The diary entries of R. Murchison, made during his travels across Russia in 1840 and 1841, have been published (Murchison's wanderings in Russia, 2004).

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