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BOOK REVIEW

Karin Reich and Elena Roussanova: *Carl Friedrich Gauss und Russland: Sein Briefwechsel mit in Russland wirkenden Wissenschaftlern*

De Gruyter, Berlin, 2012. (Abhandlungen der Akademie der Wissenschaften zu Göttingen, Neue Folge, Volume 16), ISBN: 978-3-11-025306-1, 905 pp, $225.00

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This book deals with the relationship between the great German scientist Carl Friedrich Gauss (1777–1855) and Russian politics, society and science of his time.

The authors are Karin Reich and Elena Roussanova. Reich is a professor of the history of science. She was born in München, worked in Stuttgart and was from 1995 until her retirement in 2007 professor at the Institute for the History of Natural Sciences and Mathematics of Hamburg University. Since 2008 she has been the leader of the research project "Gauss und Russland," financed by Fritz Thyssen Stiftung. Her main research interests are the history of science in the sixteenth, nineteenth and twentieth centuries. In particular, she has focused much of her work in the life and work of Gauss, and also in the history of mathematics and theoretical physics in Hamburg. Between her books there is a biography of Gauss (Reich 1977, new ed. Reich/Biegel 2005). Recently she published, together with Horst Schmidt-Böcking, a biography of Otto Stern (1888–1969), the famous German physicist and Nobel laureate in physics, who worked from 1923 to 1933 at the University of Hamburg, until resigning from his post because of the seizure of power by Hitler (Schmidt-Böcking and Reich 2011). She has published more than 140 scientific works.

Elena Roussanova has been working for a long time on the history of natural sciences in Russia, chemistry being one of her main specializations. She has published a book on Julia Lermontowa, a Russian chemist who was the first woman to get a PhD degree in chemistry (Roussanova 2003). In 2007 she published a remarkable edition of the letters and documents of the famous chemist Friedrich Konrad Beilstein (1838–1906), the author of the "Handbuch der organischen Chemie," (Roussanova 2007). Roussanova is a Russian native speaker who worked in Saint Petersburg and Hamburg. She made a perfect pair with Karin Reich in order to undertake this huge work. They had already published many papers together (like Reich and Roussanova 2012). This book includes researches in German and Russian libraries, universities, museums, archives and research institutes. All original quotations in Latin and Russian have been translated into German.

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There is a Preface written by Christian Starck, President of the Academy of Sciences of Göttingen, and another one by Axel Wittmann, one of the Managers of the Gauss Society.

The book is divided into two Parts. The first one presents an introduction to Gauss and Russia, divided into 7 Chapters. The second Part presents the correspondence between Gauss and 17 scientists who were working in Russia at that time. The book profiles these scientists with whom he corresponded and also often collaborated directly. It is the first time that a book with this scope has been published, examining the special relationship between Gauss and Russia. It presents two sides of the same coin, namely, the relevant role played by Gauss for mathematics and physics in Russia from the beginning of his career in 1799 until his death in 1855, as well as the significance of Russia in Gauss's scientific work.

Gauss was a German mathematician and physical scientist who contributed significantly to many subjects: number theory, statistics, analysis, the method of least squares, differential geometry, geodesy, geophysics, terrestrial magnetism, electricity, astronomy and optics. Even during his lifetime he was sometimes referred to as the 'Prince of Mathematicians'. In his 1799 doctorate he proved the fundamental theorem of algebra. In 1801 he published a fundamental book on number theory, *Disquisitiones Arithmeticae*, dealing with arithmetical investigations, in which he showed that a regular 17-sided polygon can be constructed with straightedge and compass. He became famous with his prediction of the position of the planet Ceres which had been discovered by Giuseppe Piazzi in 1801, disappearing soon afterwards. It was rediscovered by von Zach and Heinrich Olbers in the position predicted by Gauss. In 1807, when he was 30 years old, Gauss was appointed Professor of Astronomy and Director of the Astronomical Observatory in Göttingen, remaining in this post until his death. He claimed to have discovered the possibility of non-Euclidean geometry, but published nothing on this topic. Nikolai Lobachevsky (1792–1856) published in 1829–1830 the first work on non-Euclidean geometry. János Bolyai (1802–1860), the Hungarian mathematician and son of Gauss's friend Farkas Bolyai (1775–1856), published in 1832 an independent work on non-Euclidean geometry. Gauss also carried out a geodesic survey of the state of Hanover. He developed fundamental works in geomagnetism and electricity during fruitful collaboration with Wilhelm Weber (1804–1891), the famous German physicist. Weber and Gauss built the first working electromagnetic telegraph in 1833, which connected the Astronomical Observatory with the Institute of Physics in Göttingen. Weber was hired as Professor of Physics of the University of Göttingen in 1831, on the recommendation of Gauss. In 1837 Weber was dismissed from his post at the University for political reasons, becoming Professor of Physics at Leipzig University from 1843 to 1849, when he was reinstated at Göttingen. Gauss founded with Weber an international magnetic association, the "Magnetischer Verein," which had a publication, *Resultate aus den Beobachtungen des magnetischen Vereins*, which was published from 1836 to 1843. This year marked the last magnetic observations of Gauss and the end of his main researches in this topic, due to Weber's move to Leipzig. All of these subjects are discussed at length in this book, in connection with Russian science.

Chapter 1 addresses the political situation in Russia during Gauss's lifetime, especially during the governments of Alexander I (1777–1825), who served as Emperor of Russia from 1801 to 1825, and Nicholas I (1796–1855), who was the Emperor of Russia from 1825 to 1855.

Chapter 2 presents the situation of the sciences in Russia during this period. The Universities of Dorpat, Kasan, Moscow, Kharkiv, Vilnius, Saint Petersburg and Kiev are presented, together with the Academy of Sciences of Saint Petersburg. This Academy was founded in 1725 and Gauss was elected as a corresponding member in 1802. This was the

first recognition Gauss received from a Scientific Society, as discussed on pages 217–220 of this work. In 1824 he became an honorary member of this Society. Of the 17 correspondents presented in this book, 13 were members of this Academy. It is also outlined the visits to Germany of scientists working in Russia who had relations with Gauss, and also the Russian students of mathematics and sciences related to Gauss and his activities.

There is a long Chapter 3 devoted to terrestrial magnetism in Russia. It begins with a clear discussion of the beginnings of this research topic through Alexander von Humboldt (1769–1859) in the period from 1823 to 1833. In 1823 Humboldt and Arago built the first magnetic observatory of the world, in Paris, where Arago made observations until 1835. Humboldt travelled through Russia from April to November 1829. At Kasan he was received by the then rector of the University, Lobatchevsky. Gauss met Weber at a scientific meeting organized by Humboldt in Berlin in 1828. Humboldt motivated Gauss and Weber to devote their efforts to geomagnetism. This Chapter concentrates on the influence of Gauss in Russia through his fundamental work of 1833, on the intensity of the Earth's magnetic force reduced to absolute measurement. This article has been recently translated into English (Gauss 1995). It was originally published in 1833 in two German translations, while the original Latin version was published only in 1841. The Russian translation of this work appeared very soon, in 1836, showing a great interest in this topic. The magnetic observatory of Göttingen was built in 1833 at the gardens of the Astronomical Observatory. This Chapter also discusses in great length the influence of Gauss's theory of terrestrial magnetism of 1838, first published in 1839. The Physical Observatory of Saint Petersburg was built in 1849.

Chapter 4 presents the Russian translations of Gauss's works from his lifetime to the present age. They include a list of 53 translations, including 40 works which had one or more different publications. In no other language were so many of his works ever translated, although Gauss never visited Russia and never published in Russian scientific journals. As the authors mention on page 122, Russia was and is the country that found in the work of Gauss special attention and appreciation, more than in every other country.

Chapter 5 was written by Werner Lehfeldt, Vice-president of the Academy of Sciences of Göttingen, a specialist in the Slavic languages. It presents how Gauss learnt the Russian language at an old age. He mentions that Gauss began his interest in Russian in 1838, in order to develop his mental abilities. It is no coincidence that this period coincides with Weber's dismissal of Göttingen University, as he was the main collaborator of Gauss at this time. He continued to study Russian until his death in 1855.

Chapter 6 describes Gauss many activities related with Russian literature, language and history, while Chapter 7 presents the obituaries and biographies published in Russia after Gauss's death.

The second part of the book is divided into 17 Chapters presenting the correspondence of Gauss and the following scientists who were then working in Russia:

- Martin Bartels (1769–1836), a German mathematician who was the tutor of Gauss in Brunswick and the educator of Lobachevsky at the University of Kazan.
- Thomas Clausen (1801–1885), a Danish mathematician and astronomer, director of the Tartu Observatory.
- Nicolas Fuss (1755–1826), a Swiss mathematician and mathematical assistant to Leonhard Euler in Saint Petersburg. Fuss wrote a negative report related to Lobachevsky's non-Euclidean geometry.
- Paul Henrich Fuss (1798–1855), son of Nicolas Fuss and grand-son of Leonhard Euler, permanent secretary of the Academy of Sciences of Saint Petersburg.

- Carl Jaenisch (1813–1872), a Finnish and Russian chess player and theorist.
- Adolph Theodor Kupffer (1799–1865), a Russian Latvian physicist and chemist, who founded the Department of Weights and Measures and the main Physical Observatory in Russia, at Saint Petersburg, devoted to all aspects of geophysics, including the construction and calibration of instruments, coordination of magnetic and meteorological observations, etc. He also worked in the elasticity of metals, a subject of interest to Gauss and Weber, and held the first chair of terrestrial magnetism ever created in the world. He published in many topics, including geomagnetism, meteorology, mineralogy, geology, geography and metrology. As mentioned on page 362, Kupffer and Gauss met one another in 1819, during Kupffer's studies at the University of Göttingen. He was 22 years younger than Gauss and is the only one between these 17 correspondents in Russia who can be correctly considered a student of Gauss.
- Carl Heinrich Kupffer (1789–1838), a mathematician brother of Adolph Theodor Kupffer.
- Joseph Johann Edler von Littrow (1781–1840), an Austrian astronomer.
- Nikolai Ivanovich Lobachevsky (1792–1856), the famous Russian mathematician and geometer, one of the creators of non-Euclidean geometry, rector of the University of Kasan. As the authors point out on page 171, although Gauss had correspondence with his tutor Bartels, there was no influence of Gauss upon Lobachevsky related to non-Euclidean geometry, which he developed completely independent of Gauss. Gauss read after 1840 Lobatchevsky's original publications of 1829–1830 in Russian and had also his book published in German in 1840. Apparently it was in 1840 that Gauss first heard of Lobachevsky. He made efforts for him to be accepted as a corresponding member of the Scientific Society of Göttingen, in which he was well succeeded. The works of Lobachevsky and Bolyai on non-Euclidean geometries were only recognized in the 1860s and 1870s, after their deaths.
- Johann Heinrich Mädler (1794–1874), a German astronomer, director of the Dorpat (Tartu) Observatory in Estonia.
- Georg Friedrich Parrot (1767–1852), a Livonian scientist, the first rector of the Imperial University of Dorpat, founded in 1802.
- Friedrich Parrot (1791–1841), son of Georg Friedrich Parrot, a Livonian naturalist and traveller.
- Magnus Georg von Paucker (1787–1855), a Russian mathematician who worked in Dorpat and Mitau.
- Paul Schilling von Canstadt (1786–1837), a diplomat of Baltic German origin employed in the service of Russia in Germany. He built a pioneering electrical telegraph in Saint Petersburg.
- Friedrich Theodor von Schubert (1758–1825), a scientist member of the Russian Academy of Sciences and head of the Astronomical Observatory of the Academy.
- Ivan Mikhaylovich Simonov (1794–1855), Russian astronomer and corresponding member of the Saint Petersburg Academy of Sciences, one of the first scientists to work with geomagnetism in Kasan and author of one of the first modern Russian textbooks on astronomy.
- Friedrich Georg Wilhelm Struve (1793–1864), a Baltic German astronomer. He was the leader of a famous dynasty of astronomers. He was full professor and director of the Dorpat Observatory. In 1839 he founded and became director of the new Pulkovo Astronomical Observatory, located 19 km south of Saint Petersburg, which very soon acquired international renown. As mentioned on page 674 of the book, he was one of

the main observational astronomers of his time, being considered in Russia the "Tsar of Astronomy," while Humboldt described him as the "Tyrant of Pulkovo."

The only negative aspect in this book was the lack of a map showing the locations in the Russian Empire of the main research Institutes discussed in this work, and also the main cities where geomagnetic data was collected for the first time during Gauss's lifetime.

It is the first time that such a huge book have been published, presenting all known correspondence between Gauss and the scientists working in a specific country. In all there were published here 127 letters, most of them for the first time. The existence of some of these letters was not even known before their detailed and painstaking research. As mentioned in the Conclusion of the book, written in German and Russian, they cover the period of 1799–1855, dealing with mathematics, astronomy, geodesy and physics. Rarely were personal subjects or political questions discussed in these letters. This book reached the goal of documenting how Gauss's ideas were received and developed in Russia; and how Gauss profited from the scientific data and information collected in this huge land, related especially to geomagnetism and astronomy. This subject had been only briefly touched upon in other biographies of Gauss.

This work is extremely rich in its contents and detailed research. It contains 90 figures, including reproductions of oil paintings representing the main scientists discussed in the work, pictures showing the earliest magnetic observatories in Europe and Russia, some astronomical observatories, etc. At the end of the book the authors included 577 short biographies of scientists and other people related with the subject "Gauss and Russia," spread over 57 pages. It has 659 full references presented in 66 pages, including first and last pages, titles, etc.

It was a great pleasure reading this work. We can only hope that this masterpiece will soon find its English and Russian translations, as it rightly deserves.

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