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Off with your heads: isolated organs in early Soviet science and fiction

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Abstract

In the summer of 1925, a debutant writer, Aleksandr Beliaev, published a ‘scientific-fantastic story’, which depicted the travails of a severed human head living in a laboratory, supported by special machinery. Just a few months later, a young medical researcher, Sergei Briukhonenko, succeeded in reviving the severed head of a dog, using a special apparatus he had devised to keep the head alive. This paper examines the relationship between the literary and the scientific experiments with severed heads in post-revolutionary Russia, which reflected the anxieties about death, revival, and survival in the aftermath of the 1914–1923 ‘reign of death’ in that country. It contrasts the anguished ethical questions raised by the story with the public fascination for ‘science that conquers death’.

Keywords

Beliaev; Briukhonenko; Death; Revival; Severed head; Russia

In the summer of 1925, an aspiring littérateur, Aleksandr Beliaev, published a ‘scientific-fantastic story’ entitled The head of Professor Dowell.¹ The story became an instant hit: it depicted the travails of a severed human head living in a laboratory, supported by special machinery. In just a few months, the major ‘scientific-fantastic idea’ of Beliaev’s story came true: in the fall of 1925, a young doctor, Sergei Briukhonenko, announced at a congress of Russian pathologists that he had succeeded in reviving the severed head of a dog, and described a special apparatus he had devised to keep the head alive.

This article explores the relationship between the literary and the scientific experiments with severed heads in 1920s Russia. Following the simplistic formulae of ‘life imitating art’ and ‘art imitating life’, some observers have claimed that Beliaev’s story had somehow precipitated Briukhonenko’s research, while others have insisted that this research had inspired the literary experiment. Both these claims seem unsubstantiated: the relationship between literature and science is anything but unidirectional. Rather than imitating each other, both the fictional and the actual experiments drew inspiration from research on isolated organs, tissue cultures, and transplantations pursued by Russian and Western scientists since the late nineteenth century.

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¹The name of the main protagonist in Russian is ‘Dowel’. To avoid unnecessary confusion, I use the transliteration ‘Dowell’ as it appeared in the first English edition of the story, see Beliaev (1980).

What brought this research to the attention of both the scientific and the literary communities in 1925 was a particular cultural milieu of mid-1920s Russia, which was at one and the same time permeated by omnipresent death and by high hopes for the future. In the atmosphere of revolutionary enthusiasm and wide-scale experimentation that enveloped Russian society in the aftermath of the Bolshevik revolution, the issues of death and revival – embodied, as it were, in ‘severed heads’ – captivated the imagination of both scientists and writers. The revolution-inspired belief – that anything was now possible, and ‘newly born’ Soviet citizens could now control their own destiny – encouraged literary and scientific explorations of the possibilities that the research on isolated organs seemed to be opening up.

Of course, the ultimate goals of these explorations were as different as the vocations of their respective authors: science and literature. Briukhonenko wanted to investigate death and revival as physiological processes, with an eye on applying whatever knowledge he could gain from his experiments to medical practice. Beliaev aspired to consider death and revival as parts of human existence. Through the eyes of a head without a body, the writer examined the role of science and scientists in ‘modifying’ this inevitable part of human existence – death – and questioned the value of such ‘modifications’. But the ethical concerns raised by the rapid development of experimental biology and embedded in Beliaev's story seem to have been lost on its Russian audiences. Various state agencies provided generous support for Briukhonenko's experiments, while the Soviet public became fascinated rather than dismayed by the severed heads of dogs supported by the intricate apparatuses, which gazed at them from the pages of daily newspapers and popular magazines.

The head of a professor

From 16 June to 6 July 1925, the readers of a Moscow daily, The Worker's Gazette, eagerly awaited each issue of the paper in anticipation of the next installment of a ‘scientific-fantastic story,’ entitled The head of Professor Dowell.² Written by a former jurist, amateur musician, and actor – and now debutant littérateur – Aleksandr Beliaev (1884–1942) (Fig. 1), the novella became an instant hit: in just a few weeks, it was reprinted by a newly established popular magazine, The World Tracker.³ A few months later, at the beginning of 1926, the publisher The Land and the Factory reissued a slightly expanded and revised version of the novella in a book format, with the first print-run of 4,000 copies.⁴ A decade later, Beliaev reworked the story into a full-blown novel by the same name.⁵

The story unfolds in an unidentified city in the United States. It begins with the meeting of a certain ‘Professor Kern’ and a recent medical graduate, ‘Miss Adams’, who is desperately looking for a job to support her aged mother and a younger sister. Kern offers Miss Adams a position as his assistant. But he puts forward one condition – she must be ‘mute as a fish’ and must not talk to anyone about anything she sees or hears in Kern's laboratory. Miss Adams is mystified. On a tour through the laboratory, she discovers the reason for Kern's insistence on secrecy.

Miss Adams turned her head and suddenly saw something that made her shudder as if from an electric shock.

A human head stared at her – a head alone, without a body.

²Beliaev (1925a).

³Beliaev (1925b). All further citations are from this edition. On Beliaev's life and works see Liapunov (1967).

⁴Beliaev (1926).

⁵Beliaev (1938). The head of Professor Dowell became one of the most popular Soviet science-fiction (SF) novels and, since its appearance in 1938, various publishers reissued it no fewer than fifty times. It opened Beliaev's eight-volume Collected writings (see Beliaev, 1963–1964), and was turned into a movie in 1984. In 1980, Macmillan issued an English translation of the novel with a short, but enthusiastic introduction by Theodore Sturgeon (see Beliaev, 1980).

It was mounted on a square platform, made of glass and supported by four long, shiny metal legs. From its cut neck, from the aortas [*sic!*], through the holes in the glass, two tubes ran to tanks. A third, thicker tube came out of the head's throat and ran to a large cylinder. The tanks and the cylinder had valves, manometers, thermometers, and some other unknown [to Miss Adams] instruments.

The head looked at Miss Adams attentively and mournfully, blinking its eyes. There could be no doubt: the head was alive; severed from its body, it led its own separate and conscious existence ... Alive human thought shone in its eyes.⁶

Despite her profound shock, Miss Adams thinks she recognizes the head (Fig. 2). It looks very much like the head of 'Professor Dowell', a prominent scientist and surgeon 'renowned for his experiments on the revival of separate organs excised from fresh cadavers', whose public lectures Miss Adams had frequented during her studies in medical school. Kern confirms her impression – the head indeed belongs to Kern's teacher and colleague, Professor Dowell, who had succumbed to 'an, as yet, incurable disease'. In his will, Dowell had donated his body for 'scientific experiments', and Kern followed his wishes. 'Unfortunately, I was able to revive only the head' – Kern exclaims – 'Not all at once! As it is, we, scientists, intrude upon "unshakable laws of nature", challenge death itself, and take away the livelihood from miracle-makers and from God himself' (p. 6). Kern explains that Miss Adams's duties in his lab will be to take care of Dowell's head, and she accepts the job.

Kern shows her how to operate the machinery supporting the head, but stringently forbids her to touch a valve on the big cylinder, warning that it will certainly kill the head. After a few weeks in the laboratory, Miss Adams and the head establish a kind of simple communication, and the head repeatedly indicates that it wants Miss Adams to open the valve on the big cylinder. Thinking that the head wants her to end its dismal existence, Miss Adams refuses. In time, deeply moved by what she perceives as horrible suffering, she gives in to the head's wishes and opens the valve. As it turns out, her action does not kill the head, but instead gives it a voice! The cylinder contains compressed air, which, blowing through the head's throat, makes it able to speak. And speak it does!

The head tells Miss Adams the story of Dowell's research on the revival of human heads and of Kern's role as his assistant. It tells her of Dowell's last bout of asthma that led to his death, and she begins to suspect that, instead of helping his professor, Kern actually murdered Dowell with a lethal injection of morphine. It tells her how – by torture – Kern forced the revived head into continuing Dowell's research, which Kern now presents as his own, exploiting ideas and insights the head provides. Miss Adams is outraged and wants to expose Kern. But the head begs her not to do so. The exposure would not bring Dowell back to his normal state. The head does not care about Kern's stealing Dowell's fame or the money that could flow from his work. It does not need either. All it wants now is to continue the research, which would be impossible if Kern is exposed.

In preparation for a public presentation of 'his' research, Kern revives the heads of two cadavers: one male (the victim of a traffic accident), another female (a murder victim). The male head soon dies and Kern demonstrates the female head at a highly publicized meeting attended by the lights of the scientific community and members of high society. His presentation causes a furore. 'One of the leading American scientists' praises Kern's genius as the manifestation of 'almighty science', of 'victory over death', and of 'America, which gives birth to such minds and which brings to the world the greatest scientific achievements' (p. 29).

⁶Beliaev (1925b), p. 18.

At this moment, 'a whirlwind of long-stored anger and hatred' brings Miss Adams to the podium. She shouts that Kern had killed Dowell and tortured Dowell's revived head into continuing his research. 'Don't believe him, – cried Miss Adams pointing at Kern, – he is a thief and a murderer. He stole the work of Professor Dowell'. Amidst a general confusion, Kern calmly announces that Miss Adams suffers from delusions: 'she has lost her mind' (p. 29). Miss Adams is taken away and placed in a mental institution. In a few months, the son of Professor Dowell, Arthur, who had lived in England, comes back to America. His return is prompted by press reports on the incident of Miss Adams's outburst during Kern's demonstration. Arthur finds Miss Adams and arranges for her release from the mental institution. Together, they convince the authorities to conduct a search of Kern's laboratory. They find Dowell's head in very bad shape. But before the head finally expires, it confirms to the police investigators Miss Adams's accusations. Kern is arrested.

End of story.

The head of a dog

Less than three months after Beliaev's story had appeared, its major 'scientific-fantastic' idea – the possibility of keeping a severed head alive in a laboratory – came true. On 18 September 1925, Sergei Briukhonenko⁷ (1890–1960), a young doctor from the Chemical-Pharmaceutical Institute, demonstrated to the Second Congress of Russian Pathologists in Moscow a special apparatus – the inventor called it the autojector – that he had constructed to keep alive the severed heads of laboratory animals.⁸ The apparatus included two electric pumps, which supplied the severed head of a dog with citrated blood through a system of rubber tubes. The out-flowing blood was oxygenated in a special vessel, warmed to between 37 and 40 °C, and pumped back into the head (Fig. 3). The head was kept alive for 1 hour and 40 minutes and exhibited various reflexes.⁹ Although brief accounts of Briukhonenko's demonstration appeared in reports on the Congress in medical journals, the popular press paid no attention.

Almost a year later, in May 1926, together with a colleague at the Chemical-Pharmaceutical Institute, physiologist Sergei Chechulin, Briukhonenko presented results of his further investigations to the Second Congress of Soviet Physiologists in Leningrad.¹⁰ Originally, their report had not been on the Congress's program. Apparently, Chechulin, who served as the Congress's executive secretary, put the report on the agenda at the last moment, when the Congress was already in session. On the morning of 28 May, just before the closure of the Congress, Briukhonenko demonstrated his autojector in action, while Chechulin summarized their experiments with dogs' severed heads. A brief description of the presentation appeared in the Congress's proceedings, but, for the next half-year, Briukhonenko's research vanished from the public eye.

In November 1926, however, a popular daily, *Evening Moscow*, carried an article, entitled 'Experiments with the revived head of a dog', devoted to research conducted at the Chemical-Pharmaceutical Institute.¹¹ Although Briukhonenko's name was not mentioned, his invention was described in detail and hailed as an 'absolutely new and never before used apparatus that allows to reproduce mechanically the basic functions of an organism.' The article briefly summarized the experiments with the severed head of a dog demonstrated to the Congress of

⁷In various Western publications his name has been spelled in several different ways: Brukhonenko, Bryuchonenko, Bruchonenko, Brykhonenko, Briukhanenko, Brychonenko, and even Brjukhenenko. I will use throughout the article the spelling of his name according to the Library of Congress transliteration rules: Briukhonenko. For his brief biography, see Sirotkina & Gutkin (1972). For an analysis of his research, see Konstantinov & Alexi-Meskishvili (2000); Bottcher & Alexi-Meskishvili (2003).

⁸See reports on the congress, *II Vsesoiuznyi s'ezd patologov* (1925); Dvishkov (1926).

⁹A version of the report is preserved among Briukhonenko's personal papers kept in the Archive of the Russian Academy of Sciences, see Briukhonenko (c. 1926).

¹⁰Briukhonenko & Chechulin (1926).

¹¹Vi. O. (1926). All the following citations are from this source.

Physiologists just a few months earlier. What is more, the article detailed new experiments conducted with Briukhonenko's apparatus. The researcher succeeded in keeping a dog alive after its heart and lungs had been 'taken out' and 'replaced' by the machinery: 'The dog, without the heart and the lungs, continued to live under chloroform for two hours'. The dog reacted to pain stimuli, opened its mouth, and moved its legs. Its eyes reacted to light. The article prophesied a great future for this research.¹²

It seemed that the newspaper's prophecy would quickly come true. But it was more than six months later that on 22 May 1927, another daily, Komsomol Truth, published an article by its correspondent, one G. Grebnev, with a sensational title, 'Head, severed from the body, lives'.¹³ The article explicitly referred to The head of Professor Dowell, stating that Beliaev's 'fairy-tale' that 'could only entice a smile' became a reality in Briukhonenko's experiments:

The body lies dead. Only its severed head is alive. It does not bark, the dog's lungs are dead, but the mouth opens and the tongue pushes out a piece of cotton soaked in iodine solution. If someone moves a piece of paper in front of the head, its eyelids close in fright.

The reporter praised Briukhonenko's invention as an 'artificial heart' that enabled the 'resurrection' of the dead head and kept it alive for nearly 24 hours. He predicted that Briukhonenko's work would interest 'the entire scientific world', for it 'opens incredible perspectives for all of medicine and, particularly, surgery'. In the reporter's view, it would make possible 'the most complicated surgical operations on practically all internal organs of the human body, including the heart'. Grebnev envisaged that it would be possible 'to take out a diseased heart, cure it, and put it back; all the while the life of the organism is sustained by the artificial heart'. He excitedly proclaimed that Briukhonenko's experiments show the possibility 'to fight against death even after it had occurred.' Grebnev lamented that, despite the 'enormous importance' of this research, Briukhonenko worked under the most pitiful conditions: one small room that could barely accommodate an operating table and two researchers, with almost no equipment, chemicals, or experimental animals. He concluded his report with a call to 'the Soviet public to help the talented scientist in his research.'

Two days later the 'Soviet public' answered the call. The newspaper reported that a prominent physiologist, director of the Communist Academy Institute for Studying the Brain, Dmitrii Fursikov, was ready to provide Briukhonenko with a laboratory and all the necessary materials at his institute.¹⁴ But as the subsequent events indicate, Briukhonenko did not need to take up Fursikov's offer. Evidently, the press publications induced the director of the Chemical-Pharmaceutical Institute, Oscar Steppun, to expand the institute's support for Briukhonenko's research.

Exactly one year after the publications in Komsomol Truth, Briukhonenko's work reappeared on the public scene. This time, it produced a furore in academic circles and the popular press. At the end of May 1928, at the next Congress of Soviet Physiologists held in Moscow, Briukhonenko presented five (!) reports on his research. Three of them dealt with the issues of crucial importance for his experiments – the coagulation and stabilization of blood.¹⁵ The fourth one, supplemented by a demonstration, described the use of his autojector for establishing a system of the artificial circulation of blood in a dog.¹⁶ And the last one, presented jointly with Chechulin, detailed various experiments with a severed dog's head kept alive by the autojector.¹⁷

¹²See also Dva chasa zhizni bez serdtsa i bez legkikh (1926).

¹³Grebnev (1927).

¹⁴See Iz komnatushki v laboratoriiu. Komakademiiia pomozhet doktoru Briukhonenko (1927).

¹⁵Briukhonenko & Zverev (1928); Briukhonenko & Briukhonenko (1928); Briukhonenko (1928f).

¹⁶Briukhonenko (1928c).

Just before the opening of the congress, the Chemical-Pharmaceutical Institute released a special issue of its Proceedings devoted entirely to Briukhonenko's research.¹⁸ Subtitled 'The study of new methods for artificial blood circulation and blood transfusion', the volume consisted of four articles written by Briukhonenko (one in collaboration with Chechulin and one in collaboration with Steppun), which reported the investigations he presented to the Congress.¹⁹

Already during the Congress Briukhonenko's work captured public attention. Press coverage of the Congress in daily newspapers and weekly magazines highlighted his reports as one of the greatest accomplishments presented at it.²⁰ After the Congress, accounts of his experiments appeared in such popular magazines as Hygiene and Health, the Sparks of Science, Scientific Word, Searchlight, Man and Nature, Spark, and the Herald of Knowledge.²¹ Several magazines even placed a picture of the severed head of a dog attached to Briukhonenko's apparatus on their front covers (Fig. 4). Academic publications were as enthusiastic as the popular press. After the Congress, Briukhonenko was invited to publish his findings in a leading academic periodical, Journal of Experimental Biology and Medicine.²² Amidst the media hype, on 12 September, Evening Moscow reported that the highest agency in charge of medical research – the People's Commissariat for the Protection of Health (Narkomzdrav) – had provided a large fund (30,000 rubles) for the expansion of Briukhonenko's research.²³ Similar information appeared the next day on the pages of a central Soviet newspaper, Izvestiia.²⁴ A week later, Evening Moscow carried a large article – supplemented by several photographs – praising 'the achievement of Soviet science'.²⁵ The popular press had a field day with Briukhonenko's work, publishing articles with such enticing titles as 'A page from the book of life and death', 'The future's smile', and 'The science that conquers death'.²⁶ Even Women's Magazine carried a piece on 'the life of organs outside the body'.²⁷

Moreover, reports on Briukhonenko's research began to filter into the Western media. In early October, Briukhonenko submitted four articles (two of them in collaboration with Chechulin) to an influential French periodical, Journal de physiologie et de pathologie générale.²⁸ On 13 October 1928, two days after the articles had been received by the journal, Monde, a pro-Soviet weekly edited by Henry Barbusse, devoted an entire page to one of Briukhonenko's articles, complete with photographs of a dog's head attached to the autojector.²⁹ In January 1929, one of Briukhonenko's articles appeared in a popular German magazine.³⁰ The next month, reports on his work came out in popular periodicals in France and the United States.³¹ By September, the news had reached South America.³²

¹⁷Briukhonenko & Chechulin (1928b).

¹⁸See Trudy Nauchnogo Khimiko-Farmatsevticheskogo Instituta (1928). Many, but not all, of Briukhonenko's early publications have been reprinted posthumously in a volume of his collected works, see Briukhonenko (1964).

¹⁹Briukhonenko (1928a,d); Briukhonenko & Chechulin, 1928a; Steppun & Briukhonenko (1928).

²⁰See Na vsesoiuznom s"ezde fiziologov (1928); Opyty s golovoi sobaki (1928); Novosti nauki i tekhniki: Tretii vsesoiuznyi s"ezd fiziologov (1928); III s"ezd fiziologov (1928).

²¹See Briukhonenko (1928e); Briukhonenko & Chechulin (1928d); Chechulin (1928a,b); K. L. (1928); Kuliabko (1928); Shmidt (1929); Slavina (1928); Vinogradov (1928).

²²See Briukhonenko (1928b, 1929d); Briukhonenko & Chechulin (1928c).

²³See Zhizn' v iskusstvennykh usloviakh (1928).

²⁴See Sovetskii den' (1928).

²⁵Poltavskii (1928).

²⁶See Slitsan (1928); Nauka, pobezhdaiushchaia smert' (1928).

²⁷Shirokov (1930).

²⁸Briukhonenko (1929a,b); Briukhonenko & Chechulin (1929a,b).

²⁹Briukhonenko (1928g).

³⁰Briukhonenko (1929c).

³¹Fernan-Perez (1929); Kraus (1929).

³²Información rusa–colaboración gráfica (1929).

Publications on Briukhonenko's research in the Western media did not go unnoticed. In December 1928, Briukhonenko received an indignant letter from Konrad Mass, a German writer and the mayor of a small town, Schwerin, who condemned his research as 'abominable' and 'diabolic'.³³ In mid March 1929, a German daily, the *Berliner Tageblatt*, and a US daily, the *New York Times*, simultaneously published a letter written by the prominent Irish dramatist and ardent anti-vivisectionist, George Bernard Shaw.³⁴ The letter was written to answer an anonymous correspondent, who had asked Shaw's opinion about Briukhonenko's experiments. Shaw found these experiments 'frightfully interesting'.³⁵ Unknowingly, Shaw envisaged a situation not dissimilar to the one depicted in Beliaev's novella:

The experiment should be tried on a scientist whose life is endangered by an incurable organic disease, say cancer of the stomach, whereby humanity is threatened with the loss of services of his brain. What is easier than to save such genius from the death bed by cutting off the head, thereby freeing the brain from disease, and keeping up artificial circulation in the arteries and veins so that the great man may continue to lecture and advise us without being impeded by body infirmities.

With his characteristic wit, Shaw dwelled on the wondrous possibilities Briukhonenko's work seemed to offer: 'A university in which all chairs were occupied by a row of finest brains in the country with nothing but pumps attached to them – briefly, where the whole system of teaching was purely cerebral – would be [an] enormous improvement on the present state of things' (see Fig. 5). He was even ready to try the procedure on himself: 'I am greatly tempted to have my head cut off so that I may continue to dictate plays and books independently of any illness, without having to dress and undress or eat or do anything at all but to produce masterpieces of dramatic art and literature'.

Science and fiction

Some students of Beliaev's writings have claimed that his fiction somehow precipitated or even prompted Briukhonenko's science.³⁶ On the other hand, one of Briukhonenko's biographers has claimed that the *autojector* directly inspired Beliaev's story.³⁷ The nearly simultaneous appearance of the first version of *The Head of Professor Dowell* (in June 1925) and the first public demonstration of the *autojector* (in September 1925) clearly undermines both of these claims. Briukhonenko had been working on his apparatus for at least two years prior to Beliaev's literary debut, but he had made no public reports on his work until after Beliaev's publication of his novella. The scientific and literary explorations of the idea that a severed head could be 'revived' and kept alive in a laboratory by special machinery obviously emerged and evolved in the minds of their respective progenitors quite independently.

Furthermore, neither the scientist nor the writer could claim priority in originating this idea: head severed but 'resurrected' by 'scientific means' had figured prominently both in science and in fiction for quite some time. Briukhonenko's *autojector* continued a long line of similar apparatuses constructed for the perfusion of isolated organs and artificial (extra-corporeal, as it would be called later) blood circulation.³⁸ Indeed, the idea that a severed head could be kept alive by supplying it with blood dates back to at least the early nineteenth century and is

³³The French original and a Russian translation of the letter are preserved among Briukhonenko's personal papers in the Archive of the Russian Academy of Sciences, see Mass (1928).

³⁴Shaw will sich köpfen lassen, wenn ... Ein Privatbrief des Dichters über ein neues, abschreckendes Tierexperiment (1929); Shaw feels 'tempted' to have head cut off (1929); a Russian translation of the letter appeared in May in the *Evening Moscow*, see O golove Bernarda Shou (1929).

³⁵This and all the following quotations are from the *New York Times* publication, Shaw feels 'tempted' to have head cut off (1929).

³⁶Kazantsev (1984).

³⁷Lapchinskii (1964).

³⁸For historical accounts of the techniques of perfusion and extra-corporeal circulation, see Curtis (1966); Lee (1996); Boettcher et al. (2003); Jenson (2003).

commonly associated with the prominent French physiologist, Julien Jean César Legallois.³⁹ The growth of physiology as a distinct scientific discipline in the course of the nineteenth century spurred the proliferation of special techniques for keeping various organs (legs, hearts, lungs, kidneys, etc.) separated from the body of an animal alive. For instance, in the 1850s, another French physiologist, Charles Brown-Sequard, conducted experiments on the isolated head of a dog, injecting blood into its severed arteries, and reported that the head had exhibited various reflexes.⁴⁰ In the last quarter of that century, the perfection of perfusion techniques by the famous German physiologist, Carl Ludwig, prompted a virtual explosion of research on isolated organs and fostered the development of special equipment and saline solutions for their perfusion.⁴¹ At the turn of the twentieth century, isolated organs became a major experimental tool in studying the physiological functions of separate organs, as well as a preferred tool for pharmacological research on the effects of various preparations introduced into perfusion solutions.

Expectedly, the issues of the survival and revival of organs and tissues taken from dead bodies – particularly human bodies – were a focus of special attention for scientists all over the world, including Russia. At the turn of the twentieth century, Aleksei Kuliabko (1866–1930), a researcher at the Physiological Laboratory of the Imperial Academy of Sciences in St. Petersburg, spent several years studying physiology and pharmacology on the isolated hearts and intestines of chickens and rabbits.⁴² In February 1902, Kuliabko reported the successful revival of a rabbit heart forty-four hours after it had stopped beating.⁴³ In September, after several failures, he succeeded in reviving a human heart more than twenty hours after its donor's death.⁴⁴ Five years later, in 1907, he developed a technique of artificial circulation in a severed fish head (Fig. 6).⁴⁵ Around the same time, Nikolai Kravkov (1865–1924), the chair of the pharmacology department at the Military–Medical Academy in St. Petersburg, began his studies on effects of various poisons on isolated rabbit hearts and ears.⁴⁶ From 1910 to 1913, Fedor Andreev (1879–1952), a young Moscow surgeon, in his research on the effects of electricity on the heart, succeeded in reviving a dog killed by an electric shock. He injected a mixture of adrenalin and saline solution into the arteries of the dead dog and observed a complete restoration of the heart beat, breathing, and nervous functions.⁴⁷

Briukhonenko's experiments with an isolated head thus continued a long tradition of research conducted by numerous Russian and foreign scientists prior to World War I. Indeed, in 1926, in the first published account of his experiments with the autojector, Briukhonenko referred by name to five researchers who had constructed similar machines, emphasizing the improvements and differences of his own apparatus.⁴⁸ Two years later, in the first detailed publication on the autojector, Briukhonenko provided a list of his predecessors, which included no fewer than nineteen names.⁴⁹

³⁹See Legallois (1812); an English translation appeared the next year, see LeGallois (1813). For an account of post-revolutionary French debates involving severed heads see Jordanova (1989).

⁴⁰Brown-Sequard (1858).

⁴¹For historical accounts of research on isolated organs, see Bauereisen (1962); Curtis (1966); Fye (1986); Zimmer (1998).

⁴²Kuliabko (1901).

⁴³Kuliabko (1902a).

⁴⁴Kuliabko (1902b).

⁴⁵Kuliabko (1907).

⁴⁶Kravkov (1911).

⁴⁷See Andreev (1910, 1912, 1913).

⁴⁸Briukhonenko & Chechulin (1926), p. 289.

⁴⁹Briukhonenko (1928a), p. 73. This long lineage notwithstanding, the worldwide (and particularly Soviet) excitement over Briukhonenko's works stemmed from the facts that he was the first to perform his experiments on the heads of dogs – mammals, which are much closer to humans on the evolutionary scale than cold-blooded fish or frogs utilized in the earlier research – and that in his experiments severed heads survived for long periods of time.

Similarly, Beliaev's story continued a long tradition of constructing fictional plots using the revival and transplantation of separate organs by scientific means. This tradition also goes back to the early nineteenth century: it was famously inaugurated (just a few years after Legallois had published his ideas) in Mary Shelley's 1818 classic, Frankenstein; or, The modern Prometheus, portraying a doctor who creates a living creature out of separate organs and tissues taken from cadavers. At the end of the nineteenth century, H. G. Wells further developed this tradition in his portrait of an ambitious surgeon transforming animals into humans in The island of Dr. Moreau (1896). Wells's work directly inspired a pioneer of French science fiction, Maurice Renard, to explore a similar idea – transplanting a human brain into another (animal) body – in his 1908 novel Le docteur Lerne, sous-Dieu.⁵⁰ All three novels were translated into Russian almost immediately after being published and were regularly reissued by various publishers both before and after the Bolshevik revolution.⁵¹ Beliaev was undoubtedly familiar with these classics.

Furthermore, if the above-mentioned novels explored just the general ideas of revival and transplantation, a pioneer of German science fiction, Carl Grunert, published in 1908 a short story, entitled 'Mr. Vivacius Style', whose plot revolved around a severed human head living in a laboratory.⁵² In this story, also set up in the United States, a prominent journalist, Vivacius Style, is killed in a railroad accident.⁵³ A certain 'Dr. Magnus Magician', who happens to be at the scene of the accident, picks up the severed head of Mr. Style and brings it to his lab. He attaches the head to an 'apparatus for blood transfusion' filled with 'sanguinum', a chemical substitute for human blood, which Dr. Magician has created, and the head is revived. The good doctor constructs a special machine that blows compressed air through the head's throat and enables it to speak. Mr. Style's head resumes his journalistic crusade against racial segregation in the United States, dictating his works to a phonograph and publishing them in newspapers. In the end, the head is killed by Mr. Style's political enemies. Before World War I, Grunert's stories regularly appeared in Russian translations in popular magazines, as well as in separate editions,⁵⁴ and Beliaev may well have read 'Mr. Vivacius Style'.

Despite numerous parallels between The Head of Professor Dowell and its literary predecessors – particularly Grunert's story – Beliaev himself denied that he had simply 'borrowed' the idea from some other writer.⁵⁵ In 1939, recounting the sources for his novella, Beliaev claimed that its plot was inspired by his own personal experiences:

The head of Professor Dowell is to a large degree an autobiographical story. Once, a disease kept me in a 'plaster bed' for three-and-a-half years. This disease was accompanied by the paralysis of the lower half of my body. And although I could use my hands, my life during those years was reduced to the life of a 'head without a body': I could not feel my body at all ... It was at this time that I lived through and felt everything that a head 'without a body' could experience.⁵⁶

Beliaev undeniably used his personal experiences in the literary ornamentation of the story, for instance, in describing Dowell's terrible feeling of helplessness when a large beetle flew into the lab and crawled onto his head. But it seems unlikely that the story's major 'scientific-fantastic' idea came from these experiences.

⁵⁰Renard (1919 [1908]). On Renard's works, see Evans (1994). On the contemporary French fascination with isolated heads and brains, see Tresch (2004).

⁵¹See Renard (1912, 1923).

⁵²Grunert (2005 [1908]). On Grunert's works see von Münch (2006).

⁵³See Brandis (1978); for a Russian version of the story see Grunert (1978).

⁵⁴See Grunert (1911).

⁵⁵Unfortunately, Beliaev's personal papers perished during the Nazi occupation of the city of Pushkin where he had resided during his last years, and thus it is impossible to study drafts, research notes, or any other materials relevant to the creation The Head of Professor Dowell.

⁵⁶Beliaev (1939).

Indeed, an examination of the story's first publications points to other sources. The publication in the Worker's Gazette was prefaced by the following statement: 'Scientists have been able to revive a heart taken from a fresh cadaver. Other parts of animal and human bodies have also been revived. It was these experiments that lay the foundation for the printed [below] scientific-fantastic story'.⁵⁷ The editorial 'afterword' was even more specific: 'Beliaev's story The head of Professor Dowell is of course a fantasy and a fiction; surely nobody was able to revive a human head. The story, however, has a solid scientific basis. It is founded on a whole series of experiments by Russian and foreign scientists – physiologists and surgeons'.⁵⁸ The editorial referred to the research on tissue cultures by Alexis Carrel, a French-American surgeon, who in the 1910s had captured the world's attention with his experiments on growing the cells of an organism outside the body. Carrel claimed that the tissue cultures of chicken heart he had cultivated in his laboratory were potentially 'immortal'.⁵⁹ The editorial also mentioned experiments with isolated ears and even wombs of rabbits, as well as human fingers, by Russian pharmacologist Nikolai Kravkov. In addition, it quoted the experiences of a prominent Russian surgeon, Vladimir Oppel', with the revival of a human heart that had stopped during a surgical operation: 'What was before us was [an instance of] true resurrection. The man had died – the heart had stopped, the breathing had seized, the pupils had dilated. A half an hour later, the man was breathing, and an hour later he was speaking'.

An editorial 'foreword' to The head of Professor Dowell in The World Tracker was even more detailed in its references to scientific research that served as the underpinnings of Beliaev's story. In addition to recounting Carrel's and Kravkov's experiments, it also informed readers that the Russian physiologist Aleksei Kuliabko had succeeded in reviving a severed head – 'albeit a fish head, so far, but a head, nonetheless'.⁶⁰ The editorial emphasized that 'the idea [of reviving a human head] is already floating in the air'. 'So far, it is only a scientific fantasy [nauchnaia fantastika]', and 'a brave jump into "tomorrow"', – the editors admitted, – 'yet this scientific fantasy stands on the lines of scientific discoveries of today; it is simply a logical end of that path to which the experiments conducted in this field lead'.⁶¹

Furthermore, in a 1928 essay expressively entitled 'Fantasy and science', and published in a volume of his collected stories, Beliaev himself emphasized that the entire genre of 'scientific fantasy' is always grounded in contemporary scientific research, and insisted that to balance science and fantasy is the most important task of any writer of 'scientific fantasy'.⁶² What is more, the volume was appended with a list of 'recommended popular science writings' relevant to the plots of the stories compiled in the volume, which Beliaev himself had apparently used in constructing those plots. The same year, in the 'afterword' to his new novel, The amphibian, Beliaev explicitly referred to certain scientific research that led him to the idea of an amphibious man created by the implantation of shark gills into a human child.⁶³

Death and revival in Bolshevik Moscow

It is conceivable that the nearly simultaneous appearance of Beliaev's story and Briukhonenko's experiments in 1925 was simply a coincidence. Each, in his own field, was developing further ideas that had been explored by numerous predecessors prior to World War I. Yet, one might also suggest that the timing of Beliaev's and Briukhonenko's works was more than coincidental. Both literary and physiological experimentations with severed heads – and more generally,

⁵⁷See Rabochaia gazeta (16 June 1925), p. 5.

⁵⁸Poslesolovie (1925).

⁵⁹See Carrel (1912). On Carrel and his work on tissue cultures, see Witkowski (1979, 1980).

⁶⁰Ot redaktsii (1925), p. 17.

⁶¹Italics are in the original.

⁶²Beliaev (1928a).

⁶³Beliaev (1928b).

preoccupation with death and revival – stemmed from a particular atmosphere, the cultural milieu of mid-1920s Russia, which was at one and the same time permeated by omnipresent death and by high hopes for the future.⁶⁴

The decade of 1914–1923 in Russia was a reign of death. From the beginning of World War I in the summer of 1914 through the mid 1920s, Russia went through an unprecedented demographic catastrophe.⁶⁵ Russian losses on the battlefields of World War I were higher than those of any other combatant country. The war decimated Russia's Western provinces and led to the death of some two to three million soldiers, mostly young, able-bodied men, not counting civilian casualties. A civil war that came on the tails of the Bolshevik revolution in early 1918 engulfed the entire country: from the Crimea in the south to Arkhangel'sk in the north, and from Vladivostok in the east to Petrograd in the west.⁶⁶ In addition to more than three years of fierce fighting, all belligerents in the civil war – be they 'the Reds', 'the Whites', or 'the Greens' – exercised indiscriminate terror, executing tens of thousands of 'enemies'. The civil war exacerbated the collapse of the old civic and economic order spurred by the Bolshevik revolution and forced enormous migration of the population, which was highly conducive to the spread of epidemic diseases: typhus, typhoid, cholera, and Spanish flu.⁶⁷ The exact numbers will never be known, but available estimates indicate that some eight to ten million people perished in the flames of the civil war: killed in its battles, executed as 'enemies', and succumbed to disease, cold, and starvation. As if these horrendous losses were not enough, just as the civil war ended in 1921, the worst drought in half a century hit the southern regions of the country producing a catastrophic famine that killed millions of people. In sum, in just one decade, some fifteen to twenty million people out of a population of 140 million in Russia died. The exact number of injured, maimed, and disabled both physically and psychologically remains unknown and is difficult even to imagine.

Yet, although death was omnipresent throughout the decade, so were the high hopes for and great expectations of the bright and wonderful future that lay ahead. Of course, separate segments of Russian society nurtured different hopes and different expectations, but all of them shared the vision of reviving, remaking, and reconstructing the country and its inhabitants. The Bolshevik revolution turned this vision into what Richard Stites has perceptively termed 'revolutionary dreams' of creating a new state, a new society, a new art, a new life, and, perhaps, even a new ... death.⁶⁸

The Bolsheviks won the civil war.⁶⁹ But they paid a steep price for the victory: the economy was shattered, cities were depopulated, factories stood still and fields empty, epidemics ran rampant. The entire country was nearly dead from exhaustion. Faced with the severe economic crisis, exacerbated by the famine, in late 1921 the Bolsheviks adopted 'NEP' – a 'New Economic Policy' – which proved highly successful in reviving the country's economy, repopulating its cities, and restoring its agricultural production. Although, under NEP, the Bolsheviks preserved control over banking and key industries, they allowed private initiative in trade, the production of consumer goods, and – most importantly for our story – publishing.⁷⁰ With the end of the civil war, the Bolsheviks also launched an enormous campaign to combat illiteracy and popularize science.⁷¹ They greatly expanded the entire system of education –

⁶⁴I am currently preparing another article that explores the closely related subject of rejuvenation, which also captivated scientific and public imagination at exactly the same time.

⁶⁵For different estimates of this catastrophe, see Lorimer (1946); Isupov (2000); Poliakov & Zhiromskaia (2000); Vishnevskii (2006).

⁶⁶For a general discussion of the social, economic, cultural, and political aspects of the civil war, see Koenker et al. (1989).

⁶⁷On forced migrations, see Baron & Gatrell (2004); Gatrell (2005).

⁶⁸See Stites (1989). Unfortunately, this brilliant analysis of revolutionary visions and experiments by artists, poets, musicians, architects, writers, and social planners ignores almost completely the visions and works of the ultimate experimentalists – Russian scientists!

⁶⁹For a highly readable account of this decade in Russian history, see Lincoln (1986, 1989).

⁷⁰For a general discussion of the social, economic, cultural, and political aspects of NEP, see Fitzpatrick et al. (1991).

⁷¹See Andrews (2003).

from primary schools to universities – and promoted the quick growth of all branches of science, medicine, and technology.⁷² By the mid 1920s, the entire country had been revived.

In no other place in the country was this revival more rapid, more noticeable, or more exciting than in the capital of the new, Soviet Russia – Moscow.⁷³ Another aspiring *littérateur*, who came to Moscow in September 1921, Mikhail Bulgakov, captured this resurrection in a ten-page essay, published in April 1923 in a literary supplement to a Berlin-based Russian newspaper, *On the Eve*.⁷⁴ Set as a series of diary entries, the essay provided snapshots of Moscow life, chronicling the dramatic change the city and its inhabitants underwent in less than eighteen months: from the desolate, dark, cold, desperate, empty, dead, hungry, frightened, and frightening ‘naked times’ of the fall of 1921 to a glittering, illuminated, crowded, bursting with life, plentiful, and cheerful ‘Mother-Moscow’, which ‘even at night sleeps without turning off her blazing eyes’, in the spring of 1923.

Yet, although in the dazzling carnival of NEP it seemed that the ‘decade of death’ was now all but forgotten, at least one group in the newborn Soviet society was still trying to come to terms with it: scientists. The omnipresence of death during the years of wars and revolutions left an indelible impression on Russia's biomedical community. Death became a subject of investigation not only for medical specialists, ranging from pathologists to bacteriologists, but also for biologists of all stripes. During the early 1920s, dozens of books, brochures, and pamphlets appeared (to say nothing of countless articles in professional journals), bearing such titles as ‘Life and death,’ ‘What is death?’, ‘Death from the point of view of modern science’, ‘Aging and death’, ‘The problems of death and immortality’, ‘Death and revival’, and ‘The enigma of death’. Virtually every Russian biologist of note published a work on death. Death figured prominently in the research of biochemists, histologists, physiologists, cytologists, morphologists, zoologists, and anatomists.⁷⁵ In 1924, a renowned pathologist, Georgii Shor, even suggested that a special discipline dealing with death be instituted. He named this discipline ‘thanatology’ for the Greek god of death, Thanatos (Fig. 7).⁷⁶

Certainly, publications of these works by the state publishing houses fit well with the Bolshevik militant anti-religious campaign, bringing to the populace ‘the views of modern science’ on such theologically charged issues as death, relations between body and soul, immortality, life after death, and resurrection.⁷⁷ Yet one can infer a wide popular interest in these subjects, for a large portion of these publications were issued by private publishers operating for profit and playing to the public's demands. Furthermore, under NEP, even state-owned enterprises, including book and newspaper publishers, were supposed to turn out profit, and one could suggest that many state-run publishing houses were attentive to the public's interest in the ‘problem of life and death’.

The explorations of death and revival filtered from scientific circles to a popular scene, filling pages of numerous daily newspapers and weekly magazines and becoming subjects of popular lectures and exhibits. In 1922, the scientific community attentively followed the experiments of Russia's foremost pharmacologist, Nikolai Kravkov, on the ‘revival’ of animal and human organs.⁷⁸ Two years later, newspapers and magazines widely publicized Kravkov's latest

⁷²See Kremmentsov (2006).

⁷³This resurrection was recorded in many contemporary diaries and memoirs: see, for example, Okunev (1997).

⁷⁴See Bulgakov (1923).

⁷⁵See, for instance, Dogel' (1922); Nemilov (1923, 1924); London & Kryzhanovskii (1924); Shmidt (1924); Shmal'gauzen (1926); and many others.

⁷⁶Shor (1925).

⁷⁷Two recent monographs on the Bolshevik militant ‘godless’ pay scant attention to the role of science, scientists, and scientific explorations of the issues of life and death in the formation of the atheistic world view in Soviet Russia: see Peris (1998); Husband (2000).

⁷⁸See Kravkov (1922a,b); Kol'tsov (1922).

research, presented during a lecture tour in Moscow in March 1924.⁷⁹ The public was fascinated by the fact that long-dead and dried human fingers could be ‘brought back to life’ and even grow nails (Fig. 8). Perhaps the recent death (on January 21 1924) of the leader of the Bolsheviks, Vladimir Lenin, which had sparked a country-wide campaign for his commemoration and ‘immortalization’, amplified the public fascination with Kravkov's work.⁸⁰ The furore over these experiments in the public press was further fueled by Kravkov's own sudden death in mid April, just a few weeks after his visit to Moscow.⁸¹

In the spring of 1925, at the time when both Beliaev and Briukhonenko were working on their respective experiments, a special event devoted to ‘The problem of life and death’ was held at the Moscow Polytechnic Museum – a main venue for public education and the popularization of science in the city. In the auditorium, which could seat nearly two thousand people, Petr Shmidt, a prominent Leningrad ichthyologist and science popularizer; and a pioneer of ‘resurrection’ techniques, surgeon Fedor Andreev; delivered lectures on the essence of life and death from the viewpoint of modern science, providing examples of ‘apparent death’, ‘suspended life’, ‘revival’, and ‘resurrection of isolated organs taken from cadavers’. Reports on this event appeared on the pages of Russia's central newspapers with country-wide circulation.⁸² The editors of *World Tracker*, thus, were not exaggerating in their foreword to *The head of Professor Dowell*: in the mid 1920s, the idea of reviving a severed head was indeed ‘floating in the air’.⁸³

The authors of the first experiments with severed heads, Beliaev and Briukhonenko, breathed deeply of that air. Along with millions of their compatriots, both lived through the ‘death and revival’ of their country and its capital. Furthermore, in his personal life, each underwent a similar process of ‘death and revival’, and on both of them the ‘decade of death’ left a strong personal imprint. In 1915, Beliaev became very sick with tuberculosis of the spine, and in search of relief he moved to Yalta, a popular TB resort in the Crimea. He spent more than three years in bed, paralyzed, on the brink of death, struggling with the disease. His wife left him, and his mother, who had accompanied him to the Crimea, died during the civil war years. Miraculously, Beliaev recovered, but the disease stayed with him for the rest of his life, and, as he later stated, it was this experience that ultimately led him to *The head of Professor Dowell*. He came to Moscow in late 1922 and began working as a jurist in various government agencies. After the success of his first literary experiment, Beliaev abandoned his judicial work and became a freelance journalist and a science fiction writer.

Briukhonenko's encounters with death were as personal as Beliaev's, and no less powerful. Almost immediately after graduating from Moscow University Medical School in the spring of 1914, Briukhonenko was drafted into the army and served as a doctor in an infantry regiment, experiencing first-hand the horrendous killing machine of World War I (Fig. 9). After the Russian army collapsed following the Bolshevik revolution, he returned to Moscow and spent the civil war years working in a large hospital engaged in fighting a horrific epidemic of typhus, which took away his wife and daughter.⁸⁴ According to his unpublished memoirs, it was during his hospital work that he first came to the idea of using a severed head in investigating the high fevers that accompany typhus.⁸⁵ It also seems quite likely that the hospital's director – one of the pioneers in the development of ‘resurrection’ techniques, Fedor Andreev – actively encouraged Briukhonenko's interest in experiments with severed heads. In 1922, Briukhonenko

⁷⁹See Doklady prof. N. P. Kravkova (1924); Kol'tsov (1924).

⁸⁰On this campaign, see Tumarkin (1997).

⁸¹See Smert' professora Kravkova (1924a), Smert' prof. Kravkova (1924b); Večer pamiati N. P. Kravkova (1924); Kol'tsov (1924).

⁸²See Problema zhizni i smerti (1925).

⁸³Ot redaktsii (1925), p. 17.

⁸⁴See Briukhonenko (1921).

⁸⁵See Briukhonenko (n.d.).

left medical practice for good and became a full-time researcher at the newly created Chemical-Pharmaceutical Institute. For both Beliaev and Briukhonenko, early experiments with severed heads launched a new career, as a writer and as a researcher, respectively.

Life and art: science and values

Commentators have often reduced analysis of the interrelations between science and fiction to two simple formulae: 'life imitates art' or 'art imitates life'.⁸⁶ Yet the relation between 'art' and 'life' is obviously much more complex.⁸⁷ The appearance of Beliaev's fictional experiment a few months ahead of the scientific ones might well have prepared the Soviet public for the favorable reception of Briukhonenko's actual studies: as the journalist Grebnev noted in May 1927, Beliaev's 'fairy-tale' that 'could only entice a smile' became 'a reality' in Briukhonenko's research.⁸⁸ But, as we have seen, Beliaev's fiction did not imitate Briukhonenko's science, nor did Briukhonenko's science emulate Beliaev's fiction. Rather, both of them used the idea that a severed head could be kept alive to explore issues of death and revival. Of course, the goals of their explorations were as different as were their respective vocations.

Briukhonenko's first experiments aimed at examining the possibility of keeping a severed animal head alive in order to investigate certain physiological mechanisms: initially, the regulation of body temperature. His 1925 report indicating that this was indeed possible was barely noticed by the scientific community, and completely ignored by the public at large. At the next stage, after he had perfected his technique (including the surgical operation of severing the head from a body, the autojector, blood stabilization and oxygenation), Briukhonenko began to explore numerous new possibilities that this technique opened up: investigations of the brain's reactions to various preparations introduced into perfused blood and the effects of 'death and revival' on the brain. It was exactly these new possibilities – most importantly, the possibility of replacing for a time the heart's function with the autojector to perform surgical operations on the stopped heart – that so excited the scientific community and ignited wide interest in his work.⁸⁹ The ultimate purpose of Briukhonenko's experiments was to investigate death and revival as physiological processes with an eye on applying whatever knowledge he could gain from these experiments to medical practice.

Beliaev's literary experiment assumed that keeping a severed human head alive was an accomplished feat of science in order to investigate what effects this feat might have on human life, human relations, and human society writ large. The ultimate purpose of Beliaev's experiment was to explore death and revival as parts of human existence. Through the eyes of a head without a body (and in the later, 1938 version of the story, also a head transplanted onto another body), Beliaev examined the role of science and the scientist in 'modifying' this inevitable part of human existence – death – and questioned the value of such 'modifications'. It is quite telling that, unlike in Grunert's story, the revived head belongs to the scientist who had invented the 'resurrection' technique. Characteristically, in his reaction to Briukhonenko's 'frightfully interesting' experiments, George Bernard Shaw suggested exactly that: 'I would of course, expect one or two vivisectionists to submit themselves to the experiment to prove to my satisfaction that it is practicable and not dangerous, but I assume that would not mean any serious difficulty'.⁹⁰ Professor Dowell gets a taste of his own medicine, as it were, and his head is not at all happy with the application of his science. Dowell's head laments to Miss

⁸⁶Compare, for instance, Boutillette et al. (1999) and Thiher (2001, 2005).

⁸⁷See, for example, Jordanova (1986).

⁸⁸Grebnev (1927).

⁸⁹Shortly thereafter Nikolai Terebinskii, a prominent Moscow surgeon, conducted a series of experimental operations on a stopped heart using Briukhonenko's autojector. See Terebinskii (1940). For a historical account of Terebinskii's work, see Alexi-Meskishvili et al. (1998).

⁹⁰Shaw feels 'tempted' to have head cut off (1929).

Adams: 'I'm deprived of everything available to live people. And only mind [*soznanie*], as damnation, is left to me ... When I lost my body, I lost the world'. Nor did other revived heads in Beliaev's story enjoy their 'resurrection'. Miss Adams puts it bluntly: 'I'd prefer death to such resurrection'.

One might suggest that Russian scientists' pointed explorations of the issues of death and their enthusiastic pursuit of various scientific means of 'revival' and 'resurrection', which were covered extensively by the popular press in the early 1920s, prodded Beliaev into questioning the value – particularly the ethical value – of these pursuits. Beliaev's story could be seen as one of the earliest attempts to deal with that question, and the answer it provides is certainly in the negative: Dowell's head dies and his disciple Kern is arrested as a criminal (in the later, 1938 version of the story, Kern shoots himself).

Beliaev was not the only one troubled by this question. The first newspaper reports on Briukhonenko experiments in November 1926 provoked a lengthy comment from Ivanov-Razumnik (Razumnik Vasil'evich Ivanov, 1878–1946), a prominent Russian anthroposophist and writer. In a letter to a fellow anthroposophist and writer, Andrei Belyi (Boris Nikolaevich Bugaev, 1880–1934), Ivanov-Razumnik described these reports as 'terrifying':

Today [it's] a dog, tomorrow – [they] will separate the head of a man sentenced to the 'highest measure of punishment' (a vile farisaism in the very turn of the phrase) and will 'attach it' to the apparatus. The day after tomorrow – instead of the apparatus, there will be a body of another man, also sentenced to the 'highest measure' and beheaded: the head of one [transplanted] onto the body of the other. One more step and the head of Beethoven will be attached to the body of a snake ... Even though 'tomorrow' is a century away, and the 'step' is a million miles long, the matter is in the principle and in the first step.⁹¹

The main issues that deeply troubled Ivanov-Razumnik had to do with what should be limits of scientific experimentation, who should set the limits, and what should be allowed. He complained about the moral 'deafness' on the part of 'people of science,' who do not want even to think about the ethical implications of their science. On the other hand, he considered the Bolshevik government utterly immoral and incapable of providing science and scientists with any ethical guidance. He admitted that, in theory, Briukhonenko's experiments could pave the way to saving human lives. He even envisaged a situation when the head could be separated from the body temporarily in order to perform a complicated surgical procedure, which had been impossible on an intact organism. He conceded that in time it could become merely a 'surgical operation, though unusual for now, but so had been tracheotomy and trepanation in their times'.⁹² What, for Ivanov-Razumnik, remained an open issue was whether the promise of saving human lives could be used to justify any scientific experimentation. In the end, he subscribed to the utilitarian view of ethics with a particular anthroposophist twist: 'The goal justifies the means – is an awful formula, but only if the means are other human beings'.⁹³

Of course, neither Beliaev nor Ivanov-Razumnik could provide definitive answers to the ethical issues inherent to the rapid development of experimental biology and experimental medicine in the 1920s. Nor were the issues they addressed an exclusively Russian/Soviet concern. As witnessed, for example, by the well-known polemical writings of J. B. S. Haldane in *Daedalus* (1923), and Bertrand Russell in *Icarus* (1924), which in turn inspired such famous literary expositions as Olaf Stapledon's *Last and first men* (1930) and Aldous Huxley's *Brave new world* (1932), scientists, philosophers, and writers in Britain were troubled by similar

⁹¹Lavrov & Mal'mstad (1998), p. 408. Italics are in the original.

⁹²Ibid., p. 409.

⁹³Ibid. Italics are in the original.

questions.⁹⁴ In 1926, a leader of British experimental biologists, Julian Huxley (a stepbrother of Aldous Huxley), conducted his own, though much less well-known, literary experiment in a story, evocatively entitled 'The tissue-culture king.' The story tells of a British scientist captured by natives in a remote area of Africa. Upon arriving at the tribe's 'capital', the scientist meets another captive, a certain 'Dr. Hascombe'. In exchange for his life, Hascombe had promised that he would make the king of his captors 'immortal'. Hascombe had established a laboratory for his experiments with the king's tissue cultures and filled it with 'monsters' and 'circus freaks': two-headed toads, dwarfs, and mustached girls. Huxley ended his story with the following sentiment:

The question I want to raise is this: Dr. Hascombe attained to an unsurpassed power in a number of applications of science – but to what end did all this power serve? It is the merest cant and twaddle to go on asserting, as most of our press and people continue to do, that increase of scientific knowledge and power in itself be good. I commend to the great public the obvious moral of my story and ask them to think what they propose to do with the power which is gradually being accumulated for them by the labors of those who labor because they like power, or because they want to find the truth about how things work.⁹⁵

Yet, unlike in Britain, where such prominent experimental biologists as Huxley and Haldane directly contributed to 1920s public debates over the ethical concerns spurred by the rapid advances of their science, such a debate never emerged in the Soviet Union.⁹⁶ The ethical implications of Beliaev's story seem to have been lost on its readers. The only review of The head of Professor Dowell, which appeared in 1926 in the party magazine The Press and Revolution, completely ignored ethical dimensions of the story. Although noting that 'an artistic treatment of the head-spinning possibilities', including the 'resurrection of the dead', which modern science opened up, 'must have certain meaning', the reviewer did not find any such meaning in Beliaev's story, dismissing it as a piece of mildly amusing entertainment.⁹⁷

Neither did Briukhonenko's actual research spark a public debate. Ivanov-Razumnik confided his concerns to a private letter and never voiced them publicly. The Soviet scientific community, as well as Soviet society at large, seemed totally unperturbed (Fig. 10). The Soviet public became excited rather than dismayed by the severed heads of dogs supported by the intricate apparatuses, which gazed at them from the covers of popular magazines. None of the several dozens of articles devoted to Briukhonenko's experiments, which appeared in the popular and academic press from 1926 to 1929, even mentioned their possible ethical implications.

One might suggest that the 'decade of death' desensitized the Soviet public to the ethical issues of biomedical experimentation. In the public eye, 'science that conquers death' – as Briukhonenko's experiments were labeled in the popular press – was unquestionably moral. To oppose this science on some ethical ground seemed unthinkable. Indeed, Soviet commentators rebuffed attempts to criticize the research with severed heads on 'moral grounds'. In spring 1929, for instance, Evening Moscow carried a 'small feuilleton' entitled 'Dogs and humans'.⁹⁸ The feuilleton cited a letter received by the People's Commissariat of Enlightenment (the state agency in charge of science and education) from the president of the

⁹⁴On the Haldane–Russell exchange, see Adams (2000); Rubin (2005). On a more general issue of interrelations between biology and values in Britain see Smith (2003). For a more general discussion of the situation in post-World War I Britain, see Lawrence & Mayer (2000).

⁹⁵Huxley (1926), p. 504. Italics are in the original.

⁹⁶As witnessed by the infamous 'Scopes Trial' of 1925, in the United States a similar debate centered on religious, not ethical, concerns spurred by biological science.

⁹⁷Loks (1926), pp. 200–201.

⁹⁸Nizhnii (1929).

Frankfurt society for animal protection, a certain 'Mr. von Artus', who expressed his outrage at the inhumane treatment of dogs in Briukhonenko's research: 'The experiments of Dr. Briukhonenko are the work of the devil, and those who conduct such experiments are the servants of hell'.⁹⁹ The author of the feuilleton sarcastically suggested that since 'Mr. von Artus is so worried about the fate of the beheaded dog, he should offer his own head for the experiments on brain tissue, if, of course, he truly believes that this useful tissue is indeed present under his thick skull'.

The reactions to both actual and literary experiments with severed heads seem to indicate that scientists, state officials, and the public in 1920s Russia firmly believed in the ultimate 'goodness' of science, which Huxley mocked in his exposé. They apparently subscribed to the view that science itself was value-free. It was a particular society that gave science and its applications a moral value and passed an ethical judgment on concrete scientific endeavors: in an immoral society, science would be immoral, while in a moral society, science would 'automatically' become moral. The notion of value-free science explains why the Bolsheviks had no qualms in importing on a large scale 'capitalist' science and, particularly, technology, to their own 'socialist' land, and it fits well with Lenin's remark: 'To absorb everything valuable from European and American science is our first and foremost task'.¹⁰⁰

It seems likely that Beliaev quite deliberately set his story not in the Soviet Union, but in the United States, – a country, which, in the current Soviet views, represented the pinnacle of the 'immoral' capitalist system, and where quick scientific and technological advances served to benefit not 'the people', but a few capitalists in their pursuit of ever larger profits. The ultimate failure of Professor Dowell's science – symbolized by the death of his head and the arrest/suicide of his pupil Kern – was the logical ending for a story of science in an 'immoral society'. Similar stories about the failure of science and scientists in 'capitalist' settings became a staple of Soviet science-fiction writings in the 1920s, with examples ranging from Aleksei Tolstoi's *The hyperboloid of engineer Garin* (1925–1926) to Beliaev's own *The amphibian* (1928) and *The ruler of the world* (1926–1929).¹⁰¹

If, in Beliaev's fiction, set in 'the land of capitalism', the head of Professor Dowell failed both literally and figuratively; in Soviet reality, the scientific community, the public, and the state wholeheartedly embraced experiments with severed heads.¹⁰² Briukhonenko's work was lauded on the pages of numerous professional and popular publications, while various state agencies provided funds for its continuation and expansion. Perhaps the best illustration of this unequivocal support came in the form of a photograph that accompanied several popular articles on Briukhonenko's research (Fig. 11). In this staged photo, in the center, we see a laboratory table with the severed head of a dog placed on a large dinner plate and with the autojector in the background. Two distinguished gentlemen stare attentively and somberly at the head: on the right, the pioneer of research on severed heads Aleksei Kuliabko; on the left, the official patron of all 'pure' science in Soviet Russia, the Commissar of Enlightenment, Anatolii Lunacharskii.

⁹⁹One cannot but wonder whether the famous scene with the revival of Berlioz's head at Volland's ball in Mikhail Bulgakov's masterpiece *Master and Margarita* was not inspired by this 'small feuilleton', which Bulgakov might well have read in *Evening Moscow*. Bulgakov and Briukhonenko met in 1933. Bulgakov visited Briukhonenko's laboratory, and Briukhonenko even suggested that Bulgakov write a play or a movie script about his work on the revival of severed heads. See Bulgakova & Bulgakov (2003), pp. 174–175, 180, 184–185.

¹⁰⁰Lenin (1970 [1921]), pp. 206–207.

¹⁰¹Although there are numerous critical assessments of works by such individual Russian science fiction writers as Aleksei Tolstoi and Alexandr Bogdanov, the history of early science fiction remains one of the most neglected areas in the history of Soviet literature. For some general accounts of the genre in the early Soviet period see Stephan (1984); McGuire (1985); Stites (1989), pp. 165–189; Gornall (2004).

¹⁰²See, for instance, reminiscences of Iurii Dolgushin (Dolgushin, 1959), another Soviet writer, who met Briukhonenko and even participated in his experiments. Briukhonenko became a prototype for a leading character in Dolgushin's novel, *The generator of miracles* (1939).

In a moral society – and the first socialist state was by definition supposed to be moral, for its stated goal was to benefit the previously oppressed majority of the population – neither science nor scientists could be immoral, as long as they work for the benefit of that society and that state.

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References

- II Vsesoiuznyi s"ezd patologov. Zhurnal dlia usovershenstvovaniia vrachei 1925;10:571–574.
- III s"ezd fiziologov. Iskra 1928;8:28.
- Adams MB. Last judgment: The visionary biology of J. B. S. Haldane. *Journal of the History of Biology* 2000;33:457–491. [PubMed: 13678078]
- Alexi-Meskishvili VV, Potapov EV, Beyer EAK, Hetzer R. Nikolai Terebinski: A pioneer of the open valve operation. *Annals of Thoracic Surgery* 1998;66:1440–1443. [PubMed: 9800862]
- Andreev, FA. O narushenii funktsii serdtsa pod vlianiem gal'vanicheskogo toka. Eksperimental'noe issledovanie. Moscow: Moscow University; 1910.
- Andreev FA. Smert' ot elektricheskogo toka. *Prakticheskii vrach* 1912;8:123–127.9:146–150.
- Andreev FA. Opyty vosstanovleniia deiatel'nosti serdtsa, dykhanii i funktsii tsentral'noi nervnoi sistemy. *Voprosy nauchnoi meditsiny* 1913;2:137–172.
- Andrews, JT. Science for the masses. College Station: Texas A&M University Press; 2003.
- Baron, N.; Gatrell, P., editors. Homelands: War, population and statehood in eastern Europe and Russia 1918–1924. London: Anthem Press; 2004.
- Bauereisen E. Carl Ludwig as the founder of modern physiology. *Physiologist* 1962;4:293–299. [PubMed: 13966954]
- Beliaev A. Golova professora Douelia. *Raboचाia gazeta*. 1925a16–21 & 24–26 June; 2–6 July
- Beliaev A. Golova professora Douelia. *Vsemirnyi sledopyt* 1925b;3:17–27.4:24–31.
- Beliaev, A. Golova professora Douelia. Moscow–Leningrad: Zemlia i Fabrika; 1926.
- Beliaev, A. Bor'ba v efire. Moscow–Leningrad: Molodaia Gvardiia; 1928a. *Fantastika i nauka*; p. 309–323.
- Beliaev A. Posleslovie k romanu 'Chelovek-amphibiia'. *Vokrug sveta* 1928b;13:200–202.
- Beliaev, A. Golova professora Douelia. Moscow–Leningrad: Sovetskii Pisatel'; 1938.
- Beliaev A. O moikh rabotakh. *Detskaia literatura* 1939;5:23–24.
- Beliaev, A. *Sobranie sochinenii v vos'mi tomakh*. Moscow: Molodaia Gvardiia; 1963–1964.
- Beliaev, A. Professor Dowell's head. Bouis, AW., translator. New York, London: Macmillan Publishing; 1980.
- Boettcher W, Merkle F, Weitkemper HH. History of extracorporeal circulation. *Journal of Extra-Corporeal Technology* 2003;35:172–191. [PubMed: 14653416]
- Bottcher, W.; Alexi-Meskishvili, VV. Sergej Sergejewitch Brychonenko (1890–1960): Pionier des kardiopulmonalen Bypasses in der Sowietunion. *Deutsche Gesellschaft für Kardiotechnik*. 2003 [12 June 2006]. <http://www.dgft.de/artikel/203/Pionier.htm>
- Boutillet, M.; Coveney, C.; Kun, S.; Menides, LJ. The influence of science fiction films on the development of biomedical instrumentation. *Proceedings of the IEEE 25th Annual Northeast Bioengineering Conference*; April 8–9, 1999; Piscataway, NJ: IEEE; 1999. p. 143–144.
- Brandis E. Foreword. *Iskatel'* 1978;1:152.
- Bruihkhonenko SS. Nekotorye dannye o deistvii limonnokislogo natra i peptona pri synptom tife. *Moskovskii meditsinskii zhurnal* 1921;1:7–10.

- Briukhonenko, SS. Report to the Second Congress of Russian Pathologists in Moscow. c 1926. untitled manuscript in the Archive of the Russian Academy of Sciences (hereafter, ARAN), fond 1534, opis' 1, delo 2, listy 1–2 Such references will be further given as ARAN, f. 1534, op. 1, d. 2, listy 1–2
- Briukhonenko, SS. Izuchenie novykh metodov iskusstvennogo krovoobrashcheniia i perelivaniia krovi. Moscow: NTO VSNKh; 1928a. Apparat dlia iskusstvennogo krovoobrashcheniia (teplokrovnykh); p. 73–80.
- Briukhonenko SS. Apparat dlia iskusstvennogo krovoobrashcheniia (teplokrovnykh). Zhurnal eksperimental'noi biologii i meditsiny 1928b;10(26):296–306.
- Briukhonenko, SS. Trudy Tret'ego Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1928c. Iskusstvennoe krovoobrashchenie tselogo organizma (sobaki) s vykliuchennym serdtsem (demonstratsiia); p. 213–214.
- Briukhonenko, SS. Izuchenie novykh metodov iskusstvennogo krovoobrashcheniia i perelivaniia krovi. Moscow: NTO VSNKh; 1928d. Iskusstvennoe krovoobrashchenie tselogo organizma (sobaki) s vykliuchennym serdtsem; p. 44–72.
- Briukhonenko SS. Perezhivanie tsentral'noi nervnoi sistemy v iskusstvennykh usloviakh. Prozhektor 1928e;41:10–11.
- Briukhonenko, SS. Trudy Tret'ego Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1928f. Primenenie 'Bauer 205' dlia perelivaniia stabilizirovannoi krovi; p. 64–65.
- Briukhonenko S. La surie artificielle du système nerveux central. Monde 1928g October;13:9.
- Briukhonenko S. Appareil pour la circulation artificielle du sang des animaux à sang chaud. Journal de physiologie et de pathologie générale 1929a;27:12–18.
- Briukhonenko S. Circulation artificielle du sang dans l'organisme entier d'un chien avec cœur exclu. Journal de physiologie et de pathologie générale 1929b;27:257–272.
- Briukhonenko S. Der lebende, Körperlose Hundekopf. Umschau 1929c January 19;33:50.
- Briukhonenko S. Iskusstvennoe krovoobrashchenie organizma. Zhurnal eksperimental'noi biologii i meditsiny 1929d;11(30):21–27.
- Briukhonenko, SS. Iskusstvennoe krovoobrashchenie. Moscow: Nauka; 1964.
- Briukhonenko SS. Istoriia razvitiia idei iskusstvennogo krovoobrashcheniia i ee primeneniye v biologii i meditsine. n.d. Undated manuscript in ARAN, f. 1534, op. 3, d. 15, l. 10
- Briukhonenko, SS.; Briukhonenko, VA. Trudy Tret'ego Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1928. Koagulyatsiia i stabilizatsiia krovi i belkov; p. 63–64.
- Briukhonenko, SS.; Chechulin, SI. Trudy Vtorogo Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1926. Opyty po izolirovaniu golovy sobaki; p. 289–290.
- Briukhonenko, SS.; Chechulin, SI. Izuchenie novykh metodov iskusstvennogo krovoobrashcheniia i perelivaniia krovi. Moscow: NTO VSNKh; 1928a. Opyty po izolirovaniu golovy sobaki; p. 7–43.
- Briukhonenko, SS.; Chechulin, SI. Trudy Tret'ego Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1928b. Opyty na izolirovannoi golove sobaki; p. 214–215.
- Briukhonenko SS, Chechulin SI. Perezhivanie tsentral'noi nervnoi sistemy golovnogo mozga v usloviakh iskusstvennogo krovoobrashcheniia. Zhurnal eksperimental'noi biologii i meditsiny 1928c;10(26):307–321.
- Briukhonenko S, Chechulin S. Vozmozhna li zhizn' golovy otrezannoi ot tulovishcha? Iskry nauki 1928d; 5:161–166.6:201–205.
- Briukhonenko S, Chechulin S. Expériences avec la tête isolée du chien: I. Technique et conditions des expériences. Journal de physiologie et de pathologie générale 1929a;27:31–45.
- Briukhonenko S, Chechulin S. Expériences avec la tête isolée du chien: II. Résultats des expériences. Journal de physiologie et de pathologie générale 1929b;27:64–79.
- Briukhonenko, SS.; Zverev, VV. Trudy Tret'ego Vsesoiuznogo s"ezda fiziologov. Leningrad: Glavnauka; 1928. O deistvii nekotorykh koaguliruiushchikh i stabiliziruiushchikh krov' veshchestv in vivo; p. 62–63.
- Brown-Sequard C. Recherches expérimentales sur les propriétés physiologique et les usages du sang rouge et du sang noir et de leurs principaux éléments gazeux, l'oxygène et l'acide carbonique. Journal de la physiologie l'homme et des animaux 1858;1:95–122. 353–367, 729–735.
- Bulgakov M. Sorok sorokov. Nakanune. 1923 April 15;

- Bulgakova, E.; Bulgakov, M. *Dnevnik Mastera i Margarity*. Moscow: Vagrius; 2003.
- Carrel A. On the permanent life of tissues outside of the organism. *Journal of Experimental Medicine* 1912;15:516–528.
- Chechulin S. O novom metode izoliatsii tsentral'noi nervnoi sistemy. *Iskra* 1928a;12:19–21.
- Chechulin SI. Problema ozhivleniia golovnogo mozga. *Nauchnoe slovo* 1928b;9:42–56.
- Curtis LE. An early history of extracorporeal circulation. *Journal of Cardiovascular Surgery* 1966;7(3): 240–247. [PubMed: 5328215]
- Dogel', AS. *Starost' i smert'*. Petrograd: Mysl'; 1922.
- Kravkova NP. *Pravda* 1924 March 2;:4.
- Dolgushin, Iu. *Generator chudes*. Moscow: Trudrezervizdat; 1959.
- Dva chasa zhizni bez serdtsa i bez legkikh. *Krasnaia gazeta*. 1926 Nov 10. p. 2
- Dvizhkov PP. Vtoroi Vserossiiskii s'ezd patologov. *Klinicheskaiia meditsina* 1926;4:77–79.
- Evans, AB. The fantastic fiction of Maurice Renard. *Science Fiction Studies*. 1994 [12 January 2007]. <http://www.depauw.edu/sfs/backissues/64/evans.htm>
- Fernan-Perez. La survivance du système nerveux central dans des conditions artificielles. *La presse médicale* 1929 February 6;37:183–184.
- Fitzpatrick, Sh; Rabinowitch, A.; Stites, R., editors. *Russia in the era of NEP*. Bloomington: Indiana University Press; 1991.
- Fye WB. H. Newell Martin and the isolated heart preparation: The link between the frog and open heart surgery. *Circulation* 1986;73:857–864. [PubMed: 3516445]
- Gatrell, P. *A whole empire walking: Refugees in Russia during World War I*. Indianapolis: Indiana University Press; 2005.
- Gomel E. Gods like men: Soviet science fiction and the utopian self. *Science Fiction Studies* 2004;31(3): 358–377.
- Grebnev G. Golova, otrezanaia ot tulovishcha, zhivet. *Komsomol'skaia pravda* 1927 May;22:4.
- Grunert, C.; Grunert, K. *Gibel' zemli Shpion s Marsa*. St. Petersburg: Khronos; 1911.
- Grunert C, Grunnert K. Golova mistera Staila. *Iskatel'* 1978;1:151–159.
- Grunert, C. *Der Marsspion und andere Novellen: Nachdruck der 1908 erschienenen Erstausgabe im Neusatz*. Norderstedt: Books on Demand GmbH; 2005. Mr. Vivacius Style; p. 107-118.2005. (First published 1908)
- Husband, WB. "Godless communists": Atheism and society in Soviet Russia, 1917–1932. De Kalb: Northern Illinois University Press; 2000.
- Huxley J. The tissue-culture king. *The Yale Review* 1926;15:487–504.
- Información rusa–colaboración gráfica. *El día medico* (Buenos Aires). 1929 Sep 2. p. 93-94.p. 100
- Isupov, VA. *Demograficheskie katastrofy i krizisy v Rossii v pervoi polovine XX veka*. Novosibirsk: Sibirskii khronograf; 2000.
- Iz komnatushki v laboratoriiu. *Komakademiiia pomozhet doktoru Briukhonenko*. *Komsomol'skaia pravda* 1927 May 24;:4.
- Trudy Nauchnogo Khimiko-Farmatsevticheskogo Instituta. *Izuchenie novykh metodov iskusstvennogo krovoobrashcheniia i perelivaniia krovi*. Vol. 20. Moscow: NTO VSNKh; 1928.
- Jenson R. History of perfusion. *Journal of Extra-Corporeal Technology* 2003;35:270–274. [PubMed: 14979415]
- Jordanova, L., editor. *Languages of nature: Critical essays on science and literature*. New Brunswick, NJ: Rutgers University Press; 1986.
- Jordanova L. Medical mediations: Mind, body and the guillotine. *History Workshop Journal* 1989 Autumn;28:39–52.
- K L. *Iskusstvennoe krovoobrashchenie s vykliuchennym serdtsem*. *Vestnik znaniia* 1928;16:830.
- Kazantsev, A. No science without fiction. *The UNESCO Courier*. 1984 Nov [4 February 2007]. http://findarticles.com/p/articles/mi_m1310/is_1984_Nov/ai_3499586
- Koenker, DP.; Rosenberg, WG.; Suny, RG., editors. *Party, state, and society in the Russian civil war*. Bloomington: Indiana University Press; 1989.

- Kol'tsov NK. Issledovaniia N. P. Kravkova o funktsional'nykh osobennostiakh izolirovannykh organov u zhivotnykh i cheloveka. *Uspekhi eksperimental'noi biologii* 1922;1(3–4):375–381.
- Kol'tsov, N. Pravda. 1924 Jun 8. Blestiaschie dostizheniia russkoi nauki (N. P. Kravkov i ego raboty); p. 6
- Konstantinov IE, Alexi-Meskishvili VV, Sergei S. Brukhonenko: The development of the first heart–lung machine for total body perfusion. *Annals of Thoracic Surgery* 2000;69(3):962–966. [PubMed: 10750806]
- Kraus JH. The living head. *Science and Invention* 1929 February;:922–923.
- Kravkov N. O razlichnykh fazakh deistviia iadov na izolirovannoe serdtse. *Russkii vrach* 1911;9(41):1565–1571.
- Kravkov N, Kravkov N. Über funktionelle Eigenschaften der Blutgefäße isolierter (normaler und pathologischer) Organe von Tieren und Menschen. *Zeitschrift für die gesamte experimentelle Medizin* 1922a;27(34):127–173.
- Kravkov, NP. Sbornik nauchnykh trudov v chest' 50-letia nauchno-vrachebnoi deiatel'nosti glavnogo vracha Obukhovskoi bol'nitsy A. A. Nechaeva. Petrograd: 1922b. Dannye i perspektivy po ozhivleniiu taknei umershikh; p. 5–7.n.p.
- Krementsov N. Big revolution, little revolution: Science and politics in Bolshevik Russia. *Social Research* 2006;73(4):1173–1204.
- Kuliabko AA. Opyty nad izolirovannym serdtsem ptits. *Izvestiia Imperatorskoi akademii nauk* 1901;15(4):471–472.
- Kuliabko AA. Opyty ozhivleniia serdtsa. *Izvestiia Imperatorskoi akademii nauk* 1902a;16(4):175–183.
- Kuliabko AA. Dal'neishie opyty ozhivleniia serdtsa. Ozhivlenie chelovecheskogo serdtsa. *Izvestiia Imperatorskoi akademii nauk* 1902b;17(5):189–210.
- Kuliabko AA. Primenenie iskusstvennoi tsirkuliatsii na otrezannoi ryb'ei golove. *Zapiski Imperatorskoi akademii nauk* 1907;20(7):1–25.
- Kuliabko A. Opyty ozhivleniia serdtsa i golovy i ikh znachenie. *Iskry nauki* 1928;7:241–244.8:285–289.
- Lapchinskii, AG. Briukhonenko, SS. *Iskusstvennoe krovoobrashchenie*. Moscow: Nauka; 1964. S. S. Briukhonenko: Osnovopolozhnik iskusstvennogo krovoobrashcheniia; p. 6–12.
- Lavrov, AV.; Mal'mstad, Dz, editors. Andrei Belyi i Ivanov-Razumnik Perepiska. St. Petersburg: Atheneum–Feniks; 1998.
- Lawrence, C.; Mayer, AK., editors. *Regenerating England: Science, medicine and culture in inter-war Britain*. Amsterdam: Editions Rodopi; 2000.
- Lee, KG. The history of extracorporeal circulation. In: Barr, AM.; Boulton, TB.; Wilkinson, DJ., editors. *Essays on the history of anaesthesia*. London: Royal Society of Medicine Press; 1996. p. 98–104.
- Legallois, JJC. *Expériences sur le principe de la vie*. Paris: Chez D'Hautel; 1812.
- LeGallois, JJC. *Experiments on the principle of life*. Philadelphia: M. Thomas; 1813.
- Lenin, VI. *Polnoe sobranie sochinenii* (5th ed., 55 vols.)(Vol. 45, pp. 206–207). Moscow: Politizdat; 1970. Lozhka degtia v bochke meda. (First published 1921)
- Liapunov, BV. Aleksandr Beliaev. Moscow: Sovetskii pisatel'; 1967.
- Lincoln, WB. *Passage through Armageddon: The Russians in war and revolution, 1914–1918*. New York: Simon and Schuster; 1986.
- Lincoln, WB. *Red victory: A history of Russian civil war, 1918–1921*. New York: Da Capo Press; 1989.
- Loks K. A. Beliaev: Golova Professora Douelia. *Pechat' i revoliutsiia* 1926;8:200–201.
- London, ES.; Kryzhanovskii, II. *Bor'ba za dolgovechnost'*. Petrograd: Put' k znaniuu; 1924.
- Lorimer, F. *The population of the Soviet Union: History and prospects*. Geneva: League of Nations; 1946.
- Mass, K. Letter to S. Briukhonenko (7 December), in ARAN, f. 1534, op. 3, d. 29, l. 27 (anonymous Russian translation); ARAN, f. 1534, op. 3, d. 65, l. 22 (French original). 1928.
- McGuire, PL. *Red stars: Political aspects of Soviet science fiction*. Ann Arbor, MI: UMI Research Press; 1985.
- Na vsesoiuznom s"ezde fiziologov. *Vecherniaia Moskva* 1928 May 31;:2.
- Nauka, pobezhdaishchaia smert'. *Vecherniaia Moskva*. 1928 Feb 11. p. 2

- Nemilov, AV. Chto takoe smert'? Smert' s tochki zreniia estestvennykh nauk. Moscow–Petrograd: GIZ; 1923.
- Nemilov, AV. Zhizn' i smert'. Leningrad: GIZ; 1924.
- Nizhnii A. Sobaki i liudi. Vecherniaia Moskva 1929 March 22;:2.
- Novosti nauki i tekhniki: Tretii vsesoiuznyi s'ezd fiziologov. Khochu vse znat' 1928 July;13:390–391.
- O golove Bernarda Shou. Vecherniaia Moskva. 1929 May 25. p. 3
- Okunev, NP. Dnevnik moskvicha (2 vols). Vol. 1. Vol. 2. Moscow: Voenizdat; 1997. p. 1917-1920.p. 1920-1924.
- Opyty s golovoi sobaki. Vecherniaia Moskva. 1928 Jun 1. p. 4
- Ot redaktsii. Vsemirnyi sledopyt 1925;3:16–17.
- Peris, D. Storming the heavens: The Soviet league of militant godless. Ithaca, NY: Cornell University Press; 1998.
- Poliakov Iu, A.; Zhiromskaia, VB., editors. Naselenie Rossii v XX veke (2 vols). Vol. 1. Moscow: Rosslen; 2000. p. 1900-1939.
- Poltavskii, II. Ulybka budushchego. Vecherniaia Moskva 1928 October 9;:2.
- Posleslovie. Rabochaia gazeta 1925 July 6;:5.
- Problema zhizni i smerti. Izvestiia. 1925 Mar 14. p. 4
- Renard, M.; Renan, M. Doktor Lern Polubog. St. Petersburg: M. G. Kornfeld; 1912.
- Renard, M. Le docteur Lerne, sous-Dieu. Paris: Editions G. Crès; 1919. (First published 1908)
- Renard, M.; Renan, M. Novyi zver (Doktor Lern). Moscow-Petrograd: Puchina; 1923.
- Rubin, Ch T. Daedalus and Icarus revisited. The New Atlantis: The Journal of Technology and Society 2005 Spring;8:73–91.
- Shaw will sich köpfen lassen, wenn ... Ein Privatbrief des Dichters über ein neues, abschreckendes Tierexperiment. Berliner Tageblatt 1929 March 17;:3.
- Shaw feels 'tempted' to have head cut off. New York Times 1929 March 17;:5.
- Shirokov S. Zhizn' organov vne tela. Zhenskii zhurnal 1930;4:49.
- Shmal'gauzen, II. Problema smerti i bessmertii. Moscow–Leningrad: GIZ; 1926.
- Shmidt, P Iu. Bor'ba so starost'iu. Leningrad: GIZ; 1924.
- Shmidt, P Iu. Opyty ozhivleniia golovy. Chelovek i priroda 1929;1:14–23.
- Shor, GV. O smerti cheloveka. Vvedenie v tanatologiiu. Leningrad: Kubuch; 1925.
- Sirotkina, G.; Gutkin, VS. SS Briukhonenko. Moscow: Meditsina; 1972.
- Slavina M. Perezhivanie tsentral'noi nervnoi sistemy. Gigiena i zdorov'e 1928;19:1.
- Slitsan II. Stranitsa iz knigi zhizni i smerti. Nasha Gazeta 1928 December 9;:6.
- Smert' professora Kravkova. Pravda 1924a April 25;:4.
- Smert' prof. Kravkova. Izvestiia 1924b April 25;:6.
- Smith R. Biology and values in interwar Britain: C. S. Sherrington, Julian Huxley and the vision of progress. Past and Present 2003;178:210–242.
- Sovetskii den'. Izvestiia 1928 September 13;:3.
- Stephan H. Aleksei Tolstoi's 'Aelita' and the inauguration of Soviet science fiction. Canadian–American Slavic Studies 1984;18(1–2):63–75.
- Steppun, OA.; Briukhonenko, SS. Izuchenie novykh metodov iskusstvennogo krovoobrashcheniia i perelivaniia krovi. Moscow: NTO VSNKh; 1928. Primenenie 'Bayer 205' dlia stabilizatsii perelivaemoi krovi; p. 81-95.
- Stites, R. Revolutionary dreams: Utopian vision and experimental life in the Russian revolution. Oxford; Oxford University Press; 1989.
- Terebinskii, NN. Materialy po izucheniiu otkrytogo dostupa k atrioventrikuliarnym klapanam serdtsa. Moscow–Leningrad: Medgiz; 1940.
- Thiher, A. Fiction rivals science: The French novel from Balzac to Proust. Columbia, MO: University of Missouri Press; 2001.
- Thiher, A. Fiction refracts science: Modernist writers from Proust to Borges. Columbia, MO: University of Missouri Press; 2005.

- Tresch J. In a solitary place: Raymond Roussel's brain and the French cult of unreason. *Studies in History and Philosophy of Biological and Biomedical Sciences* 2004;35:307–332.
- Tumarkin, N. *Lenin lives! The Lenin cult in Soviet Russia*. Cambridge, MA: Harvard University Press; 1997.
- Vecher pamiati N. P. Kravkova. *Izvestiia* 1924 May 15;:7.
- Vinogradov MP. Ozhivlenie otrezannoi golovy. *Vestnik znaniia* 1928;19:936–938.
- Vishnevskii, AG., editor. *Demograficheskaiia modernizatsiia Rossii, 1900–2000*. Moscow: Novoe izdatel'stvo; 2006.
- VI O. Opyty s ozhivlennoi golovoi sobaki. *Vecherniaia Moskva* 1926 November 9;:2.
- von Münch, D. *Carl Grunert (1865–1918) der Pionier der deutschen Kurzgeschichten Science Fiction*. Dortmund: Synergen; 2006.
- Witkowski JA. Alexis Carrel and the mysticism of tissue culture. *Medical History* 1979;23:279–296. [PubMed: 395375]
- Witkowski JA. Dr. Carrel's immortal cells. *Medical History* 1980;24:129–140. [PubMed: 6990125]
- Zhizn' v iskusstvennykh usloviiakh. *Vecherniaia Moskva* 1928 September 12;:2.
- Zimmer HG. The isolated perfused heart and its pioneers. *News in Physiological Sciences* 1998;13:203–210. [PubMed: 11390791]



Fig. 1.
Aleksandr Beliaev, ca. 1930 (from Liapunov, 1966).



Fig. 2.
Ms. Adams and Professor Dowell's head (from Beliaev, 1963).

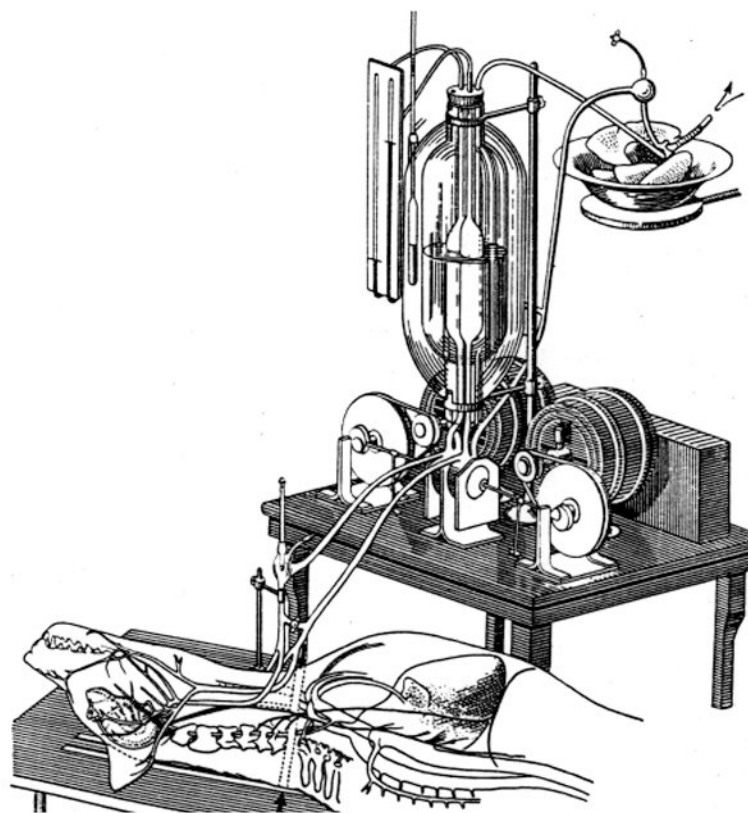


Fig. 3.
Autojector (from Briukhonenko, 1928a).



Fig. 4.
Cover page of the May 1928 issue of The Sparks of Science.



Fig. 5.

An illustration that accompanied a Russian translation of Shaw's letter in the *Evening Moscow*. The poster on the podium reads: 'Today is a lecture by Bernard Shaw' (from *O golove Bernarda Shou*, 1929).

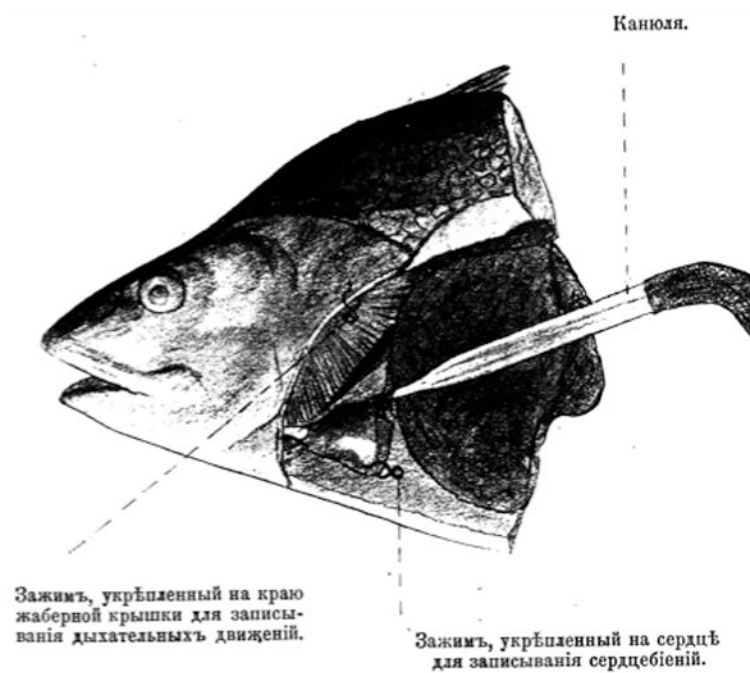


Fig. 6.
'Revived' fish head (from Kuliabko, 1907).



Fig. 7.
The title page of Georgii Shor's book On human death. Introduction to thanatology [O smerti cheloveka. Vvedenie v tanatologiiu] (from ^{Shor, 1925}).

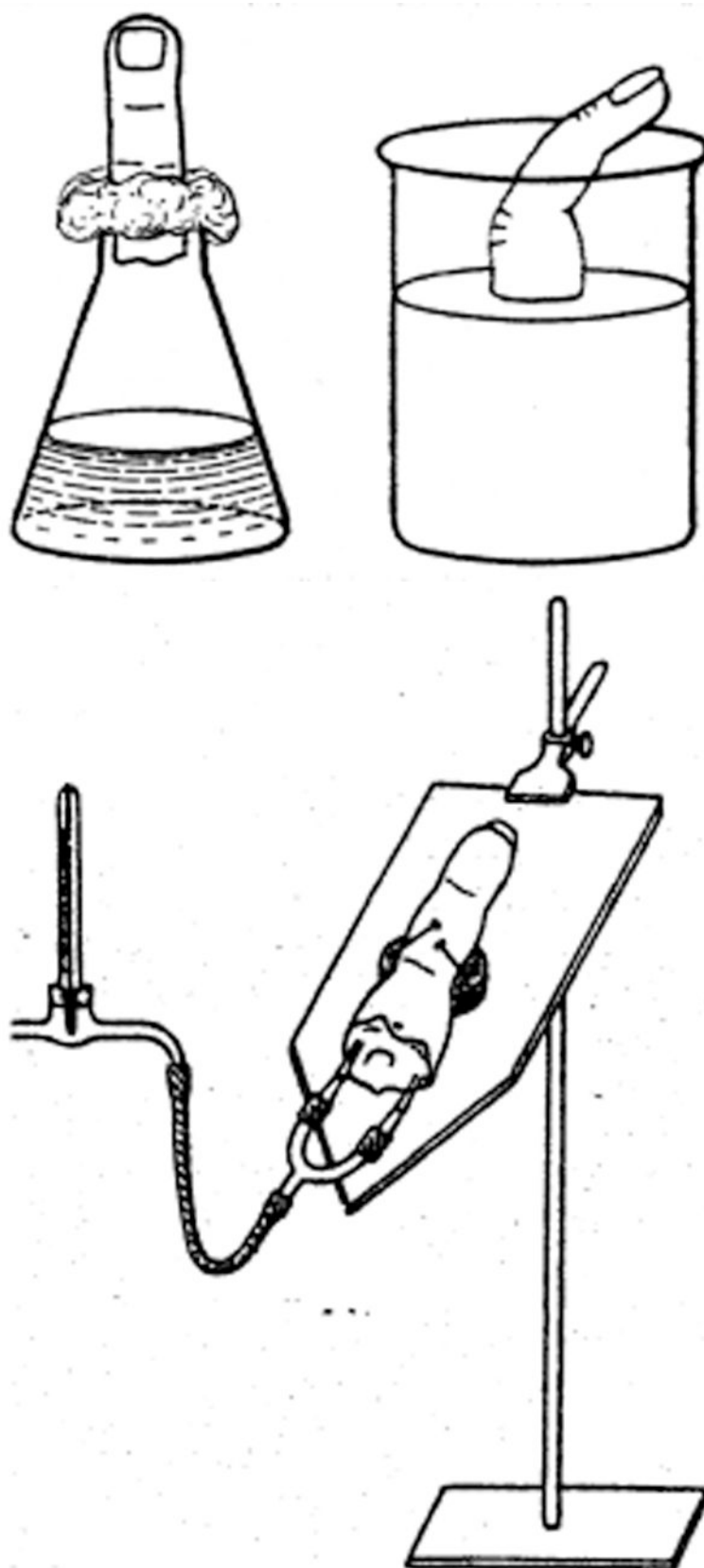


Fig. 8.
'Revived' human fingers (from Kravkov, 1922a).



Fig. 9.
Dr. Briukhonenko in the trenches of World War I (author's collection).



Fig 10.
Public demonstration of a severed head. Briukhonenko is in the upper left corner. Note the facial expressions of the observers (from Briukhonenko, 1964).

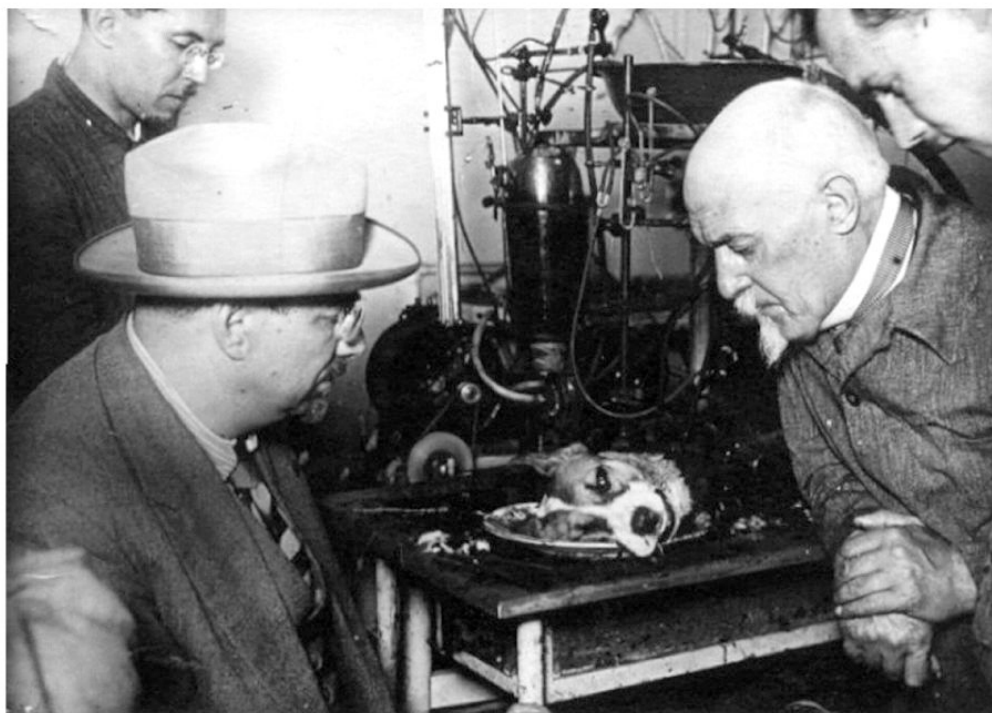


Fig. 11.
(Left to right) Sergei Briukhonenko, Anatolii Lunacharskii, Aleksei Kuliabko, and Sergei Chechulin (from Briukhonenko, 1964).