

ENGLISH SUNDIAL MAKERS IN RUSSIA

Part 1. Before the Beginning

ALEKSANDR M BOLDYREV

Introduction

In the heroic age of Peter the Great the most courageous, well educated and energetic people came to Russia from all over the world. Sundial makers from England and Scotland were amongst them.

Two periods are clearly distinguished in the history of the sundial making in Russia. The first concerns the Russian Navy. The Navy grew so rapidly that the instrument making industry could not grow at a corresponding rate. With few exceptions sundials were imported but not manufactured in this period. The second period deals with land-surveying. In this period almost all the European countries had completed geodesic surveys of their territory. Russia, due to its size, could not succeed in this work and invited instrument makers from abroad.¹⁸

The present article deals mainly with the first period and even with some events before it. It will not reveal all the details but only outline the topic: in this very brief compilation I give some of the historical events that served as the reasons for sundial makers from England to emigrate to Russia. In this period sundial makers had not yet arrived in Russia. That is why I write relatively little about sundial makers in my compilation. I tell as well about a nobleman Jacob Bruce (1669-1735) of Scottish descent who was a tsar's confidant and outstanding man of science and of military art¹ and who, in fact, was a leader of Russian sundial- and instrument-making industries.

Setting the Scene

By the end of the 17th century Russia had no seaports in the Black and Baltic Seas. The shores of the Black Sea were under the jurisdiction of Turkey. It was an obstacle to the country's progress. Peter I faced a long war against Turkey and needed allies. During his Grand Tour he visited some European capitals and in September 1697 when he was in The Hague he met William III, who invited him to England. But almost three months passed before Peter came to England due to the fact that he waited for Jacob Bruce, one of his most trustworthy advisers. When at last Bruce arrived, the cause of his delay became clear. He was seriously wounded.

During Peter's European trip the duke-caesar Fyodor Romodanovsky, the head of the secret affairs 'prikaz' (department), was an acting governor of Russia. This man of absolute devotion was noted for extreme cru-

elty to the tsar's enemies. It is not known for certain whether the duke-caesar tortured Jacob Bruce or not. But there remains Peter's letter, in which he called his duke-caesar a brutal animal and promised to 'muzzle' the duke by himself.

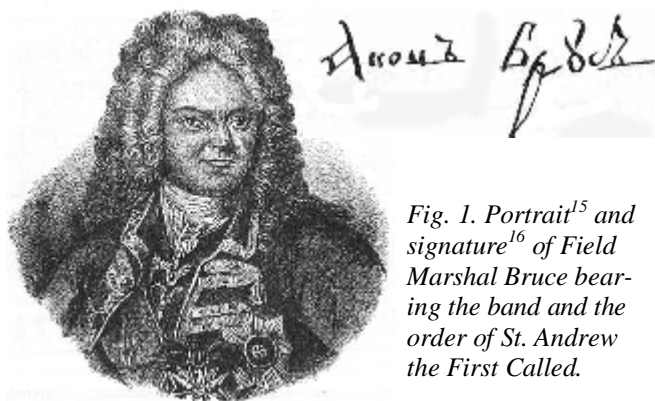


Fig. 1. Portrait¹⁵ and signature¹⁶ of Field Marshal Bruce bearing the band and the order of St. Andrew the First Called.

England was expecting the War of the Spanish Succession and negotiations with William III for the help against the Turks did not succeed. Peter saw Parliament, Oxford, the Arsenal, the Mint, and the Tower of London and Windsor Castle and tried a beautiful twenty-gun yacht, a present from the king.¹² By the end of December 1697 Peter received a message that regiments of the fusiliers had revolted again and had to leave hurriedly for Moscow.

The Grand Tour did not influence Peter directly, but moved his attentions from Turkey to Sweden. He realized that there existed a possibility to break the Swedish supremacy in the Baltic area. He had decided very ambitiously to create modern army, navy and military industry and not only to win over the Sultan of Turkey but even to beat Charles XII of Sweden. As the first step he ordered Jacob Bruce to stay in England and to study astronomy, mathematics, gun and powder manufacturing, minting techniques and all the subtle nuances of the shipbuilding in England. Of great importance was the order to employ qualified teachers in navigation and mathematics and to buy spyglasses, astro-labes, sundials and some other instruments. Bruce carried out all the orders and, in addition to the instructions, was introduced to Isaac Newton, John Flamsteed and Edmond Halley whom he was in correspondence with for the rest of his life.¹⁴

Who was Jacob Bruce?

After the execution of Charles I in 1649 some Stuart supporters left their dangerous home for an even more rugged

life abroad. Like Quentin Dorward, the Scottish marksman of Walter Scott, a young knight William Bruce, the 14th Lord of Clackmannan and direct descendant of Robert I Bruce, the King of Scotland, came to Russia in 1647. By the end of the 17th century he was the lieutenant colonel in Russian army and gained a reputation as a brave and trustworthy officer. He had two sons, Robert and Jacob.

In 1783 John Patrick Gordon (another Scot in Russia), a trusted confidant of the teenage Peter, had given William Bruce some good advice: to assign his sons to Peter's junior army [roughly equivalent to the Boy Scouts]. From this time Jacob Bruce progressed very rapidly and made a good public and army career. He participated in the Azov (1695-1696) and Crimean (1687, 1689) campaigns against the Turks. During the Great Northern War Bruce was involved in the development of Russian artillery.¹ He was a commander of artillery in the Battle of Poltava (1709), for which he was awarded the Order of St. Andrew the First-Called. In 1727 he became one of the first Russian counts.

The Neptune Society

The young Peter I, Patrick Gordon, Jacob Bruce and some others were the members of the so-called Neptune Society. Almost nothing is known about this society. It is assumed, however, that its members met from time to time and discussed the ways of how to organize the Russian navy. The meetings were usually held in the Sukharev Tower in Moscow. The Grand Tour offered the possibility to make the dreams of the members of the Neptune Society come true.

The School of Navigation

Staying in 1697 in England and fulfilling the Peter's orders, Jacob Bruce managed to engage many Englishman: naval officers, navigators, gunners, ship makers and even an architect. Among them there were three people who should be mentioned especially. They were a Scottish mathematician Prof. Henry Fargwarson (or Farkenson, or Farquharson) from the University of Aberdeen (died in Dec 1739 in St Petersburg) and two English experts in the theory of navigation and astronomy - Stephan Gwyun (1683-1720) and Richard Greice (1681-1711), both from Canterbury Christ Church University College.

In 1699 they came to Moscow where they lived in poverty for more than one year. The Tsar had not forgotten about them, he just had no time to regulate their life, being very busy preparing for the war against Turkey and Sweden. At last, on January 14 1701, he signed a 'ukase' (tsar's decree) "the Navigation School is to be" and ordered the recruitment of students.

The Navigation School was housed in the Sukharev Tower the same edifice where the sessions of the Neptune Society

were held. Teachers lived on the first floor. On the ground floor there was a workshop supplied with modern equipment Jacob Bruce had bought in England and where astronomical devices could be made or repaired. The top storey of the tower was assigned to serve as the observatory. Jacob Bruce, when in Moscow on leave from the army, undertook observations there and delivered lectures. The only Russian teacher was Leonty Magnitsky who was the author of the first Russian course of arithmetic. Later on Prof. Fargwarson learned Russian language so as to be able to edit translations from Latin. He taught geodesy in Russian, created the first Russian table of sine and cosine, and wrote school-books in Latin. In 1714 he analyzed the published data on the land-surveying of the Eastern territories. Then the responsibility for land-surveying was transferred to the graduates of the School of Navigation.

Meanwhile, Jacob Bruce was very busy. He headed the gun laboratory, manufactured and introduced new artillery equipment, and translated numerous manuals on military strategy. Yet, he found time to contribution to the Navigation School. He sorted out the manuals and translated them into Russian. In 1708 he translated into Russian a manual of geodesy.

Tsar Peter I himself wrote a chapter for the second edition of this manual. The chapter was referred to as "The way of compasses and ruler with some adding about sundials and the figure transformation". This book together with the tsar's contribution on the sundials was published in 1709 in the Moscow Printing Yard.

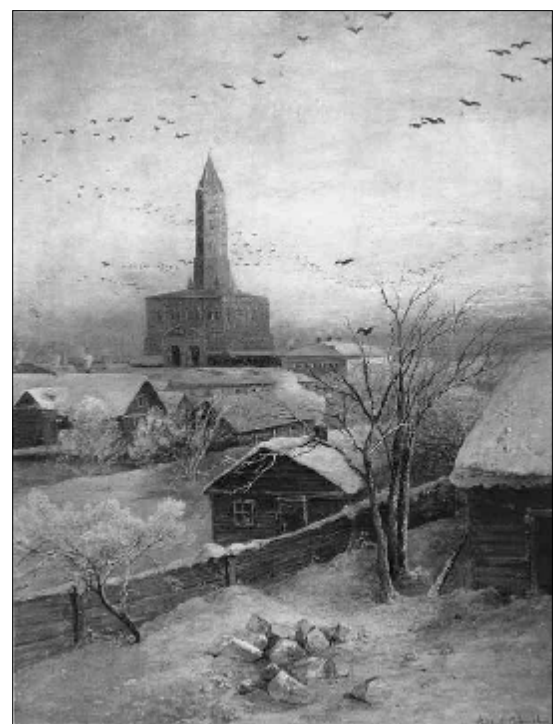


Fig 2. 'The Sukharev Tower' by Alexey Savrasov. 1872. Oil on canvas. The Historical Museum, Moscow.(The tower was demolished in 1930.)



Fig.3. Moscow Printing Yard with sundials flanking the lion and unicorn on the centre of the façade, late 17th century.¹⁵

Kurbatov, the clerk of the Tsar's Duma, made complaints against Prof. Fargwarson, who was frequently late to start the lessons and was too lenient to his students. It is a very funny detail, taking into account the brutal habits of that time: for example the service regulations of the Russian navy (modeled on the English ones) provided for eight (!) kinds of death penalty. Kurbatov was in charge of salaries. Prof. Fargwarson's salary was as high as 250 rubles per year, the two other English teachers were paid the salary

150 rubles each and the only Russian teacher Leonty Magnitsky (a peasant by birth) was paid only 90 rubles per year.¹¹

Lyrical digression

The Printing Yard was located close to the Sukharev Tower and less than 1km from the Kremlin. It was built by the 'ukase' of Ivan IV the Terrible in 1553-1663. It consisted of several buildings that were rebuilt and renovated more than once. An old engraving shows that at the time of Jacob Bruce it looked like a palace from a Fairyland. The engraving shows that the entrance into the edifice is decorated with a base relief of a lion and a unicorn with sundials on either side. The similarity with the emblem of the United Kingdom is most probably an accidental coincidence. Ivan IV was a faithful follower of the theory that Moscow is the third Rome and that Orthodoxy, inherited from Byzantium (the second Rome), was the only true religion. He considered the unicorn served as a symbol of the truth of this religion.

It ought to be mentioned here that in the 11th century Russia had inherited from Byzantine the style of stone carving. It can be seen from the engraving than the parts of building

It ought to be mentioned here that in the 11th century Russia had inherited from Byzantine the style of stone carving. It can be seen from the engraving than the parts of building

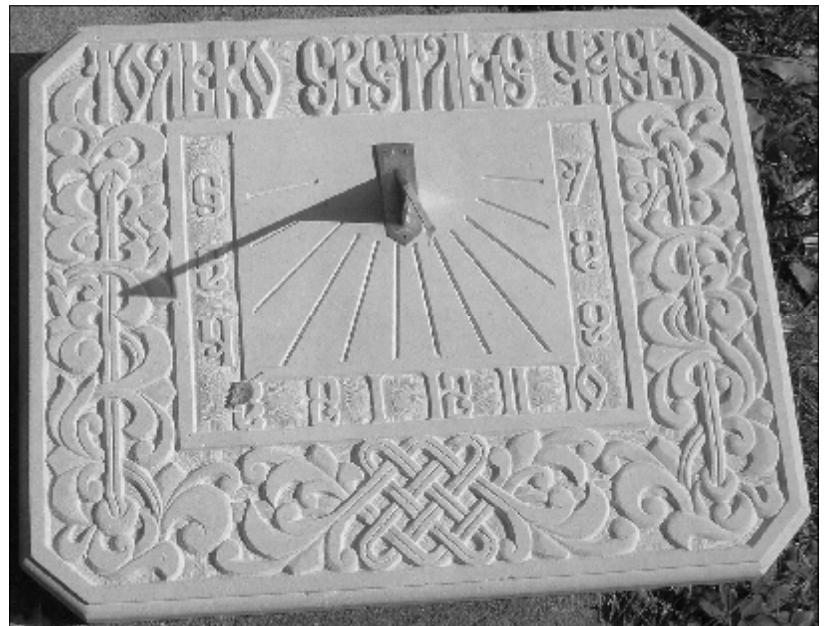


Fig. 4. Two Byzantine-style dials by the author. (left) A vertical dial as a silver wedding present. The fairy birds, exchanging the rings, are very pleasant with themselves. (above) A horizontal dial.

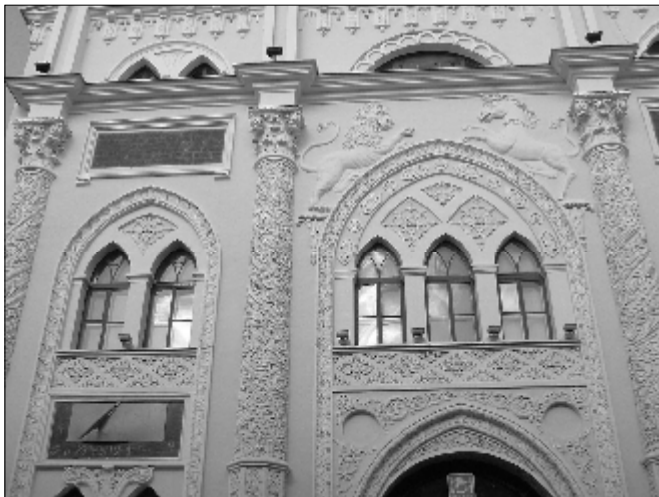


Fig. 5. Printing Yard façade, Moscow. The left dial, lion and unicorn. Photo by the author, March 2006.

(columns, frieze, capitals) are all in the Byzantine style. As can be seen in Fig. 4, some of my own sundials are made in this medieval Byzantine style as well. It is a style which is very rich in carvings.

In the autumn of 1812 Napoleon had occupied Moscow and had burned it to ashes. The buildings of the Printing Yard were destroyed. But in 1814, like a phoenix, it had reappeared due to the talent of the architect I. L. Mironovsky and became even more beautiful. The remaining parts of the destroyed building were carefully inserted into the façade. The sundials flanking the entrance were made more fashionable and the unicorn and its facing the lion were completely renewed. From then, the edifice is not changed much. Now, almost 200 years later, it looks as it is shown in Fig. 5. The Institute of History and Archives is located there.

Admiralty workshops, Navy Academy workshops and other derivatives of the Navigation School

In May 1703 Peter I founded a fortress on the shores of a small river Okhta and gave it the name Petersburg. A naval shipyard was ordered to be built right in the centre of Petersburg. In 1712 Peter's navy dominated the Baltic over all the foreign navies. But in Petersburg there was no special navy sub-unit assigned to teach navigators and to make the instruments.

Before 1706 the Navigation School in Moscow was formally the subordinate of Oruzheinaya palata (The State Treasure and Weapon Department). The Sukharev Tower, which was located at least 750km from the nearest sea, was the headquarters of the Russian Admiralty. Later, when the opportunity arose, it was subordinated to the Admiralty board created by Peter I.

In 1715 the Navigation School had left for St. Petersburg. In its new location it was renamed as the Naval Academy. Prof. Fargwarson, his compatriots and Russian students had transferred to St. Petersburg as well. The surviving records³ show that in 1735 Fargwarson was still the head of the Naval Academy and in 1737 he was given the rank of brigadier (a bit less than general) and professor. It should be mentioned that before Fargwarson nobody in Russia was given the academic status Professor. A workshop was attached to the Naval Academy where instruments including sundials were manufactured.

In 1701 the School of Artillery was founded in Moscow. In 1710 Jacob Bruce offered a job in this School to an outstanding sundial maker from England. His name was John Bradlee. In Russia he was the first English sundial maker (and, perhaps, the best). Some of Bruce's letters have survived⁷ in which Bruce ordered to Bradlee to make two sundials fitted with a plumb line device and delineated for the latitude 60. In 1716 Bradlee had left Moscow for St. Petersburg and, for the rest of his life, worked for the Chancellery of the Head Artillery and Fortification. It is assumed that Bradlee stayed in a close contact with field marshal Bruce, who for a long time was responsible for artillery in Russia. Some of the sundials made by this remarkable



Fig. 6. Nikolskaya street leads to Kremlin. The star on the Kremlin tower is screened by advertising panel crossing the street. The Printing Yard building is on the right. Photo by the author, March 2006, morning.

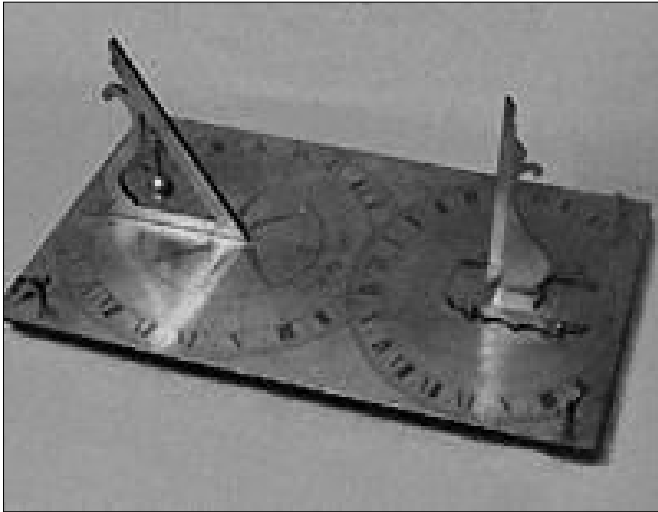


Fig 7. The sundial made by John Bradlee. Lomonosov Museum, St.Petersburg.

Photo courtesy <http://www.museum.ru/C470>

master are kept now in the best Russian museums. One of these sundials (Fig. 7) was the favourite one of Peter I and was placed on the table in his private office.

In 1722 the Instrument Workshop was re-organized as the branch of the Admiralty. Among the products there were astrolabes, quadrants, gunner's clinometers, sextants and compass sundials. It is astonishing that this enterprise is still functioning in St. Petersburg. Its name now is Navy Devices Ltd. Though the instruments are now based on microchips, the set of devices manufactured is still the same, with the only exception of sundials. Together with hi-tech compasses and logs, they still manufacture the portable star glob, to be installed in a captain's bridge, and sextants. (I venture to suggest that they make the sextants for the modern sundial makers.)

The direct and indirect derivatives of the Navigation School are numerous. It is impossible to make general conclusions about all of them as they are all different. But I would like to mention just a few facts.

For the period of less than 10 years after the foundation of the School of Navigation there were founded 40 schools of mathematic in other Russian cities. They were similar to the School of Navigation almost in every respect. In 1719 two young geodesists, Evreinov and Luzhin, the graduates of Moscow School of Navigation, participated in the Commander Bering expedition to the North Pacific.² They draw a map of the North-West shores of America and, as a by-product, discovered the strait between Asia and America – one of the last great discoveries of the world. And, finally, not all of us know that Alexander Fridman (Moscow University), the inventor of the mathematic theory of the Universe Expansion published in 1922, was a geodesist by education. The list may be continued. Yet it is clear that lineal descendants of the School of Navigation are all worthy of

the noble house they descend from and of one of its creators Jacob Bruce.

Civilian life

In 1710 Jacob Bruce participated in the siege of Riga. In 1711 in the context of alliance between Russia, Denmark and Saxony he participated in the military operations in the North Germany. After 1712 he had left the military service for the public one.¹

In 1719-1726 Bruce was at the head of Berg Collegium, a kind of state organization responsible for mining and smelting. In 1720 the mint was affiliated to the Berg Collegium and Bruce organized the assay office in it. Russia was in urgent need of currency reform and Jacob Bruce worked out the detailed plan of how to fulfil this reform. It is easy to see that Bruce's reform bears the features of similarities to the reform which Isaac Newton had fulfilled in England. Thus, it has become clear why Peter I and Bruce, when in England, visited the mint four times.

Jacob Bruce always concentrated his attention on publishing. In collaboration with Vasily Kiprianov, who managed the Moscow Printing Yard, he started to publish an edition of the first Russian secular calendar. The first copper plate was engraved in 1709. The edition lasted six years. The calendar was printed annually in sheets of large size. Altogether there were forty seven pages which included maps, information about the religious holiday, astrological divinations, explanations of lunar eclipses, distances between cities, and agricultural advices. In folk etymology the calendar was referred to as Bruce's calendar. A few surviving copies of this calendar are kept now in the State Hermitage.

Astronomy was his favorite subject. Valentin Boss, a Canadian scientist, says that the first of Bruce's articles on astronomy, which was titled as "A treatise on the movement of the planets" was issued when he visited England in 1698.⁵ This manuscript is kept now somewhere in Cambridge. In 1707 together with Vasily Kiprianov who, beyond publishing, was known as an experienced engraver and expert in mathematics, Jacob Bruce published the Copernican star map. He also translated and published "Cosmotheoros" by Christian Huygens. Despite the fact that this book expounding Copernicus's theory and Newton's laws was called "blasphemous libel" for a long time it served as the main manual of astronomy in Russia and ran to two editions (1714 and 1724). Both issues were prefaced with Bruce's introduction.

After Peter the Great

Once in the autumn of 1724 there was a gale. Peter was walking along the shore and saw a small boat in danger of running aground. Helping the sailors, he waded into the cold water, caught cold and had died a few weeks later.

All Peter's reforms were all stopped. The court intrigues and fight between political parties were not in Jacob Bruce's character. For several years he fulfilled his duties mechanically but soon he resigned from all of his appointments. In June 1726 the first Russian Count, a person of encyclopaedic learning, the bearer of highest Russian orders and descendant of a king of Scotland, field-marshal Bruce went into retirement. From this moment the most mysterious and enigmatic period of his life had started. Almost nothing is known about it.

It is known that Bruce bought a large estate named Glinky located not far from Moscow. His new home did not satisfy his demands and Bruce rebuilt the estate, attached an observatory to the main building and raised some new ones for chemical experiments. He also reconstructed the garden. It is impossible to know for certain, but some evidence suggests that Bruce himself made the architectural sketch and the landscaping plan. As a condition indispensable to life, Bruce's home was supplied with a workshop equipped with modern machines and devices.⁶

When preparation was finished he took up residence for the rest of his life. Here Bruce spent his time performing chemical experiments and constructing new astronomical devices and sundials. A telescope lens which Bruce made is still kept in Lomonosov Museum in St. Petersburg. He lived in his castle in solitude, visiting Moscow only rarely. In Moscow he went up the Sukharev Tower, stayed there for some time and conducted his astronomical observations. He made sundials and watched the stars through the telescope. Like a dragon of Clifford Simak ("The Goblin Reservation") – a relic of the lost Universe – he did not find himself in this new world. How insignificant this world seemed to him as compared to the extraordinary accomplishments of the great past age.

Jacob Bruce died in April 1735 and was buried in Lutheran church in Moscow. He did a great deal and stayed in our memory as an enlightener and man of honour. His student Vasily Tatischev, a well known Russian historian, said "Being in tsar's good graces he was a paragon of virtue and has hurt nobody's feelings searching by any means the opportunity to express his sympathies to everybody".¹⁹

Heritage

In 1735 the St. Petersburg Academy of Science bought the research library and collection of rarities that had been left by Bruce.

Rarities included the instruments, sundials, coins and specimens of oriental applied art. The library consisted of more than 1500 books on mathematics, astronomy, medicine and other disciplines. In 1829 a part of this collection was donated to the Helsinki University (Finland). Several Bruce's

books are now in the library of Moscow University and the Mining Institute. Bruce marked his books with ex-libris and signed some of them. Elena Savelieva, a researcher from St. Petersburg Academy Library, says that Bruce had put his signature on the title-page of a copy of William Leybourn's 1682 "Dialing plain concave and convex".

In modern Russia Jacob Bruce is considered as a national hero. The literature about Bruce is abundant, continues in demand and varies from short articles⁸ to full valued books.^{10, 13} Bruce's birthday is marked with organizing of the special exhibitions in leading museums. The last one was written in 2003 by Filimon¹⁴, the director of Bruce's Museum-estate Glinky.

Russian Nostradamus

Experts have many reasons to consider Bruce to be one of the initiators of geodesy, mining, instrument-making industry and military engineering in Russia. As to the rest of population, they, as usual, are interested only in the mythical component. The contemporaries of Bruce said that he was an outwardly restrained person and tended to be an armchair scientist rather than a Field Marshal. Together with astrological divinations published in the calendar, this feature of his character, as well as the fact that he lived reclusive in a village, was the food for rumours. The old rumours have reached us through a bit less than 300 years with adding of new details. For example Robert Collis, researcher from University of Turku (Finland), asserts now that Field Marshal Bruce was an alchemist and a freemason.⁹

In Russia, Bruce has been a subject of romantic prose for the last 150 years. It is said that he made a parlor maid of flowers to serve to him and that on a hot summer day he had frozen the water in a pond. This year (2006) the Memorial Estate of Jacob Bruce in Glinky village has celebrated his 150th anniversary. The lectures were delivered in the anniversary meeting. One of the lectures was devoted to cryogenic machinery, which Bruce could apply to freeze the pond.

As long ago as in his lifetime Bruce was well famed as a magician, predictor and a person reminiscent of Michel Nostradamus.⁴ This comes as no surprise because of a part of the contemporaries considered Peter's best friend to be at least an accomplice of devil and Peter himself to be a blood-thirsty monster. Besides, the locality of the Sukharev Tower had an ill-boding reputation. Before the School of Navigation was organized, the Sukharev Tower was used as a barrack for colonel Sukharev soldiers. The possessing of cardinal virtues was not the determinative peculiarity of their behavior. No wonder the rumours proliferated that Bruce animated the dead bodies and that somebody even



Fig. 8. (above and right). The blank dial-plate of "Bruce's" dial at the corner of Dobroslobodskaya and Spartakovskay streets. Moscow. March, 2006. Photo by the author.

saw him flying out of the Sukharev Tower astride a bird made of steel and wood.

In 1872 during the celebration of Peter's 200th birthday there was a competition among painters. The first prize was awarded to Savrasov. Nothing could express the spirit of Peter's epoch better than the Sukharev Tower. Looking at the landscape waiting for forthcoming spring and surrounding the tower of Russian Baroque taste one can imagine that somewhere inside the tower two Scottish gentlemen, Jacob Bruce and Henry Fargwarson, discuss something of great importance in ancient Latin. Not only spring but even summer is just around the corner.

Here is a paradox to finish with. There is a house in which the Moscow University of Building is now located. This house was built at the end of 18th century by Count Musin-Pushkin who was married to Jacob Bruce's grand-niece and who was a relative of the poet Alexander Pushkin. Between two left hand windows of the second floor you can see a blank dial-plate shaped as a coffin lid. This dial was designed and constructed by a priest named Seruge, who was a tutor of the Count's children. Jacob Bruce had never been to this house for he had died much earlier. Nevertheless, for the last 200 years this dial is referred to as Bruce's dial. It was said that the dial pointed out the treasures which Bruce buried in the wall and that on the eve of revolutions and wars the dial runs with blood.

In 1930, because of superstitions and partly in order to put a stop to idle talk, the drawing was erased from the dial face, but the dial remained. Superstitions are tenacious of life. A ghost of a tall old man wearing a wig and an old-fashioned brocade camisole still appears before the students of the University of Building.

ACKNOWLEDGEMENTS

I am very glad to express my sincere gratitude to John Davis who supported me at the every step in the course of preparing this article and to Douglas Bateman, the BSS Honorary Secretary, who inspired me to write it.

REFERENCES

1. Bantysh-Kamensky D.N. *Russian generalissimos and general-field-marsals*. AST, Kharwest Publishers. Moscow, 2005. In Russian. (Д.Н. Бантыш-Каменский. *Российские генералиссимусы и генерал-фельдмаршалы*. АСТ, Харвест, Москва, 2005).
2. Berg L.S. *The discovery of Kamchotka and expedition of Bering, 1725-1742*. Publishers of USSR Ac. Sci., 1946. In Russian. (Берг Л. С. *Открытие Камчатки и экспедиции Беринга, 1725-1742*. М-Л, Изд-во АН СССР, 1946).
3. Berk K.R. 'Travel notes about Russia'. (Translated into Russian by Ju. N. Bespyatnykh). *Bespyatnykh Ju. N. Petersburg of Anna Ioanovna as described by foreigners. Introduction, texts, comments*. BLITs Publishers, pp. 111-302 (1997) In Russian. (Берк К.Р. 'Путевые заметки о России' (Перевод Ю.Н. Беспятых). *Беспятых Ю.Н. Петербург Анны Иоанновны в иностранных описаниях. Введение. Тексты. Комментарии*. СПб. БЛИЦ, с. 111-302 (1997).
4. Bogatyrev P.I. *The Moscow antiquity*. Pravda Publishers, Moscow, 1989. In Russian (Богатырев П. И. *Московская старина*. М. издательство "Правда", 1989).
5. Boss V. *Newton and Russia: The Early Influence, 1698-1796*. Harvard University Press, Cambridge, 1972.
6. Chenakal V.L. *Assays on the history of Russian astronomy*. The USSR Academy Science Publishers. Moscow. 1951. In Russian. (Ченакал, В.Л. *Очерки по истории русской астрономии*. М. Академия наук СССР, 1951 г).
7. Chenakal V.L., Chenakal L.G. 'Sundials in European part of USSR'. *Sundials and calendar systems of peo-*

- ples of USSR*. The main astronomic observatory of Academy of Science of USSR Publishers. Leningrad. p. 16-94. (1985). In Russian. (Ченакал В.Л., Ченакал Л.Г. Солнечные часы на европейской территории СССР. *Солнечные часы и календарные системы народов СССР*. Изд-во Главной Астрономической обсерватории АН СССР. с. 16-94. 1985).
8. Chlebnicov L.M. Russian Faust. *Voprosy istoriy*. **12**, p.195-200. (1965) In Russian. (Хлебников Л.М. Русский Фауст. *Вопросы истории*. **12**, с.195—200 (1965).
 9. Collis Robert. 'Freemasonry and the Occult at the Court of Peter the Great'. *Aries*, Brill Academic Publishers, **6, 1**, pp. 1-26, (2006).
 10. Kirukhin A.V. *This very magician Bruce*. Agraf Publishers, Moscow. 2003. In Russian. (Кiryухин А.В. *Тот самый кудесник Брюс*. Изд-во Аграф. Москва. 2003).
 11. Kliuchevsky V.O. *The course of Russian history*. V4. Lecture N69. Mysl publishers. Moscow. 1989. In Russian. (Ключевский В. О. *Курс русской истории*. Том 4. Лекция 69. Мысль. Москва. 1989).
 12. Massie, Robert K. *Peter the Great. His life and world*. Alfred A. Knopf. New York 1980.
 13. Pavlenko N.I., Lrozdova N.I., Kolkina I. *Peter's brothers-in-arms*. Molodya gvardya Publishers. Moscow. 2001. In Russian. (Павленко Н.И., О. Дроздова, И. Колкина. *Соратники Петра*. Изд-во Молодая гвардия. Москва. 2001).
 14. Philimon A.N. *Jacob Bruce*. Chistye vody Publishers. Moscow. 2003. In Russian. (Филимон А.Н. *Яков Брюс*. М. "Чистые воды", 2003).
 15. Pozdneeva I., Pushkov V., Dadyjik A. *Moscow printing yard – the fact and the factor of Russian culture 1618-1652*. Mosgoarkhiv Publishers. Moscow. 2001. In Russian. (Поздеева И., Пушков В., Дадькин А. *Московский печатный двор – факт и фактор русской культуры 1618 -1652*. Издательство Мосгорархива, 2001).
 16. Shikman A.P. *Figures of the Fatherland history. The biographic reference book*. AST-LTD Publishers. Moscow. 1997. In Russian. (Шикман А.П. *Деятели отечественной истории. Биографический справочник*. Издательство АСТ-ЛТД. Москва. 1997).
 17. *Slavonic Enciclopedia. XVII century*. OLMA-PRESS, Moscow. 2004. In Russian (*Славянская энциклопедия. XVII век*. М. ОЛМА-ПРЕСС. 2004).
 18. Teterin G.N. *The history of geodesy in Russia before 1917. The textbook*. NIIGAiK Publishers. Novosibirsk. 1992. In Russian. (Г. Н.Тетерин. *История геодезии в России до 1917 г. Учебное пособие*. НИИГАиК, Новосибирск 1992).
 19. Vernadsky V.I. *Proceedings on the history of science in Russia*. Nauka Publishers. Moscow. 1984. In Russian. (Вернадский В.И. *Труды по истории науки в России*. М. Наука. 1984).

Author's address:

*Mozaiskoya shosse, 86/71, Moscow dept.,
Odintsovo, 143005, RUSSIA.
sundials@mail.ru
<http://www.sundials.ru>*