Історія медицини

History of medicine

ISSN: 2411-6181(on-line); ISSN: 2311-9896 (print)
Current issues of social studies and history of medicine. Joint Ukrainian-Romanian scientific journal, 2017, №:2(14), P. 143-148
***UDK** 612. 014. 42:*
***DOI** 10.24061/2411-6181.2.2017.57*

НАУКОВІ ЗДОБУТКИ ВИДАТНОГО ФІЗІОЛОГА І.М. СЕЧЕНОВА

Інга ТИМОФІЙЧУК, Лілія РОМАН,
Світлана СЕМЕНЕНКО, Тетяна САВЧУК,
ВДНЗ України «Буковинський державний медичний університет»,
Чернівці (Україна)
ingatima@rambler.ru, liliya.roman@ukr.net
Ігор РОМАН,
Чернівецький національний університет імені Юрія Федьковича.

SCIENTIFIC ACHIEVEMENTS OF EMINENT PHYSIOLOGIST I.M. SECHENOV

Inga TYMOFIYCHUK, Liliya ROMAN,
Svitlana SEMENENKO, Tetiana SAVCHUK,
Higher State Educational Establishment of Ukraine
«Bukovinian State Medical University», Chernivtsi (Ukraine)
Ihor ROMAN,
Chernivtsi National University named after Y. Fed'kovych.
Researcher ID G-2726-2016
ORCID 0000-0002-4624-1796

Тимофийчук Инга, Роман Лилия, Семененко Светлана, Савчук Татьяна, Роман Игорь. Научные достижения выдающегося физиолога И.М.Сеченова. В статье представлен жизненный и научный путь выдающегося русского физиолога Ивана Михайловича Сеченова (1829-1905), который впервые описал концепцию нейрофизиологии центрального торможения у животных и в организме человека. Позже его последователи расширили учение центрального торможения, изучая этот процесс не только в лягушек, но и у млекопитающих. За рубежом І. Сеченов больше известный за свой вклад в физиологической психологии. В России его называют «отцом русской физиологии» благодаря его научным достижениям в области нейрофизиологии и в других аспектах физиологии. Путь ученого в медицинскую школу пролегал через обучение в инженерном колледже в 1843-1848рр., а впоследствии И. Сеченов работал военным инженером. До сих пор эксперименты И. Сеченова и основные положения его теории о физиологии психической деятельности остаются актуальными.

Ключевые слова: *И.М. Сеченов, центральное торможение, история физиологии.*

Introduction. Sechenov Ivan Mikhailovich, a Russian scientist and thinker-materialist, creator of the physiological school, corresponding member, honorary member of the St. Petersburg Academy of Sciences. In the classic work, Reflexes of the Brain, he substantiated the reflex nature of conscious and unconscious activity, discovered the phenomena of central inhibition, summation in the nervous system, established the presence of rhythmic bioelectric processes in the central nervous system, and substantiated the importance of metabolic processes in the implementation of excitation. The works of Sechenov had a great influence on the development of natural science and the theory of knowledge.

Historiography of problems. After graduation from Moscow University Medical School in 1856 he spent 3½ years in Germany and Austria where he attended lectures and conducted research under the direction of several prominent physiologists and biochemists. In his subsequent academic career he held positions at universities in St. Petersburg (1860–1870; 1876–1888), Odessa (1871–1876) and Moscow (1890–1905). From 1860 onwards, he has acclaimed as a physiologist in academic circles. He has also well known in Russian society for his public lectures on physiology and his views on physiological psychology. The latter resulted in him being branded "politically unreliable" by the tsarist bureaucracy from 1863 onwards. I. Sechenov's first (1862) study on central inhibition remains his most memorable. He delayed the withdrawal of a frog's foot from a weak acid solution by chemical or electrical stimulation of selected parts of the central nervous system. He also noted similar effects on his own hand during co-activation of other sensory inputs by tickling or teeth gnashing.

Today his experiments and fundamental statements about physiological psychology are relevant. That is why Sechenov's theory about Higher nervous activity is important nowadays. We provide a brief history and focus on the pioneering work of Russian physiologist and physiological psychologist Ivan Michailovich Sechenov.

The main material. The Engineering College (1843–1848) and a brief period as a military engineer (until 1850), I. Sechenov enrolled in medical school at the University of Moscow. He graduated in 1856 with the intent of becoming a physiologist (Fig. 1). Accordingly, he spent the next 3½ years working in several prominent laboratories, including three in Berlin, one in Leipzig, one in Vienna, and two in Heidelberg. At several of these laboratories, he collected sufficient physico-chemical and electrophysiological data to write a doctoral dissertation, which was awarded shortly after his return to Russia in 1860. I. Sechenov's academic positions began at the St. Petersburg Medico-Surgical Academy (1860–1870), where he was awarded his doctoral dissertation degree at the very beginning of his employment. He rose quickly from assistant to full professor, and subsequently had professorial positions at Novorossiysk University in Odessa (1871–1876), St. Petersburg University (1876–1888), and Moscow University (1891–1901). After retirement, he continued to work in his university quarters until

his death, in late 1905 at the age of 76. I. Sechenov's first scientific paper published in 1855 when he was 26 years old, and his last in 1908, 3 years after his death. In these 53 years, he contributed over 150 mostly scientific publications. I. Sechenov was a particularly prominent Russian physiologist and physiological psychologist. From the beginning of his first university faculty appointment, he championed the importance of universities for advancing Russian science and culture as well as women's rights to a tertiary education, and continued to advocate for these issues throughout his career.

In 1905 I. Sechenov was endowed with the unofficial title "father of Russian physiology" by Ivan Pavlov (1849–1946), the 1904 Nobel Laureate who, like Sechenov, played a key role in Russian physiology and physiological psychology. After his death, I. Sechenov's academic accomplishments became progressively more renowned and respected in both Russia and abroad, particularly among international psychologists.

Early life and training experiences. I. Sechenov was the youngest of eight children of an army captain, who retired in relative financial comfort to an estate in the village of Teplyi Stan (now called Sechenova), Simbirsk Province (now called Arzamus or Middle-Volga Region), about 550 miles east of Moscow. His father, who possessed about 200 serfs, had no formal education and his mother was a former peasant with a natural intelligence. At her future husband's request before their marriage, she received reading and writing instruction at a women's convent. I. Sechenov's parents made sure their children received a thorough education and they were atypically humane to their serfs. The elder five children all received a full high school curriculum at various schools. After completing her own secondary school education at boarding school, the older daughter returned to the family estate to teach reading and writing to her two younger sisters and to I. Sechenov, who continued to receive home schooling until the age of 13½. I. Sechenov wrote fondly of his childhood in rural Russia except for the lack of male companions. He emphasized the expert instruction in French and German that he received from a skillful and popular German governess, who was treated as a member of the family. He also received tutoring in arithmetic, Russian, and Latin from a local clergyman, who was apparently far from a learned and effective teacher!

Engineering college and brief engineering career (1843–1850). I. Sechenov's father died when he was 10 years old. Apparently, I. Sechenov had little to say about his mother's and oldest brother's joint decision that he should go to St. Petersburg in early 1843 to receive 6 months tutoring from a military engineer. This was to prepare him for an August 1843 entrance exam for enrollment at the St. Petersburg Main Military Engineering College. The college offered both a 4-year and a 6-year curriculum to be followed by a career as a military engineer. This initial 6-month trial period for a rural 14-year-old was a sorrowful experience of near-total isolation and inadequate tutoring. This experience presumably contributed to I. Sechenov's early-developed resolute, stoic personality and ability to study any discipline on his own. These included French and Russian grammar (two areas in which he was already advanced), and history and geography (which ironically id not appear on the entrance exam). I. Sechenov had no difficulty passing the entrance exam and the subsequent first 5 years of the 6-year curriculum. His lack of companionship throughout 1843 was alleviated to some degree by his un day visits to the home of his previous governess, who along with her younger sister and mother treated him with great kindness. These visits continued on Sundays and holiday periods throughout his 5-year college experience.

The college environment, which was quite strict and academically demanding, apparently suited I. Sechenov. It provided his first opportunity to form close friendships with his male teenage peers and to engage in many fun-filled and often bold adventures. The curriculum was quite advanced, particularly in mathematics (differential equations by his fifth year), physics, inorganic chemistry, analytical mechanics, the history of architecture, and French literature. I. Sechenov excelled in these areas, particularly the physical science topics taught by the highly respected mathematician, Mikhail V. Ostrogradskii, but was indifferent to the main subject, fortification using engineering methodologies. For this indifference, and a variety of misdeeds indicative of an independent and headstrong personality, he was not selected by the vindictive director to complete the final sixth year of education at the college. Rather, he was assigned in June 1848 at the age of 19 to a reserve engineering battalion in Kiev as a second lieutenant. A family indentured servant from his childhood village was provided to him at that time by his mother. I. Sechenov's 1½ years in Kiev were quite dull professionally and sufficient to convince him that he had no desire to continue as a fortifications engineer. Rather he decided for altruistic reasons at the age of 20 to leave the military and enter medical school encouraged to do this by the 20-year-old sister of a fellow officer. She was a well-educated widow with whom I. Sechenov had many serious discussions, while, at the same time being secretly enamored of her, albeit to no avail! Over 50 years later he wrote about her with great affection and gratitude[1].

Medical and post-medical degree research training (1850–1860). I. Sechenov arrived at Moscow University in October 1850 with the hope of beginning medical school but he could not take the entrance examination until the late summer of 1851. He therefore spent almost a year in Moscow auditing lectures at the university, reading in a variety of non-medical (particularly cultural) areas, and studying for his entrance exams. Even though quite poor, he and his servant nonetheless found ways to survive, with I. Sechenov even experiencing the Moscow culture, in particular its literature, music, and ballet. I. Sechenov wrote at length about his medical courses in his autobiographical notes, the most striking features being his progressive distaste for the empirical nature of his clinical training and his progressive fascination with the field of physiology, as taught to him with a theoretical bent by Ivan Glebov (1806–1884). After a shaky third year Sechenov buckled down in his fourth and fifth years to the rigors of clinical training and came to respect the abilities of a surgery professor, Fyodor Inozemtsev (1802–1869). Nonetheless, when I. Sechenov graduated in June 1856 with a degree in medicine he had no doubt that his academic future would be in physiology. A small inheritance that I. Sechenov received from his late mother's estate and an even smaller legacy from a deceased aunt sometime later, enabled him to immediately study and travel abroad for 3½ years from mid-1856 to 1860 and gain freedom from

[1] Anon., "Pamjati Petra Alekseevicha Kiseleva" [Memory of Peter Alekseevich Kiselova], *Russ. Zhurn. Fiziol.,* No. 7, 1987, P. 22-23.

family serfdom for his loyal servant, who had become his comrade. While they again lived quite modestly, I. Sechenov showed great resoluteness and steadfastness by working in succession in the renowned laboratories of Franz Sonnenschein (1817–1879) (analytical chemistry), Emil Du Bois-Reymond (1818– 1896) (electrophysiology) and Ernst Hoppe-Seyler (1825–1895) (biochemistry) in Berlin, Otto Funke (1828–1879) (physiology) in Leipzig, Karl Ludwig (physiology; recall footnote 5) in Vienna, and Hermann von Helmholtz (1821–1894) (physics, electrophysiology, psychology) and Robert Bunsen (1811–1895) in Heidelberg. At most of these laboratories he accumulated largely physicochemical data, particularly about the absorption of gases by the blood, but also electrophysiological data that he incorporated into his doctoral dissertation. For example, his first published article in neuromuscular physiology was undertaken in Funke's laboratory. It addressed the correction of an error, which he had found in Bernard's work on the effects of potassium sulfocyanide on nerves and muscles. Hoppe-Seyler was the main mentor for I. Sechenov's thesis research with Ludwig playing a more dominant and long-lasting role as his primary mentor and very close German friend and advisor. Throughout his post-medical-training period in Germany and Austria, I. Sechenov heard lectures from the above group and, in addition, heard lectures by, and interacted with other prominent scientists including Heinrich Magnus (1802–1870) (chemistry and physics), Heinrich Rose (1795–1864) (analytical chemistry), Johannes Müller (1801–1858) (physiology and comparative anatomy) and Ernst Brücke (1819–1892) (physiology). In his 1907 autobiographical notes I. Sechenov did not mention making an effort to meet Bernard, but he may well have done so. (Recall that he was later to work in Bernard's laboratory for 6 weeks in 1862). Throughout his postdoctoral research experience I. Sechenov found time for vacations in Germany, Austria, Italy, and France. The latter came near the end of his 1856–1860 postdoctoral studies abroad when he visited Paris. In fact his visit to France was essentially a tourist experience. However, it did include (purely by chance) attending some lectures on so-called "theoretical surgery" by Joseph-François Malgaigne (1806–1865). In summary, it seems that I. Sechenov's basic biomedical science and clinical training in Moscow, the best then available in Russia, were not nearly at the level attainable in Germany, France, Great Britain and the USA. His post-medical education and laboratory training, however, were certainly as thorough and high a caliber as that available to his peers in these countries.

University career. St. Petersburg medico-surgical academy (1860–1870). After defending his doctoral dissertation within 1 month of his arrival in St. Petersburg in February 1860, I. Sechenov became a "junior scientific assistant" and immediately began presenting lectures and laboratory demonstrations. The latter included use of equipment he had acquired from Germany. It included a then state-of-the-art galvanometer, a direct current stimulator (a Du Bois-Reymond inductorium), a multiplier device to reduce polarization of stimulating electrodes, and a mounting apparatus for making electrophysiological measurements on frogs. His electrophysiological equipment was thus almost identical to that used by Du Bois-Reymond. This was the equipment's first use in Russia, which I. Sechenov (1861) explained in a technical article and lectures published as a text (Sechenov, 1862). This effort gained near instant recognition because it pioneered electrophysiological instruction and research in Russia. These 10 years were very productive and dramatic, albeit turbulent, for I. Sechenov. His academic efforts flourished, including (1) his peace of mind that resulted from the overall societal benefits that he believed would accrue nationally after the abolition of serfdom in 1861; (2) his rapid promotion to I. Sechenov reflected "I called Olga Aleksandrovna my benefactress, above, and not for nothing. I went to her house as a youth, to this time swimming inertly in the channel to which fate had thrown me, without a clear consciousness where it might lead me. But I left her house with my life's plan prepared, knowing where to go and what to do.…To what, if not her influence, was I obliged for going to the university, namely that which she considered foremost – to study medicine and to help my fellow man. It is possible, finally, that some part of her influence even affected my very late service to the interests of women who were struggling for an independent way"[2]. About his medical training, I. Sechenov wrote "The first two years I "extraordinary" (special) professor in March 1861 and "ordinary" (full) professor in April 1864, (3) completion of most of the St. Petersburg research that he and his trainees undertook on central inhibition, (4) the publication in 1863 of "Brain Reflexes," his first major work in the field of physiological psychology, (5) further advances on central inhibition, as undertaken during an 1867 stay in the laboratory of Alexander Rollet (1834–1903), Karl Franzens University, Graz, Austria, and (6) widespread recognition that he was a brilliant lecturer to both university students and the lay public, and one who augmented his university lectures with laboratory (experimental) demonstrations. His private life was also most rewarding including (1) no longer being poor, (2) forming and/or continuing close, lifelong friendships with several faculty, including the subsequently renowned clinical internist, Sergey Botkin (1832–1889) and (3) most importantly, beginning in 1961 to direct the research of Bokova and beginning his life-long partnership with her (Fig.2). These years were not without their tribulations. First, the St. Petersburg Censorship Department attacked his 1863 essay, "Brain Reflexes," for being overly materialistic, anti-religious, and for opposing the tsarist-approved political ideology. I. Sechenov had hoped to publish this essay with the title "An Attempt to Bring Physiological Bases into Mental Processes" in a popular, widely read liberal periodical, "Sovremennik." The censor department insisted, however, that it be published in a medical journal and with a medical title (Sechenov, 1863-1866) so the essay would not be available to the public. The expanded second edition in 1866 further enraged the censorship department so they banned it temporarily. Nonetheless, the essay attracted immediate Russian acclaim in 1863, and later the international acclaim that persists to this day. In Russia, however, there were also many hostile reactions from both the authorities and people not knowledgeable about psychology and physiology. This hostility persisted throughout I. Sechenov's life. A second problem was that while he was given near-optimal research space and equipment, his laboratory was cold and damp, being situated above a cellar, which, no one seemed to realize, was filled with stagnant water. This brought on a respiratory illness in 1866 that produced general weakness and dizziness. His illness continued for several years, and he did not recover

[2] Aminoff, M.J., "Brown-Se´quard: Selected Contributions of a Nineteenth-Century", *Neuroscientist,* № 6, 2000, P. 60–65.

fully until moving to Odessa (see below). Finally, I. Sechenov became progressively disillusioned with the St. Petersburg Medico-Surgical Academy for two reasons. First, he was an outspoken champion of women being entitled to a university education in general and a medical one, in particular. This was banned at the St. Petersburg Medico-Surgical in 1864. Second, he felt the faculty had become too inbred. This problem became explosive in the spring of 1869 when the later 1908 Nobel Laureate (for work on immunology), Ilya Mechnikov (1845–1916), was not appointed to the professorship in zoology. I. Sechenov promptly resigned after this decision was announced, even though he had not yet secured another position for himself.

Novorossiysk University in Odessa (1871–1876). With the considerable help of Mechnikov, I. Sechenov was approved for a full professorship at Novorossiysk University in Odessa in August 1870. The Odessa authorities delayed this appointment until April 1971 because they were not comfortable with I. Sechenov's fiery and outspoken public reputation on academic issues and his notoriety following the publication of "Brain Reflexes". While waiting for the appointment, I. Sechenov worked happily in the renowned St. Petersburg laboratory of Dmitry Mendeleyev (1834–1907), who taught him additional skills in chemistry. I. Sechenov's time in Odessa was particularly happy. He had many interesting friends among the faculty (particularly Mechnikov), and with Bokova, he had several enjoyable vacations in Western European countries and cities, including trips to Paris and London. In contrast to Bokova, Sechenov had no science interactions in London because he did not speak English. I. Sechenov's physiological research in Odessa focused largely on respiratory gas exchange and the role of CO_2 in the blood, which continued until his 2005 demise. His contributions to electrophysiology and neurophysiology included work on the responses of nerves to high frequency stimulation, locomotion in frogs (one published abstract on this topic), the effects of vagus nerve stimulation on the heart, and short articles defending his earlier work on central inhibition. Two psychology articles attracted great interest among the intelligentsia. I. Sechenov also continued to help Bokova's translate largely German textbooks into Russian. His editing of Bokova's translation of Darwin's 1871 "Descent of Man…" into Russian (Darwin and Sechenov, 1871–1872) was read immediately and widely. Subsequently, he applied the ideas of Charles Darwin (1809–1882) to physiology and psychology such that "Sechenov can justly be considered the precursor of evolutionary physiology in Russia" .

St. Petersburg University (1876–1888). Despite Sechenov's fondness for Odessa and his university and private life there, he transferred back to St. Petersburg in May 1876. He spent the next 12 years at St. Petersburg University pursuing his academic duties and scientific interests. He also gave free lectures in the first Russian university courses for women . This epoch included a particularly happy stay in terms of his family life, which included interactions with two of his siblings, their families, and other relatives, and many close associations with his fellow faculty members including Botkin. He also derived great pleasure from his lectures to the Bestuzhev women. I. Sechenov's research at the St. Petersburg University brought him "…many happy moments and great grief". His laboratory was modest in size, equipment, and personnel. "Nonetheless, I worked very successfully here and qualitatively did more in essence than in any of my former Sergey Botkin have long been considered one of the fathers of modern Russian medicine and medical education"[3]. In his autobiography, I.Sechenov commented somewhat mildly that "Because of this book, I was made out to be an unintentional champion of undisciplined temper and a nihilistic philosopher" His problems included inadequate and insufficient instrumentation to optimally continue his Odessa work on respiratory gas exchange and the role of CO_2 and the feeling that his peers did not consider his work on the absorption of blood gases by salt solutions to be of particular importance because they thought it lacked general applicability. He was compensated in part by a well-received set of physiology essays, some original renal research, and a substantial effort for 2½ years studying electrical activity in the medulla and spinal cord of the frog . This latter work focused on spontaneous brain wave activity and it served to again rule out fatigue as a cause of central inhibition. I. Sechenov also studied some fundamental electrical properties of peripheral nerve cells and their axons. About this latter work, he wrote years later with much feeling that "… I, by some incomprehensible mental lapse, made a mistake in the currents in the branching conductors, which a high school boy would hardly have made if he had had an elementary course in physics". An interesting article written by I. Sechenov in this period was a critique of the overall university situation in Russia prior to 1860. Relatively recently, he has been criticized for being overly harsh in his judgment. I. Sechenov became sufficiently frustrated, discouraged, and upset with his research on blood gases, salt solutions, and respiration, and possibilities for his personal further development as a physiologist at St. Petersburg University, that he retired in 1888 and spent the next year at his wife's rural estate. While there he negotiated successfully for "… a more modest position as a "Privatdocent" (a non-paid position) in Moscow". I. Sechenov spent 1890 quite peacefully and contentedly in this position at Moscow University here he focused on giving lectures to medical students and writing a textbook, "Physiology of the Nervous System"

Moscow University and subsequent retirement (1891–1905). I. Sechenov occupied two well-equipped rooms in his new and last position as Professor of Physiology at Moscow University. This arrangement continued after his retirement in 1901 up to his death in 1905. For Sechenov these years were relatively calm politically, and quite productive research-wise. The latter included work with his trainee and subsequent collaborator, Mikhail Shaternikov (1870–1939), who later became quite prominent in Russian physiology circles. I. Sechenov's research in Moscow continued to be varied and impactful. With Shaternikov, he put much time and effort into studying metabolism, respiratory physiology and the role of CO_2, which they investigated both chemically and functionally. By 1896, the general applicability of I. Sechenov's work on CO_2 absorption by blood and other salt solutions was recognized and "…I. Sechenov was highly gratified by this confirmation of his labor of many years". In his autobiographical notes I. Sechenov stated that his main writing between 1891 and 1901 was in three books. The first was "Physiology of the Nervous System", which addressed issues ranging from the unconscious movements of decerebrate animals to higher forms of human perception and ended with his viewpoints on how to advance the field

[3] Kovshova O.S., Vzorova L.A., Kurbatova E.G. "Ivan Mikhaylovich Sechenov — vydayushchiysya russkiy fiziolog. osnovatel meditsinskoy psikhologii kak nauki" [Ivan Mikhailovich Sechenov is an outstanding Russian physiologist. The founder of medical psychology as a science], *Meditsinskaya psikhologiya v Rossii: elektron. nauch. Zhurn,* 2016, N 5(40), URL: http://www.medpsy.ru/mprj/archiv_global/2016_5_40/nomer01.php

of experimental psychology. The second book, "Essay on the Working Movements of Man," was the first Russian book on the physiology and biomechanics of human labor. The third book was his translation into Russian of a clinical textbook written by a German internist, Karl von Noorden (1858–1944), who some feel has been neglected in medical history. This work on the physiology and biomechanics of human labor was one of his last endeavors, with several publications between 1901 and 1906 (Fig.3,4).

Conclusions. Throughout his autobiographical notes I. Sechenov revealed his intense concern for the wellbeing of humankind, and those he respected and liked. While far from being active politically, he had great concern and support for "vox populi," including the full emancipation of women, in particular. I. Sechenov was known for his somewhat strange avoidance of any administrative responsibilities and publicity. Setting aside his notorious popularity among nihilists, which he never sought, I. Sechenov deserved esteem for his personal qualities. Ilia Mechinkov recalled, that "everywhere I. Sechenov was met with a sympathetic even enthusiastic attitude. I. Sechenov enjoyed good relations with several faculty members at Moscow University. Irony was certainly in order because 1904 was the year that he was elected to the Russian Academy of Sciences and a year later the by-then-famous Pavlov heralded him as "the father of Russian physiology!" The final footnote documents I. Sechenov's close academic and other friends, because they helped inspire his academic performance. Clearly, his was a life well spent (Fig.5).

Тимофійчук Інга, Роман Лілія, Семененко Світлана, Савчук Тетяна, Роман Ігор. Наукові здобутки видатного фізіолога І.М. Сеченова. У статті представлений життєвий і науковий шлях видатного російського фізіолога Івана Михайловича Сєченова (1829-1905), який уперше описав концепцію нейрофізіології центрального гальмування у тварин та в організмі людини. Пізніше його послідовники розширили вчення центрального гальмування, вивчаючи цей процес не тільки у жаб, але й у ссавців. За кордоном І. Сєченов більше відомий за свій внесок до фізіологічної психології. В Росії його називають «батьком російської фізіології» завдяки його науковим здобуткам у галузі нейрофізіології та в інших аспектах фізіології, зокрема газів крові та дихання, фізіології і біомеханіки руху, загальним фізіологічним концепціям, які він описав у своїх трактатах, а також завдяки науковим перекладам з німецьких джерел. Закінчивши Московський Медичний Університет у 1856 році, І. Сєченов провів три з половиною роки у Німеччині та Австрії, де відвідував лекції і проводив пошукову роботу під керівництвом декількох видатних фізіологів і біохіміків. У його подальшій академічній діяльності і кар'єрі він займав посади в університетах Санкт-Петербургу (1860-1870; 1876-1888), Одеси (1871-1876) та Москви (1890-1905). З 1860 і далі він був проголошений фізіологом в академічних колах. Вчений також був відомий у російському суспільстві завдяки своїм публічним лекціям з фізіології та своїм інноваційним поглядам на фізіологію психічної діяльності. За останнє царська бюрократія оголосила І. Сєченова політично ненадійним з 1863 року.

Шлях вченого до медичної школи пролягав через навчання в інженерному коледжі у 1843-1848рр., а згодом І. Сєченов працював військовим інженером. До сьогодні експерименти І. Сєченова та основні положення його теорії про фізіологію психічної діяльності залишаються актуальними і саме тому є доцільним вивчення теорії І. Сєченова про вищу нервову діяльність.

Ключові слова: І.М. Сєченов, центральне гальмування, історія фізіології.

Тимофійчук Інга *– кандидат медичних наук, доцент кафедри фізіології ім. Я. Кіршенблата ВДНЗ України "Буковинський державний медичний університет". Співавтор 2 підручників й автор понад 70 наукових статей. Коло наукових інтересів: вплив патогенних чинників на структуру і функцію нервової системи людини.*

Tymofiychuk Inga *– candidate of medical science, assistant of professor of physiology department named after Y. Kirshenblat of Higher State Educational Establishment of Ukraine «Bukovinian State Medical University». Coauthor of two text-books and of over 70 scientific articles. Research interests: pathogenic factors influence on the structure and function of the human nervous system.*

Роман Лілія – *кандидат філологічних наук, викладач кафедри суспільних наук та українознавства ВДНЗ України «Буковинський державний медичний університет». Автор понад 60 публіцистичних та 32 наукових і навчально-методичних робіт. Співавтор навчально-методичного підручника та монографії. Коло наукових інтересів: інновації у методиці викладання української мови як іноземної.*

Roman Liliya *– PhD of Philology, teacher of the department of Social Sciences and Ukrainian Studies of Higher State Educational Establishment of Ukraine "Bukovinian State Medical University". Author of more than 60 nonfiction and 32 scientific and educational works. Coathour of teaching textbook and monograph. Research interests: innovationin methods of teaching Ukrainian as a foreign language.*

Семененко Світлана *– кандидат біологічних наук, доцент кафедри фізіології ім. Я. Кіршенблата ВДНЗ України "Буковинський державний медичний університет". Співавтор монографії та 2 підручників. Автор 55 наукових статей. Наукові інтереси: роль оксиду азоту в хроноритмічній регуляції діяльності нирок.*

Semenenko Svetlana *– candidate of biological sciences, associate professor of physiology department named after Y. Kirshenblat of Higher State Educational Establishment of Ukraine «Bukovinian State Medical University». Co-author of monograph and two textbooks. The author of 55 scientific publications. Research interests: the role of nitric oxide in the regulation of renal chronorytmichniy of kidney.*

Савчук Тетяна *— кандидат медичних наук, асистент кафедри фізіології ім. Я. Кіршенблата ВДНЗ України «Буковинський державний медичний університет». Автор 20 наукових статей. Коло наукових інтересів: історія медицини, історія фізіології, нейродегенеративні зміни.*

Savchuk Tetiana *— PhD, assistent of physiology department named after Y. Kirshenblat Higher State Educational Establishment of Ukraine "Bukovinian State Medical University." Author of 20 scientific articles. Research interests: history of medicine, pathogenic factors influence on the structure of nervous system.*

Ігор Роман *– к. філософ. н., асистент кафедри філософії Чернівецького національного університету імені Ю. Федьковича. В доробку автора – більше 60 наукових статей, 2 методичних посібники: «Філософія для лінгвістів» та «Філософія Середніх віків». Коло наукових інтересів: герменевтичний потенціал норми у філософії науки, прагматика апеляції в сакральних англомовних текстах, герменевтичні інтерпретації сакрального англомовного дискурсу.*

Igor Roman - *PhD, Assistant Professor of Department of Philosophy of Chernivtsi National University named after Y.Fedkovych. In the works of the author - over 60 scientific articles, 2 methodical manuals "Philosophy for linguists" and "Philosophy of the Middle Ages". Research Interests: hermeneutic potential norms in the philosophy of science, pragmatic appeal in English sacred texts, hermeneutical interpretation of sacred English discourse.*

Received: *19. 03. 2017*
Advance Access Published: *April, 2017*

Applications

Fig. 1 Sechenov in his youth

Fig. 2 Sechenov with his wife and I.P. Suslova1897 year

Fig. 3 "Physiology of the nervous system" - 1866

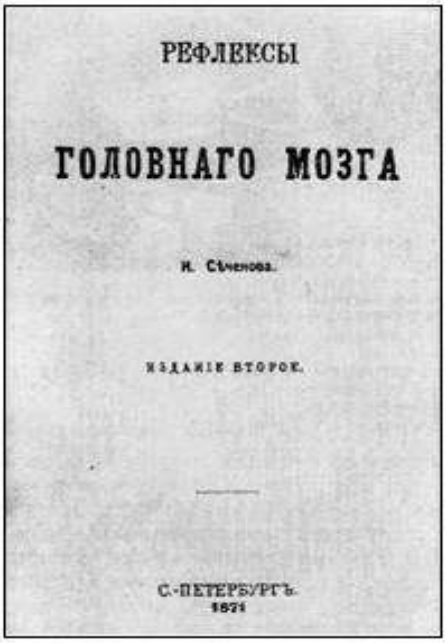

Fig. 4 "Reflexes of the brain" - 1863

Fig. 5 Monument-bust to Ivan Mikhailovich Sechenov near the First Moscow Medical University