



RUSSIAN SCIENTISTS AND THE ROYAL SOCIETY OF LONDON: 350 YEARS OF SCIENTIFIC COLLABORATION

by

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This paper examines the dynamics of the honorary membership of Russian scientists at the Royal Society over a 350-year period. Using several outstanding Russian scientists as examples (Dmitrii Mendeleev, Il'ya Metschnikoff, Ivan Pavlov and Nikolai Vavilov), we will demonstrate how a combination of cultural and political factors influenced the dynamics of memberships. Furthermore, we explain how their memberships of the Royal Society influenced their scientific careers.

Keywords: Royal Society of London; Russian Academy of Sciences; international members of the Royal Society

INTRODUCTION

Interactions between various national academies of science are an important indicator of scientific growth. A symbiotic relationship between a British academy and an academy from a non-Western country is of special interest because it results in the contact and interaction between two different scientific cultures and political systems. Here we outline the relationship between the Russian Academy of Sciences and the Royal Society, beginning with the time of establishment of the latter. We thereby emphasize the correlations between the general historical circumstances, technological changes, political history and history of science. As to political history, we will show that interactions between the two academies not only indicated the isolationist tendencies characteristic of certain periods of Russian history, but also served as a counterbalance to intellectual isolationism.

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The relationship between the Royal Society and the Russian Academy of Sciences has received little treatment in Russian historiography. This is an astonishing fact, considering that there is an abundance of works devoted to Russian–American, Russian–Chinese, Russian–French and especially Russian–German relations. In the mid twentieth century, Russian historians of science concentrated on either the most outstanding British members of the Royal Society (Isaac Newton, Michael Faraday, Charles Darwin, Thomas H. Huxley, Joseph Lister and others) or on Anglo-Russian scientific contacts from the end of the seventeenth century to the beginning of the twentieth,¹ but few works were published on the contact and cooperation between the two most prominent national scientific institutions of both countries.

There are also more recent works in Russian that analyse the circumstances of the growth of the Royal Society and its institutional evolution, but pay little attention to its Russian members.² Even when crucial figures of the Russian science community – such as Nikolai (Nicolas) Vavilov, Dmitri Mendeleev (Dmitri Mendeleeff), Il'ya Metschnikoff (Elias Metchnikoff) and Ivan Pavlov – are mentioned, their fellowships of the Royal Society are used simply as proof of their international fame, without going into any further details of their contributions to the Society or of how the Society influenced their careers.³ Meanwhile, British historians have published a great deal on the relationship between the Royal Society and Russian scientists, but they have concentrated on the early period in the growth of Russian science while neglecting later developments.⁴

The objective of the present paper is to fill the gap in the examination of the history of the Royal Society by demonstrating how both political and more purely scientific circumstances influenced the scientific collaboration between Russia and Great Britain. We show that the demand for scientific exchange, immanent to science, conflicted with the isolationist tendencies in Russia and, later, in the USSR. The struggle of these two forces produced observable fluctuations in the amount and intensity of contacts between the two academies. We will also demonstrate the importance of elections to the Royal Society for Russian and Soviet scientists, which meant not only a step towards recognition within the English-speaking world but also a means of support within their homeland during periods of isolation or political repression.

INITIAL CONTACTS BETWEEN THE ROYAL SOCIETY AND RUSSIAN SCHOLARS

By the time that the Royal Society was established (1660), British medical doctors had already played a leading role in the Moscow Drugs Control Department (*Aptekarskii Prikaz*), which was responsible for healthcare in the Russian Empire. One of these doctors, Samuel Collins (1619–1670), was a personal physician to Tsar Alexei (1629–1676), and in 1662 Collins became a corresponding member of the Royal Society. Formally speaking, this was the beginning of direct contact between the Royal Society and Russian scholars.⁵ However, it must be stated that this was just an individual case, and not yet the beginning of systematic contacts.

Real cooperation on an institutional level began at the time of Peter the Great (1672–1725), son of Tsar Alexei. Peter exemplifies the radical turn in Russian policy. His major objective was the Westernization of Russian society, including the importation of professional skills, technologies and scientific achievements. In order to achieve his objective, Peter initiated contacts with the major scientific society of the most technologically advanced country of the time. On 27 January 1698, he visited the Royal

Society and then, on 6 and 9 March, the Royal Observatory, where he was welcomed by John Flamsteed (1646–1719), a fellow of the Royal Society.⁶ On 13 and 21 April 1698, he examined the Royal Mint. The Warden of the Royal Mint at that time was none other than Isaac Newton (1642–1727).⁷ Five years later, when Newton became the President of the Royal Society, he sent a copy of his *Principia mathematica* to Tsar Peter.

One of the consequences of Peter the Great's visit to the Royal Society was the appointment of the Scottish doctor Robert Areskine (1677–1719) as a personal physician to the tsar and to reform the Russian medical services. Areskine became the chief of all civil and military healthcare. On the tsar's orders, Areskine purchased a collection of European books, instruments and natural rarities (so-called *naturalia*) for the *Kunstkammer* in St Petersburg (a cabinet of curiosities). The *Kunstkammer* later became the core of the newly established Russian Academy of Sciences. Today, the *Kunstkammer* is known as the Peter the Great Museum of Anthropology and Ethnography. In other words, Areskine was not just a physician from abroad: he was a figure of multidimensional importance who made sweeping cultural and scientific contributions to the Russian Empire. His 'museological' services and healthcare expertise contributed to the growth of a modern culture of science in Russian society at that time.

The Royal Society, in its turn, showed interest in strengthening relations between the two countries. Prince Alexander Menshikov (Menzicoff) (1673–1729) was an outstanding Russian political and military figure, as well as one of the closest friends and associates of Peter the Great and, for a certain time, the most powerful Russian statesman. Therefore, it was not a coincidence that on 29 July 1714 the Royal Society, on the recommendation of two British merchants, James Spilman (1680–1763) and Henry Hodkin (d. 1730), elected Menshikov as a foreign member of the Society. The invitation to Menshikov came from Isaac Newton on 25 October 1714 and stated that 'the most puissant and honourable Lord Alexander Menshikov, Prince of the Roman and the Russian Empire' was honoured for aiding his Caesarian Majesty 'in the dissemination of literature and science'.⁸ Ironically, Menshikov was almost illiterate and his election is an example of a purely politically motivated decision.⁹

Contacts between the Royal Society and Russian scholars continued on the 'middle level'. When the Alsatian Johann D. Schumacher (1690–1761), who replaced Areskine as a curator of the *Kunstkammer* and founded the first Russian public library,¹⁰ visited the Royal Society, he was warmly welcomed, receiving an invitation to attend a 'private' meeting of the Society. Writing to Tsar Peter on 5 July 1721, Schumacher proudly reported that he not only regularly attended these meetings but that he also initiated a discussion about a map of the Caspian Sea.¹¹

When the St Petersburg Academy of Sciences was founded in 1724, on the initiative of Peter the Great, there were originally no Englishmen among its full members, but many of the members – such as Jacob Hermann (1678–1733), George Bülfinger (1693–1750) and Joseph-Nicolas Delisle (1688–1768) – appealed to the authority of Newton in their public lectures.¹² The St Petersburg Academy had no direct role models in Western countries, but resulted from many contacts with Western academies, including the Royal Society.

Peter the Great died in February 1725, just before the official opening ceremony of the St Petersburg Academy, which took place under the rule of Catherine I. Between the end of August and the beginning of September 1726 the newly established Academy sent a letter to the Royal Society suggesting the establishment of a relationship between the two institutions. This letter and others highlight the fact that the Royal Society was older and

more influential than other scientific academies. At the same time, the St Petersburg Academy expressed the hope that ‘one day it would be on the same or even higher level in relation to quantity and quality of its scientific works’.¹³ This letter was announced at a meeting of the Royal Society in February 1727, which was overseen by Sir Isaac Newton.

The botanist and founder of the British Museum, Sir Hans Sloane (1660–1753), who replaced Newton as President of the Royal Society, did much to establish regular contact between the St Petersburg Academy and the Royal Society. The Royal Society maintained correspondence with the President of the Academy, Johann Albert von Korff (1696–1667),¹⁴ as well as with members and officials of the Academy such as Johann Schumacher,¹⁵ Theophil Bayer (1694–1738), Joseph-Nicolas Delisle (1688–1768), Leonhard Euler (1707–1783) and especially Johann Amman (1707–1741). Amman was a member of the Royal Society from 1731, and professor of botany at the Russian Academy of Sciences (as the St Petersburg Academy later became known) from 1733, and he helped to deepen relations between the two institutions.¹⁶

In 1764, three years before coming to Russia, the outstanding German naturalist Peter Simon Pallas (1731–1811) became a member of the Royal Society. Another member of the Royal Society, Peter Collinson (1694–1768), exchanged letters with the German astronomer Gottfried Heinsius (1709–1769) and the Swiss mathematician Euler, who were active members of the Russian Academy.¹⁷ Euler himself was elected a member of the Royal Society in 1747, by which time he was already working in Berlin, but he also remained an honorary member of the Academy during that time.

Sir Hans Sloane initiated the election of the first and only Russian foreign member of the Royal Society in the eighteenth century, Gerald F. Muller (1705–1783).¹⁸ Muller was a ‘conference-secretary’ (an academic position equivalent to that of managing secretary today) of the Russian Academy, and in 1730 was instructed to travel to Western Europe to look for new members of the Academy.¹⁹ Sloane expressed his readiness to cooperate with the Academy and invited Muller to inspect his collection of curiosities and the library, as well as to take part in a meeting of the Royal Society on 22 October 1730.²⁰ During this meeting, Muller was invited to become a member of the Royal Society. On 15 April 1734, Sloane himself became the first foreign member of the Russian Academy from Britain.

The rule of Catherine the Great (1762–1796) is often defined as a period of enlightened absolutism. Her enlightening aspirations stimulated the growth of arts and sciences. It was during this time that contacts between the Royal Society and the Academy became increasingly personal, which is an indication of the growing intensity and depth of scientific exchange. The number of joint expeditions, letter exchanges, mutual visits and honorary memberships in the latter half of the eighteenth century is also indicative of the intensity of scientific cooperation. Regardless of this increased involvement between the Russian Academy and the Royal Society during this time, the exchange between each other was still less intensive than each of their exchanges with the Paris Academy of Sciences, which was the leading scientific institution during the eighteenth century.²¹

HONORARY MEMBERSHIP BEFORE THE END OF THE FIRST WORLD WAR

The Patriotic War of 1812 against Napoleon during the reign of Alexander I of Russia (1777–1825) paradoxically contributed not only to the strengthening of Russian national identity, but also to the spread of Western values and ultimately to the uprising in 1825

by liberal conspirators against the newly appointed Tsar Nikolas I (1796–1855) which became known as the Decembrist Revolt. Although the major objective of the Decembrists was political change in Russia, they tightly connected social and political progress with the development of science.²² Although the Decembrist movement failed, Decembrist ideas began to spread in society even during the reign of Nikolas I, a reign usually characterized as reactionary. The time of Alexander II (1818–1881), who followed Nikolas I, was on the contrary that of a liberal reformer most well known for the emancipation of Russian serfs. Liberal reform stimulated the growth of science and education, and contributed to the intensification of exchange between Russian and foreign research institutions, including the Royal Society.

From 1724 to 1874, 47 British scientists were elected as members of the Russian Academy. Two-thirds of these scholars were simultaneously members of the Royal Society. This is less than a third of the number of German-speaking scholars (142) and less than half the number of French-speaking scholars (95).²³ The overwhelming majority of the members of the Russian Academy were German-speaking men of science. This can be explained by the traditionally close relations between Russia and German-speaking countries since the time of Peter the Great, close relations between the Russian court and German courts, especially since 1762, and the growing influence of Baltic Germans in Russia as Baltic governorates became part of the Russian Empire after the Great Northern War (1700–1721).

British men and women of science could learn about the achievements of their Russian colleagues from the rare translations of their works into English, or if their fame had reached Europe. From 1730 to 1877 there were only four members of the Russian Academy who achieved such transnational fame (dates in parentheses signify the beginning of their membership of the Royal Society): the astronomers Friedrich von Struve (1827) and his son Otto von Struve (1873),²⁴ the zoologist and geographer Karl Ernst von Baer (1854) and the explorer Adam Johann von Krusenstern (1837). All of them were German-born. According to a tradition established at that time, a period spent abroad was a prerequisite for Russians to obtain a professorial position. Russian scientists usually spent this time in Germany or France. Since all their friends and teachers were on the continent, it was difficult for them to find the three members of the Royal Society necessary to be appointed as a member. There were exceptions, however, such as the famous British geologist Roderick Murchison (1792–1871), who was elected a full member of the Russian Academy (1845). Murchison worked for several years in Russia, doing much to establish connections between the Academy and the Royal Society.²⁵

The first industrial revolution made significant changes to traditional scientific careers in the Russian Empire. In particular, the Crimean War (1853–1856) demonstrated the technological ‘backwardness’ of Russia compared with Great Britain and caused Russia to initiate economic and technological development during and after the war. Moreover, steamboats made Britain more accessible for inhabitants of continental Europe. Visits to the leading British scientific centres became an important element in the careers of Russian scholars. This accelerated the growth of connections between the two scientific institutions and individual scholars. In 1852 a founder of an influential Russian mathematical school, and a future member of the St Petersburg Academy of Sciences (1856), Pafnuti L'vowitsch Chebyschev (Tchebitchef), visited England and established strong connections with British colleagues. On 13 December 1877, he was elected as a member of the Royal Society.²⁶



Figure 1. Copley Medal (1905) awarded to Dmitri Mendeleev. (From Mendeleev Museum Archive, St Petersburg State University.)

Another Russian scholar, the talented chemist Dmitrii Mendeleev (Mendeleeff) (1834–1907), who formulated the Periodic Law and created the periodic table of chemical elements, was well known in Great Britain.²⁷ In 1872, during the International Exhibition in London, Mendeleev was given a medal for important discoveries and inventions.²⁸ Ten years later, the Royal Society awarded him the Davy Medal (jointly with Lothar Meyer (1830–1895)), the highest honour for a chemist.²⁹ Mendeleev gave many lectures and talks at British universities on the occasion of his being granted honorary doctorates. He delivered talks in Edinburgh (1884), Cambridge (1894) and Oxford (1894). In 1888 he became an honorary member of the Royal Society of Edinburgh, and a year later an honorary member of the Royal Irish Academy (1889). In addition, he was a member of the Royal Institution of Great Britain (1891) and other British societies. In 1892 he became a foreign member of the Royal Society.³⁰

Mendeleev initially published his periodic table in 1869 in the German scientific journal *Zeitschrift für Chemie*,³¹ but from 1877 onwards, the distinguished English-language journal *Nature* was the main publisher of his papers on the chemical characteristics of gases and on the Periodic Law. Notoriously, because of intrigues within the Russian Academy, Mendeleev never became a full member, although he was elected a corresponding member in physics in 1876. Yet his international fame began to blossom. In 1891, his chemistry textbook was translated into English; there were three subsequent editions.³² For many years he collaborated with the leading British physicists and chemists Henry E. Armstrong (1848–1937, elected fellow of the Royal Society 1876), Sir Frederik A. Abel (1827–1902, elected fellow 1860), Frederick J. Bramwell (1818–1903, elected 1873), Thomas Edward Thorpe (1845–1925, elected 1876) and others, all of whom greatly appreciated his scientific achievements.³³ The Nobel Laureate William Ramsay called Mendeleev ‘our teacher’.³⁴ Mendeelev’s certificate of appointment on 19 May 1892 was signed by the distinguished physicist Lord Kelvin (1824–1907).³⁵ In 1905, the Royal Society awarded him the Copley Medal (figure 1).³⁶

Altogether, Mendeleev visited Great Britain 14 times and every time, with great enthusiasm, he emphasized that his ideas were best understood in England, even more so

than in Russia.³⁷ Overall he received 21 British honours, including honorary memberships of various universities, academies and societies, whereas he received only eight awards each from the USA and France, and seven from Germany. Mendeleev's objective was to bring Britain and Russia closer in order to contribute to the 'development of the world', because 'both nations are built strong, one on the seas, another on land, and they have nothing to compete for'.³⁸ Mendeleev first expressed this idea in 1889, long before the appearance of the Triple Entente between Russia, France and Great Britain, which advanced a political union between the two empires.

Other fields of successful collaboration included evolutionary theory and developmental biology (embryology). After the publication in 1859 of *The origin of species* (and especially after its translation into German in 1860³⁹), Darwinism soon gained popularity and support among Russian biologists. It is common practice in Russian historiography to label Russia as 'the second birthplace of Darwinism'. Although the Ministry of Religious Affairs and Public Education had controlled and determined the strategy of censorship in relation to religious and secular literature in the Russian Empire since 1817, in 1865 the state censorship law was weakened and publishers obtained the right to publish highly specialized scientific literature without preliminary censorship. Darwin's *Origin* was translated into Russian (by S. A. Rachinsky) under the explicit approval of censorship officials and was published in 1864.⁴⁰ In contrast, *The descent of man* was published only after experiencing serious difficulties with censorship (first edition 1871–1872, second 1873 and 1896, both translated by Ivan M. Sechenov; third edition 1908, translated by Filippov).⁴¹

Several strong Darwinian schools appeared in Russia. The two best-known and internationally recognized researchers in the field were Alexander Kowalevsky (Kowalewski, Kovalevsky) (1840–1901) and Il'ya (Elias) Metschnikoff (1845–1916). Together they described the ontogenesis of almost all invertebrate groups and lower chordates, and discovered homologies in their early embryonic stages. They discovered the close connection between the coelomic cavities of higher Metazoa and the gastrovascular system of Coelenterata. They developed a universal theory of germ layers, declaring homology of the germ layers in all Metazoa, and contributed to investigations into the problem of recapitulation. The concept of homology of germ layers as a universal principle proving that homology goes beyond any separate 'type' of animals was formulated by Kowalevsky in 1871, and this formed part of the empirical basis for the Darwinian monophyletic view of evolution. Darwin himself greatly appreciated Kowalevsky's work and appealed to Kowalevsky's discoveries in the second edition of *The descent of man*.⁴²

Russian work in the field of evolutionary biology was recognized by the Royal Society through the elections of Alexander Kowalevsky on 10 December 1885 and Il'ya Metschnikoff on 12 December 1895. Both Alexander Kowalevsky and his brother Vladimir (1842–1883) had corresponded with Darwin and influenced the course of his research.⁴³ Darwin himself wrote about the brothers Kowalevsky to a publisher on 24 August 1867: 'I have had much correspondence with M. Kovalevsky, & he has visited me here. I have formed a very high opinion of him, as his knowledge is extraordinarily great. He is brother of a distinguished naturalist.'⁴⁴ It is not a coincidence that the election of Kowalevsky as a foreign member of the Royal Society took place in the year when it was headed by Darwin's closest friend, Thomas Henry Huxley (1825–1895), who worked on the same issues as Kowalevsky and Metschnikoff. Neither Kowalevsky nor Metschnikoff worked at a British university, and they published almost nothing in English. Nevertheless, the Royal Society recognized their merits much earlier than the St Petersburg Academy in Russia. It is

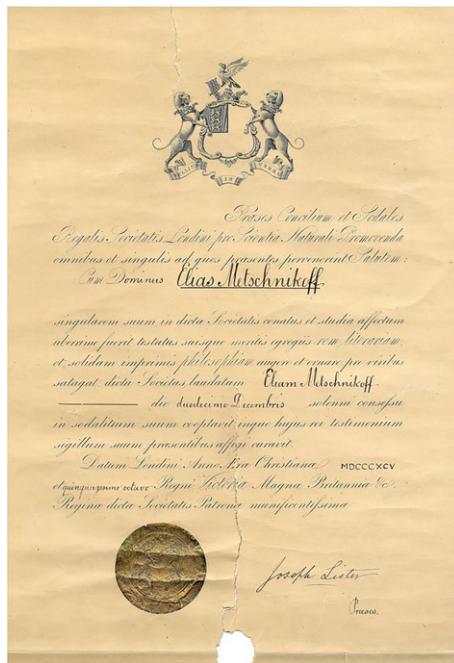


Figure 2. Certificate of the election of Il'ya Metschnikoff as a member of the Royal Society, 1895. (From the Archive of the Russian Academy of Sciences.)

noteworthy that Metschnikoff found recognition in France much later, although he had lived and worked in France since 1888 and elaborated his cellular theory of immunity while based in that country. It was this theory that brought him international fame and the Nobel Prize (jointly with Paul Erlich), though the award was preceded by intense discussion over many years. British physiologists, including Joseph Lister (1827–1912), the Edinburgh professor and surgeon to Queen Victoria, actively participated in this discussion. Lister served as President of the Royal Society from 1895 to 1900 and played a crucial role in Metschnikoff's election to the Society in 1895 (figure 2).⁴⁵

In his letter to Lister dated 16 December 1895, Metschnikoff expressed his appreciation of Lister's contribution to his election.⁴⁶ In 1906, the Royal Society further awarded Metschnikoff a Copley Medal, given for outstanding achievements in science. In 1909, he participated in the lavish celebration at the University of Cambridge to commemorate the anniversary of the birth of Charles Darwin.⁴⁷ During the celebration, he gave an address in the name of Russia and France.

A less surprising nomination was that of the first Russian Nobel Laureate, Ivan Pavlov (1849–1936), who was elected a member of the Royal Society on 6 June 1907, during a period of political and military convergence between the Russian and British empires. By 1904 Britain was seeking an alliance with Russia and in 1907 Russia joined the Triple Entente. This political alliance acted as a catalyst for scientific exchange as well.

In contrast to Metschnikoff, Pavlov was elected a member after having already received a Nobel Prize in 1904. He gained recognition first on the continent and only afterwards in Great Britain. The English version of his book, *The work of the digestive glands: lectures*,



Figure 3. Certificate of the election of Ivan Pavlov as a foreign member of the Royal Society, 1907. (From the St Petersburg Branch of the Archive of the Russian Academy of Sciences.)

was translated by Sir William Henry Thompson (1860–1918), who became Pavlov's first pupil in Great Britain. Pavlov established direct personal contacts with British colleagues during international congresses in Paris (1900) and Madrid (1903).⁴⁸ Nevertheless, communication was impeded in the first years by differences in methodology and by the language barrier, but the situation changed when Pavlov was awarded the Nobel Prize. After that, he was elected to honorary membership of the Royal Medical and Chirurgical Society of London in 1905, and two years later to membership of the Royal Society (figure 3)⁴⁹ and the Royal Society of Edinburgh and nine other British scientific Societies.⁵⁰

Pavlov first visited Great Britain in 1906 at the invitation of the University of Aberdeen. During this trip, he gave a lecture at the Charing Cross Hospital Medical School (London), dedicating it to T. H. Huxley.⁵¹ In 1912 he was invited to participate in the 250th anniversary of the foundation of the Royal Society (figure 4).⁵² He was excited to attend this celebration 'because the history of the London Royal Society is the history of English natural sciences and medicine'.⁵³ This visit strengthened Pavlov's connections to British physiologists such as Charles Sherrington (1857–1952), William Bayliss (1860–1924) and Joseph Barcroft (1872–1947).⁵⁴ Barcroft later wrote an obituary for Pavlov, where he briefly outlined how British scholars changed their opinion on Pavlov's research over time. Before the First World War, Pavlov had been seen in Britain as a rather enigmatic figure,⁵⁵ but in 1915 he was awarded a Copley Medal, as Metschnikoff had been a few years earlier.⁵⁶

The First World War impeded international exchange even between members of the Triple Entente, but it had no influence on the popularity of Pavlov in Great Britain. After



Figure 4. Letter of invitation of Ivan Pavlov to celebrate the 250th anniversary of the Royal Society of London, 1912.
 (From the St Petersburg Branch of the Archive of the Russian Academy of Sciences.)

the war, he visited England on a number of occasions: Barcroft pointed out that Pavlov had attended the Neurological Congress in London in 1935; and in 1928, he gave the Croonian Lecture at the Royal Society. This lecture, named after William Croone (1633–1684), is a prestigious lecture in the biological sciences delivered annually at the invitation of the Royal Society. When describing Pavlov's character, Barcroft emphasized that 'no better example than Pavlov could be quoted to illustrate the kinship between simplicity and greatness'.⁵⁷

Two further outstanding Russian scientists were elected to the Royal Society at this time of close political alliance between the Russian and British empires. Kliment Timiryazev (Clement Timiriazeff) (1843–1920), a professor at Moscow University and a well-known advocate of Darwinism, was elected on 9 November 1911. After the outbreak of the First World War, Boris Golitsyn (1862–1916), the director of a major physical laboratory, also became a member, in 1916. He was the last member of the Imperial (Russian) Academy to be awarded a membership of the Royal Society.

HONORARY MEMBERSHIPS AFTER THE FIRST WORLD WAR

After the October Revolution of 1917, Russian scientists came under very tight ideological control. The Soviet Academy of Sciences was deprived of autonomy in its decisions and

could not elect foreign members without the permission of the Communist (Bolshevik) Party. For the same reason, Russian/Soviet scientists could not be elected to foreign academies and societies without explicit consent of the Party. Great Britain had a very difficult relationship with Soviet Russia, but did its best to preserve neutrality in its relationship to Russian scientists, although the election of Russian scientists to the Royal Society in the divided world suffered owing to explicit political bias.

In the period between the two world wars, the only Russian scholar elected a member of the Society was Pyotr Kapitsa (1894–1984), who was elected in 1929 while he was working with Ernest Rutherford (1871–1937) in England (at the Cavendish Laboratory in Cambridge), where he, together with others, developed methods of inducing strong magnetic fields. In 1978 Kapitsa received a Nobel Prize for his fundamental inventions and discoveries in the area of low-temperature physics. A press release from the Royal Swedish Academy of Sciences emphasized that Kapitsa ‘has played a leading role in low-temperature physics for a number of decades. He has also shown an amazing capacity to organize and to lead work: he established laboratories for the study of low-temperatures in both Cambridge, United Kingdom and Moscow.’⁵⁸

At the same time, Soviet Russia made significant efforts to overcome political and scientific isolation, encouraging international contacts between scientific academies, at least until 1929. Between 1922 and 1934, 14 British scientists were elected members of the Soviet Academy of Sciences. However, at the end of the 1920s the USSR changed its policy, taking a course towards autarky and mass repressions; consequently no further foreign members were elected to the Soviet Academy until 1942.

After the outbreak of the Second World War, the USSR made a U-turn, proclaiming the importance of strengthening scientific collaboration with Western countries including Great Britain. The election of a mathematician, Ivan Vinogradov (1891–1983), in 1942 and a mechanical engineer, Stepan (Stephen) Timoschenko (1878–1972), the following year can be considered signs of respect for the USSR as a member of the anti-Hitler coalition. The Soviet Academy, in turn, elected both the biochemist Henry H. Dale (1875–1968) and a geneticist with Marxist views, J. B. S. Haldane (1895–1964), in 1942 as honorary members. The election of the geneticist Nikolai Vavilov (1887–1943) on 23 April 1942 was an expression of solidarity, as he was a famous scientist who had been arrested for his fight against Stalin’s favourite biologist, Trofim Lysenko (1898–1976). Lysenko and his followers advocated a strongly ideologically affected version of neo-Lamarckism and enjoyed the support of Joseph Stalin. Lysenkoists, like many nineteenth-century Lamarckians, attributed inheritance to the whole organism and denied the existence of discrete hereditary factors like genes. Such a form of Lamarckism could not survive in the twentieth century without the support of extreme totalitarian regimes and repressions against geneticists such as Vavilov.⁵⁹ Unfortunately, this appointment, as well as other efforts by the international community, could not protect Vavilov against prosecution and, in the end, served only to forestall the bitter consequences of that fight.

Throughout his life, Vavilov had strong connections with Great Britain. He worked in England in 1913–1914 after graduating from the Moscow Agricultural Institute, and published his first paper there, on the immunity of plants, in the *Journal of Genetics*. He published several other papers in English, which brought him world recognition. During his stay in England, Vavilov won many friends among outstanding British scholars and younger colleagues, who contributed to his popularity within the Western scientific community. Among others, his ‘lobbyists’ included William Bateson (1861–1926), Alfred

Daniel Hall (1864–1942), Reginald Punnett (1875–1967), Arthur William Hill (1875–1941), Vernon Herbert Blackman (1872–1967), Rowland H. Biffen (1874–1949), Cyril Darlington (1903–1981) and Haldane.⁶⁰ All of them were members of the Royal Society and also promoted his election to the Royal Horticultural Society (1931).

In 1942 Vavilov was elected a member of the Geographical Society of London, the Linnaean Society of London and the Royal Society of Edinburgh. As Henry H. Dale argued, his election was not only a recognition of his scientific merits but also an attempt to support him in a difficult situation.⁶¹ On 25 April 1942, immediately after his election as a member of the Royal Society, Vavilov was allowed to plead for mercy, and on 23 June the Presidium of the Russian Supreme Court commuted his death sentence to 20 years in a labour camp.⁶² However, this did not prevent his death as he died in prison less than a year later, on 26 January 1943. Thanks to the information blockade, it was not until 1946 that his British friends published his first obituary.⁶³

After the breakdown of Hitler's regime, the Cold War between Eastern and Western blocs began, and all contacts between Soviet and Western scientists ceased:

Scientific contacts during the war, if somewhat limited, had nevertheless led many scientists to believe that a new era of post-war cooperation would begin, but it was not to be. This was due, in very large measure, to a return to the form of the 1930s in connection with Soviet policy. . . . the situation remained difficult until Stalin's death in 1953. During the subsequent 'thaw' under Khrushchev international (scientific) contacts improved once more, with Western scientists availing themselves of new-found opportunities to visit the USSR.⁶⁴

In 1956, during the 20th Congress of the Communist Party, the Soviet leader Nikita Khrushchev (1894–1971) denounced Stalin's cult and proclaimed a new era that would be marked by de-Stalinization and peaceful co-existence with the capitalist environment. In the same year, the Royal Society and the Soviet Academy of Sciences signed an agreement supporting the mutual exchange of scholars. The election of Soviet scientists to membership of the Royal Society was considered an achievement of socialist science. In six years, four Soviet scientists were elected: the chemist and Nobel Laureate Nikolai Semenov (1896–1986, elected in 1958), the President of the Academy, the chemist Alexander Nesmeyanov (1899–1980, elected in 1961), the physicist and future Nobel Laureate Lev Landau (1908–1968, elected in 1960) and the mathematician Andrei Kolmogorov (1903–1987, elected in 1964).

All of these men were known for their complex relationships with the state power. For example, Lev Landau was arrested in the late 1930s and remained under the control of the security agency until the end of his life. Another example is Nesmeyanov, who lost his position as the President of the Academy in 1961 owing to a conflict with Khrushchev. These examples demonstrate that Khrushchev's science policy had a double nature. On the one hand, his policies of liberalization, known as 'Khrushchev's thaw', improved the intellectual climate in the country. On the other hand, he still tried to keep intellectuals, including scientists and artists, under tight state control, although the marginalization of intellectuals did not carry the same lethal consequences for them as in Stalin's time. Under these circumstances, the election of outstanding Russian scientists to the Royal Society was an expression of the international solidarity of the Western scientific community with politically persecuted Soviet scientists. At the purely scientific level, both sides had consistently demonstrated their interest in strengthening and widening cooperation.

After Nikita Khrushchev lost power, the liberalization of scientific cooperation continued to make progress, albeit slowly. The Academy of Sciences and the Royal Society organized mutual visits of representative delegations, including the presidents of both scientific societies. The cooperation between Soviet and British scientists in the late Soviet period was supported at a very high political level.⁶⁵ This was reflected in the dynamics of elections of Russian/Soviet scholars to the Royal Society: the astrophysicist Viktor Ambartsumian (1908–1996, elected in 1969), the mathematician and biologist Israil Gelfand (1913–2009, elected in 1977), the physicists Yakov Zeldovich (1914–1987, elected in 1979) and Evgenii Lifshitz (1915–1985, elected in 1982), and the mathematician Igor Shafarevich (1923–2017, elected in 1981). All of them were known for their independent political views. Shafarevich and Gelfand were even known as members of the Soviet dissident movement. While the election of Soviet scientists to the Royal Society was determined by their scientific merits, the election of British scholars to the Soviet Academy of Sciences was fully dependent upon the foreign policy of the USSR and the political views of a potential candidate. As a result of this policy, the percentage of British scholars at the Academy decreased significantly in the late USSR era. The overwhelming majority of foreign members were citizens of eastern European countries (members of the Warsaw Pact), as well as French and American citizens. France was seen as a USSR-friendly country at this time, and it withdrew from NATO's military integrated command in 1966. The USA was seen as a major rival and the most important country of the Western bloc.

The elections to the Soviet Academy took place at intervals of approximately six years. Thus, in 1958 three British scientists became members of the Soviet Academy, in 1966 four scientists, in 1971 only one, in 1976 three, in 1982 again only one and in 1988 two. The number of British members of the Academy remained at a stable but low level in the post-Stalinist USSR, although in 1987 the Royal Society could count 26 joint projects with Soviet institutions.⁶⁶ The low profile of scientific contacts in the 1960s and 1970s can be seen as a reflection of the low level of cultural relations. As Alex Pravda wrote in 1990: 'Cultural contacts have run at a relatively low and fluctuating level. The regular educational, scientific and artistic exchanges which began in earnest have remained hostage to the vicissitudes of the overall political relationship.'⁶⁷

In general, the 1970s and 1980s can be characterized as a time of relatively intensive academic contacts between Soviet and Western scientific institutions: 'In spite of continuing problems, scientific contacts between East and West were, by the 1970s and 1980s, better than they had ever been before.'⁶⁸ At the same time, academic contacts between the Soviet Academy and the Royal Society developed quite slowly as a result of the difficult political relationship between the two countries.

The breakdown of the Soviet Union in 1991 removed all political obstacles to international cooperation between Russian scientists and Western academic institutions. The first post-Soviet Russian government declared a pro-Western and liberal policy. Russian scholars could now spend an unlimited amount of time in foreign countries and publish in the most prestigious journals.⁶⁹ The intensification of contacts contributed to the better understanding of the real impact of individual scientists on the course of science independently of their place within the scientific hierarchy in Russia. Thus, the Royal Society elected the physicist and future (2003) Nobel Laureate Vitaly Ginzburg (1916–2009, elected 1987), the theoretical physicist Isaak Khalatnikov (b. 1919, elected 1994), the physicist and future (2003) Nobel Laureate Alexei Abrikosov (1928–2017, elected 2001) and the mathematician Vladimir Arnold (1937–2010, elected 1988), as well

as scientists who were Russian-born but had been living and working abroad: the physicists Andrei Geim (b. 1958, elected 2007) and Konstantin Novoselov (b. 1974, elected 2011), the mathematician Yakov Sinai (b. 1935, elected 2000), the astrophysicist Rashid Sunyaev (b. 1943, elected 2009) and the applied mathematician Grigory Barenblatt (b. 1927, elected 2000).

Even considering that some of these scholars worked or are still working in Western countries, it is evident that the breakdown of the USSR accelerated the process of electing Russians to the Royal Society. Roughly speaking, the quantity of Russian members of the Royal Society of London grew exponentially and doubled every hundred years. In contrast, the dynamics of elections of British scientists to the Russian Academy of Sciences was the opposite to that which was seen for the Royal Society: fewer and fewer British colleagues were elected. A possible explanation for this fact is the globalization of science and the intensive migration of British scientists to other countries, primarily to the USA, as well as political turbulence in Russia, where science became a marginal part of domestic policy.

CONCLUSION

The first contacts between the Royal Society and Russian scholars date back to the time of the Society's establishment. During more than 350 years, about 50 scientists who were connected to Russia either by their origin, education or studies were elected to membership (see the Appendix below). Until the eighteenth century, newly elected members were mostly British people or Germans who moved to Russia. The overwhelming majority of the later elections of Russian foreign members of the Royal Society (32 out of 41) took place in the twentieth and twenty-first centuries. About two-thirds of these elections have happened in the last 60 years, including 12 after the end of the Cold War.

In general, the dynamics of honorary memberships have reflected the contribution of Russian science to the global science community. At the same time, political and social factors have influenced the dynamics of elections at all times, although priority has always been given to scientific merit. With the exception of Alexander Menshikov (the first Russian member of the Royal Society), all of the other Russian members have, indeed, been outstanding scholars who have enriched science.

Historical circumstances have influenced the dynamics of membership as well. Until the beginning of the First World War, Russian scientists had their strongest connections with Germany and France, where they attended universities, wrote their dissertations, produced the majority of their publications and conducted joint research projects. British scientists usually learned about the scholarly achievements of their Russian colleagues from German and French journals. Original publications in British journals were rare and took place primarily in the time between the two world wars. Significant obstacles to mutual appreciation by British and Russian scholars were the language barrier (Russians spoke mostly French and German as their first and second foreign languages) and the relative physical inaccessibility of the British Isles until the mid nineteenth century, in comparison with continental Europe. The works of British scientists were, as a rule, translated into Russian not directly from English but rather from French or German, as was the case, for example, with Darwin's *Origin*. Links between the two countries tended to have a personal rather than an institutional character.

The situation began to change significantly at the end of the nineteenth century. As Great Britain became a leading industrial country, technological changes also made it more accessible to Russian scientists. Science in the Russian Empire developed rapidly, and there was mutual interest in cooperation. It is noteworthy that many Russian scientists (Kowalevsky, Metschnikoff, Mendeleev, Timiryazev) became world famous because of the recognition they received in Britain. As Mendeleev put it: 'as in many other respects I enjoyed most of all English sympathies'.⁷⁰ Towards the end of the nineteenth century Great Britain began to play an increasing role as a crucial stepping stone towards achieving world fame, because publication in British journals and election to the Royal Society opened the door not only to Britain but also to the USA, which became increasingly important. Examples of Russian scientists who benefited from this practice are Pavlov and Vavilov, who went to the United States armed with the highest recommendations from their British colleagues.

Another important factor was political history, which influenced the memberships of the two institutions in two ways. First, the Russian Empire and later the Soviet Union alternated its policy, with a certain periodicity, between more or less strong isolationism and attempts to catch up with industrially developed Western countries. There was, however, no direct correlation between isolationism and the frequency of nominations to the Royal Society because the Society often reacted unpredictably by electing certain Russian scientists to improve their position at home. The best example is Nikolai Vavilov, who, among others, was accused of being an English spy.

Nevertheless, the foreign policies of the two countries definitely influenced the dynamics of scientific contacts. For example, during the First World War, when Great Britain and Russia were allies, numerous English–Russian scientific societies were created. Several British universities established chairs of Russian Studies. There were even plans to found a Russian institute in London.⁷¹ Yet the Russian Revolution of 1917 cooled this growing cooperation down. The majority of scholars who came to Britain after the revolution, as immigrants, were experts in the humanities and contributed only moderately to the changes in the British scientific and educational landscape. Even so, the Royal Society played a significant role in training new immigrants and providing them with work places and, sometimes, laboratories, as was the case with Pyotr Kapitsa.

After the Second World War, the Royal Society played a crucial role in establishing scientific connections between the USSR and Western countries. Even today, an honorary membership of the Royal Society is an important step towards international recognition for Russian scientists. At the same time, memberships in the Society contribute to the integration of Russian science in general into the global scientific enterprise. As Martyn Poliakoff, who was foreign secretary and vice president of the Royal Society of London until November 2016, has claimed:

good relations continue with RAS [Russian Academy of Sciences] despite the currently strained political relations between the United Kingdom and Russia and recent threats to scientific collaboration between Russia and the West. RAS is itself undergoing unprecedented change. The society is supporting RAS during this transformation.⁷²

APPENDIX: LIST OF RUSSIAN MEMBERS OF THE ROYAL SOCIETY

This appendix includes all members of the Royal Society who were born in Russia/USSR or spent a significant time in the service of Russian research or educational institutions. For each member, the entry gives the date of election to the Royal Society, the member's name, vital dates and scientific field, and the kind of membership awarded. Finally, if a person was elected a member of the Royal Society prior to resettling in Russia, we indicate the date of election to the St Petersburg Academy of Sciences and/or the dates of service in Russia. For names, we have indicated both the transliteration as it appears in the 'List of Fellows of the Royal Society 1660–2007: a complete listing of all Fellows and Foreign Members since the foundation of the Society' and the alternative transliteration used in this paper.

1762	Samuel Collins (1619–1670), physician, Corresponding Member
30.11.1703	Robert Areskine (1677–1719), physician, Fellow (public service in Russia from 1706)
29.07.1714	Alexander Danilovich Menzicoff (Menshikov) (1673–1729), political and military figure, Fellow
10.12.1730	Gerald F. Muller (1705–1783), historian, Fellow
18.03.1731	Johann Amman (1707–1741), naturalist, Fellow (Professor of Botany and Natural History at the Academy of Sciences from 27.02.1733)
22.01.1747	Leonhard Euler (1707–1783), mathematician, Fellow (Adjunct and Professor of the Academy of Sciences, 17.12.1726–05.06.1741; Honorary Foreign Member of the Academy of Sciences, 04.05.1742–25.04.1766; Professor of Mathematics at the Academy of Sciences from 07.09.1783)
07.06.1764	Peter Simon Pallas (1731–1811), naturalist, Fellow (Professor of Natural History at the Academy of Sciences, 1767–1810)
06.04.1826	Roderick Impey Murchison (1792–1871), geologist, Fellow ('Ordinary', i.e. full, Member of the Academy of Sciences in geology from 21.09.1845)
15.03.1827	Friedrich Georg Wilhelm von Struve (1793–1864), astronomer, Fellow
27.04.1837	Adam Johann von Krusenstern (1770–1846), geographer and seafarer, Foreign Member
15.06.1854	Karl Ernst von Baer (1792–1876), biologist and geographer, Foreign Member
27.11.1873	Otto Wilhelm von Struve (1819–1905), astronomer, Foreign Member
13.12.1877	Pafnuti Livowitsch Tchebitchef (Pafnutii Chebyshev) (1821–1894), mathematician, Foreign Member
10.12.1885	Alexander Onufrievitch Kowalewski (Kowalevsky) (1840–1901), biologist, Foreign Member
19.05.1892	Dmitri Ivanovich Mendeleeff (Dmitrii Mendeleev) (1834–1907), chemist, Foreign Member
12.12.1895	Elias Il'ich Metchnikoff (Il'ya Metschnikoff) (1845–1916), biologist, Foreign Member
06.06.1907	Ivan Petrovich Pavlov (1849–1936), biologist, Foreign Member
09.11.1911	Clement Arkadevich Timiriazeff (Kliment Timiryazev) (1843–1920), biologist, Foreign Member
23.03.1916	Boris Borisovich Golitsyn (1862–1916), physicist, Foreign Member

10.05.1928	Gleb Vasil'evich von Anrep (1889–1955), biologist, Fellow
02.05.1929	Pyotr Leonidovich Kapitsa (Piotr Kapitza) (1894–1984), physicist, Fellow (Corresponding Member of the Academy of Sciences from 31.01.1929 and Academician from 29.01.1939)
18.06.1942	Ivan Matveevich Vinogradov (1891–1983), mathematician, Foreign Member
18.06.1942	Nicholas (Nikolai) Ivanovich Vavilov (1887–1943), geneticist, Foreign Member
15.06.1944	Stephen (Stepan) Prokofievitch Timoschenko (1878–1972), engineer and mathematician, Foreign Member (Foreign Corresponding Member of the Academy of Sciences from 14.01.1928)
16.03.1950	Boris Petrovich Babkin (1877–1950), biologist, Fellow
16.03.1950	Boris Petrovich Uvarov (1886–1970), biologist, Fellow
24.04.1958	Nikolai Nikolaevich Semenov (1896–1986), chemist, Foreign Member
28.04.1960	Lev Davydovitch Landau (1908–1968), physicist, Foreign Member
27.04.1961	Alexander Nikolaevich Nesmeyanov (1899–1980), chemist, Foreign Member
23.04.1964	Andrei Nikolaevich Kolmogorov (1903–1987), mathematician, Foreign Member
24.04.1969	Viktor Amazaspovich Ambartsumian (1908–1996), astrophysicist, Foreign Member
21.04.1977	Izrael (Israil) Moiseivich Gelfand (1913–2009), mathematician and biologist, Foreign Member
26.04.1979	Yakov Borisovich Zeldovich (1914–1987), physicist, Foreign Member
09.04.1981	Igor Rostislavovich Shafarevich (1923–2017), mathematician, Foreign Member
24.06.1982	Evgenii Mikhailovich Lifshitz (1915–1985), physicist, Foreign Member
25.06.1987	Vitaly Lazarevich Ginzburg (1916–2009), physicist, Foreign Member
30.06.1988	Vladimir Igorevich Arnold (1937–2010), mathematician, Foreign Member
09.06.1994	Isaak Markovich Khalatnikov (b. 1919), physicist, Foreign Member
11.05.2000	Grigory Isaakovich Barenblatt (b. 1927), engineer and mathematician, Fellow
10.05.2001	Alexei Alekseyevich Abrikosov (1928–2017), physicist, Foreign Member
17.05.2007	Andrei (Andre) Konstantin Geim (b. 1958), physicist, Fellow
15.05.2008	Evgenny Konstantinovich Sklyanin (b. 1955), mathematician, Fellow
14.05.2009	Yakov Grigorevich Sinai (b. 1935), mathematician, Foreign Member
14.05.2009	Rashid Alievich Sunyaev (b. 1943), astrophysicist, Foreign Member
20.05.2010	Ludvig Dmitrievich Faddeev (1934–2017), theoretical physicist and mathematician, Foreign Member
19.05.2011	Kostya (Konstantin) Sergeevich Novoselov (b. 1974), physicist, Fellow
19.05.2011	Mikhail Leonidovich Gromov (b. 1943), mathematician, Foreign Member
28.04.2016	Eugenija Kumacheva, chemist, Fellow

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NOTES

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- 5 In particular, Samuel Collins provided information about the natural history of Russia and the customs of the Royal Court in a posthumously and anonymously published book: *The Present State of Russia, in a Letter to a Friend at London; Written by an Eminent Person residing at the Great Tzars Court at Mosco for the space of nine years* (John Winter, London, 1671). The book was first published in Russian in 1841 in *Russkii Vestnik* [Russian Messenger] **7**, 161–182 and **9**, 567–596 (1841). Collins claimed that the majority of Russians in the mid seventeenth century saw science as something monstrous and scary.
- 6 Arthur MacGregor claims that Peter made four separate visits to the Royal Observatory at Greenwich: ‘The Tsar in England: Peter the Great’s visit to London in 1698’, *Seventeenth Cent.* **19**, 116–147 (2004).
- 7 A. I. Andreev, *Piotr Velikii* (Izdatel’stvo AN SSSR, Moscow and Leningrad, 1947), pp. 69–73.
- 8 S. I. Vavilov, *Isaak Newton* (Izdatel’stvo AN SSSR, Moscow and Leningrad, 1945), pp. 212–213. The Royal Society gave the draft of this letter to the Soviet Academy of Sciences as a gift in 1943. Newton’s sign manual was reproduced in the book: *ibid.*, pp. 216–217.
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- 15 *Ibid.*, F. 121, Register 2, no. 128. L. 1.
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- 19 SPF ARAN, F. 21, Register 1, no. 1; no. L. 1–2ob.
- 20 *Ibid.*, no. 1. Ll. 9 ob.–17.
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- 23 *Rossiiskaia Akademiia nauk: personal’nyi sostav* [Russian Academy of Sciences: list of members], vol. 1. 1724–1917 (Nauka, Moscow, 2009), pp. 294–399.
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