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He preferred buzzers

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Ivan Pavlov: A Russian Life in Science by Daniel Todes
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It looked for a long time as if Ivan Petrovich Pavlov wouldn't amount to much as a scientist. On Pavlov's 40th birthday in 1889, as Daniel Todes notes in his magisterial biography, 'an unsympathetic outsider might have described him as an ageing part-time lecturer and lab assistant whose only official position was Commissioned Physician at the Clinical Military Hospital, a scientist with grand notions who had just been passed over for two extremely rare professorships in his field.' His own titanic self-confidence notwithstanding, who was going to back a scientist whose most creative years were probably behind him? Certainly not the bean counters who underwrote the risks of expensive laboratory research in imperial St Petersburg.

Pavlov had made the best of his opportunities. The son of a priest in Riazan, a provincial city almost two hundred kilometres south-east of Moscow, the young Ivan Petrovich seemed destined for the cloth. The only sure path for advancement for Ivan and his brothers was to enrol at the Riazan theological school, and then to attend the local theological seminary. A truly gifted student might later go to the seminary in St Petersburg. Pavlov was talented, and did well during his first four years of study. In the fifth, though, he dropped out of the top ranks of his class and by the summer of 1869 he had withdrawn and abandoned his hopes of the priesthood. He enrolled in the law faculty (which was easier to get into) at St Petersburg University and then – in a move common for ambitious but underqualified defectors from the priestly castes – slipped through to the Physico-Mathematical Faculty. At this point, Pavlov had already received the only formal instruction he would ever have in psychology: a few months in early 1867 in Riazan dispensed by a cleric, Nikolai Glebov, a graduate of the Moscow Theological Seminary.

The Physico-Mathematical Faculty, along with the neighbouring Imperial Academy of Sciences, sat at the apex of scientific study in the Russian Empire. Among the young professors in September 1869, when Pavlov began studying inorganic chemistry, was Dmitrii Ivanovich Mendeleev, who at 35 had recently published what would come to be known as the periodic table of elements. Pavlov threw himself into his studies – despite a nervous breakdown in his second year that forced a brief return to Riazan – and grew particularly attached to his physiology tutor, Ilya Tsion, who began teaching at the university the year Pavlov arrived.

Just after his 25th birthday, Pavlov and his friend Vladimir Veliky delivered two joint reports on the nervous control of the circulatory system to the St Petersburg Society of Naturalists. He was still working on the nerves of the heart ten years later, having drifted meanwhile from one minor post or penurious temporary appointment to the next. Things looked up during a year spent in Leipzig, where he gorged on the extensive library holdings and became better acquainted with cutting-edge laboratory apparatus. But at 40, Pavlov had a sense that his career would remain humdrum unless he did something about it. Gambling that a new line of research might improve his chances, he shifted his focus exclusively to the nerves of the digestive system.

He got a post at the Military-Medical Academy in St Petersburg, where military physicians received their training. This institution lay a brisk walk away (Pavlov was a famously vigorous walker), just up the banks of the Neva from the university and the Academy of Sciences. Pavlov

> was transformed – not merely as a physiologist, but as a man. Viewed from afar, the Pavlov of the 1890s was the antithesis of the undisciplined and unfocused procrastinator of the previous decade, the man who preached the virtues of self-discipline and the systematised life but who was easily distracted, pursuing his research erratically and complaining constantly to his wife that it was not his fault.

Faced with a large research question about the secretions of the digestive organs, and a laboratory filled with untrained medical students required to conduct research in order to earn their degrees, Pavlov created a factory for the production of physiological knowledge. It helped that at a crucial moment he received philanthropic support from Prince Oldenburgsky to kit out the lab. At the centre stood Pavlov and the cohort of dogs he had surgically

manipulated in order to capture their digestive juices. He concocted dozens of research questions and farmed them out, through his chief assistants, to the students. Data began flowing in. Although hardly any of the findings were originally published under his name, Pavlov designed and managed every step of the process. In 1897, he synthesised the results into the impressive *Lectures on the Work of the Main Digestive Glands*. In 1901, Pavlov was included on the shortlist for the first Nobel Prize in Physiology or Medicine. He won Russia's first Nobel Prize in 1904, at the age of 55.

Impressive as it is, this comeback wasn't the most astonishing part of Pavlov's scientific career. The once lacklustre 40-year-old receives his Nobel Prize on page 264 of Todes's biography, and will die on page 724. At 55, he ought to have been pretty close to scientific obsolescence. Instead, he had just hit his stride. 'I know no other scientist,' Todes writes, 'for whom fully one half of a biography might reasonably be devoted to his or her life and research after age 65.' Neither do I.

It isn't just a question of Pavlov's longevity (he died aged 86), or that he lived through the 1905 Revolution, the First World War, the February and Bolshevik Revolutions of 1917, the civil war, the tumultuous 1920s and the first decade of Stalinism. Todes devotes attention both to the political tumult and to Pavlov's everyday life and loves for his wife Serafima and his mistress Maria Petrova, a researcher who joined his lab in 1912 and remained an important collaborator for the rest of his life. What makes Pavlov's life especially baffling is that he began his most ambitious and intellectually wide-ranging research, involving the most complex experimental arrangements, in 1903, when he was 54. Pavlov is popularly associated with bells and salivating dogs. The bells weren't really a feature of his experimental apparatus (uncontrolled, imprecise; he preferred buzzers), but the salivation was real – a mechanism to quantify and map the nervous structure of the brain through the manipulation of conditional reflexes. The salivatory reflex was conditional, meaning it appeared only under certain circumstances and often without physical stimulus, quite different from a doctor tapping your knee with a hammer; this variability opened the way to experimentation. Pavlov spent more than thirty years developing the 20th century's first comprehensive research programme, based on 'saliva drops and logic', to understand empirically the relationship of the mind to the world.

The Imperial Academy of Sciences was renamed the Soviet Academy of Sciences (and became the Russian Academy of Sciences in December 1991). Pavlov held moderate liberal political views and felt a distinct antipathy to the Bolsheviks. As the autocracy collapsed and the civil war disrupted both labour and transport in the countryside, like most Russians he soon

became taken up with the interminable quest for food. Between 1918 and 1920, the Pavlovs lost their youngest son Vsevolod to the White Army in the civil war (after the Red victory he fled to Constantinople), and their middle son Viktor to typhus, contracted on his way to join the Whites. Pavlov's brother Sergei died in 1919. His relatives and neighbours succumbed to hunger, disease and old age, but the Pavlovs scraped together enough to feed their friends, colleagues and dogs (in case years of research were lost). Pavlov used ever present famine conditions as an experimental set-up, exploring the effects of malnutrition and starvation on the conditional reflexes of his dogs. He had two bouts of pneumonia in 1919 but held on, despite persistent rumours abroad of his death. The speculations appear and reappear periodically in Todes's narrative (the first was in 1916) almost as a running gag, as colleagues are continually surprised to find that not only is Pavlov still alive, he's still working.

In 1920, his British colleague William Bayliss announced to a friend that 'something is being done about Pavlov.' The sum of £100 was collected by the Royal Society and the British Physiological Society and given to the Swedish scientist Svante Arrhenius to forward to Pavlov through the Danish Red Cross; Pavlov sent word that Arrhenius should hold on to the money. In June 1920, Lenin and his secretary Vladimir Bonch-Bruevich received a letter from Pavlov intimating that he was considering employment in Western Europe because of the terrible conditions for Russian scholars. Lenin was not about to lose Russia's most prominent scientist – even if he happened to be an irascible, impolitic anti-Bolshevik – and he considered the letter as the opening move in a chess game of negotiations. If that's what Pavlov intended, then he was an excellent chess player. He won significant resources for his physiological institute and the right to travel abroad, and retained a surprising degree of freedom of speech. As long as he limited his grumbling to lectures in the Soviet Union and wasn't overly critical of the regime when abroad, he was granted enormous latitude.

The Bolsheviks did well out of the arrangement, perhaps even better than Pavlov. They were spared the humiliation of Russia's most famous scientist fleeing the state that stood for 'scientific socialism'. Communist Party members received training in Pavlov's laboratory and became capable scientists, cadres who would staff the universities and academies of the new Soviet Union. And the notion of conditional reflexes – simplified, popularised and somewhat distorted from Pavlov's vision – would be central to Soviet psychology for decades to come. In addition, the Party appropriated the underlying picture of mind as an ideological mainstay of materialism. In propaganda terms, Pavlov was a good investment. As Stalin extended and transformed the Soviet state and Bolshevik Party, Pavlov's freedom of expression became both increasingly anomalous and less and less of a problem. He exercised his freedom more

sparingly: he had less to complain about.

Next to the freedom, and arguably more important to Pavlov, was the money. He began to eat well, and insisted that his colleagues did too. Along with salaries and larger food rations, Pavlov and his co-workers got more space, and new space. Between 1925 and 1929, his institute was entirely renovated, complete with the so-called Towers of Silence for isolated animal experiments. The bigger the facilities, the more researchers he could bring in; the more assistants, the more data was produced in his expanded knowledge factory. The data continued to frustrate Pavlov's attempts at interpretation, yet he proved astonishingly flexible in revising his preconceived theories. By 1935, he was supervising around fifty researchers every year. Some of them stayed; others cycled through and took Pavlovian physiology with them when they left. Ground was broken on a third major facility at Koltushi outside Leningrad, which would within a few years be known as the 'Capital of Conditional Reflexes'.

Pavlov's Communist colleagues staged a public celebration for his 80th birthday in 1929. Years of planning went into his 85th birthday party. Meanwhile, Pavlov – increasingly reining in his criticisms of the regime – prepared for what Todes considers the second 'great public triumph of his long life': the hosting of the International Physiological Congress in Leningrad and Moscow in 1935. He died the following year.

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