

“The enemy of old age and the friend of phagocytes...”. Toward the 175th anniversary of the I.I. Mechnikov’s birth

NATALIA N. KOLOTILOVA

Lomonosov Moscow State University, Moscow, Russia; kolotilovan@mail.ru

The exhibition titled “An enemy of ageing and a friend of phagocytes...,” dedicated to the 175th anniversary of the birth of Ilya Ilyich Mechnikov (1845–1916), was held in the State Darwin Museum. Mechnikov (Élie Metchnikoff) was a Nobel Prize winner (1908) and an outstanding Russian biologist (embryologist, physiologist, pathologist, bacteriologist and immunologist). The exhibition was held jointly with the Archive of the Russian Academy of Sciences from June 23 to August 23, 2020. A wealth of photographs, documents and other archival materials was exhibited to illustrate Mechnikov’s life and work. The remote opening ceremony, held on 25 June 2020, was attended by the staff of the State Darwin Museum, the Archive of the Russian Academy of Sciences, the Paul Stradins Museum of the History of Medicine (Riga, Latvia), the Archive of the Institut Pasteur (Paris, France) and a number of other scientific institutions.

The article briefly discusses the content and concept of this exhibition. Mechnikov’s multifaceted scientific legacy is primarily associated with his main line of research: studies on the laws of immunity, discovery of phagocytes, and the theory of phagocytosis. His studies of ontogenesis conducted jointly with Alexander Kovalevsky led to the emergence of a new discipline, comparative embryology. The observations of the development of coelenterates resulted in a hypothesis on the origin of multicellularity. Mechnikov is also considered to be the founder of gerontology. Believing that premature ageing is but a disease which may be treated, he suggested regularly using fermented dairy products that improve the intestinal microflora as a way to prolong life.

Keywords: Élie Metchnikoff (Ilya Metchnikov), exposition, Darwin museum, Archives RAS, phagocytes.

DOI 10.24411/2076-8176-2020-14012

The 90th anniversary of Professor Miklós Müller: a long life devoted to protistology, history of science, and art

SERGEI I. FOKIN

University of Pisa, Pisa, Italy; Sankt-Petersburg State University, Sankt-Petersburg, Russia; sifokin@mai.ru

Prof. Miklós Müller is a prominent Hungarian-American protistologist, historian of biology, and owner of an impressive collection of modern Hungarian art. His impressively long professional life in protistology lasted more than 50 years. He has been deeply involved in protist studies, comparative

analysis of energy metabolism, its evolution, and its organellar localization in parasitic anaerobic protists. For decades, Prof. Müller, who is quite fluent in Russian, has been introducing to the English-speaking world the studies conducted by Soviet protozoologists in the 1960s–1980s. Since 2007, he has been contributing to the history of biology, mainly in Eastern Europe, especially during the period of Stalin's rule in the USSR.

Keywords: biochemistry, cytology, fine art collection, history of biology, Hungary, Miklós Müller, protistology, USA, USSR.

Miklós Müller, a renowned protistologist and historian of biology, professor emeritus at Rockefeller University, USA, has recently celebrated 90th anniversary of his birth in Budapest, Hungary. My senior colleague and friend, with whom I personally become acquainted 20 years ago, has lived a long and very successful life in science despite many historical cataclysms that befell his generation. Prof. Müller has repeatedly visited and worked in the USSR/Russia and was well acquainted with many Russian biologists and historians of science, including the prominent scientists such as Yu.I. Poljansky, B.P. Tokin, I.B. Raikov, K.S. Khoshtoyants, E.I. Kolchinsky, and many others.



Fig. 1. M. Müller. USA, New York, 1980s
Рис. 1. М. Мюллер, Нью-Йорк, 1980-е гг.

As a protistologist he was deeply involved in different areas of protist studies associated with their cell and molecular biology and biochemistry. In addition to his significant achievements in protistology to be discussed below, it should be mentioned that Miklós Müller's most important historical works are closely connected to the not too-distant past of Russian biology.

In recent years, as a historian of biology, Müller also became interested in the history of 20th-century biology. His current work conducted in the archives and libraries in different countries concerns two main topics: the life and works of Ervin Bauer (1890–1938), a

Hungarian and Soviet theoretical biologist who worked in Hungary, Czechoslovakia, Germany, and the Soviet Union; and the impact of Soviet pseudoscientific distortions of biology on this discipline in Eastern Europe in the 1940s–1950s.

As regards the history of that tragic period for Soviet biology, Prof. Müller has been actively working with the themes associated with the names of T.D. Lysenko and O.B. Lepeshinskaya. It should be stressed that Prof. Müller, who is quite fluent in Russian, has been for decades acquainting the international English-speaking scientific community with the main areas of research and its results conducted by Soviet protistologists in 1970s–1980s. In fact, apart from his native Hungarian, English and Russian, Miklos also speaks German and French.

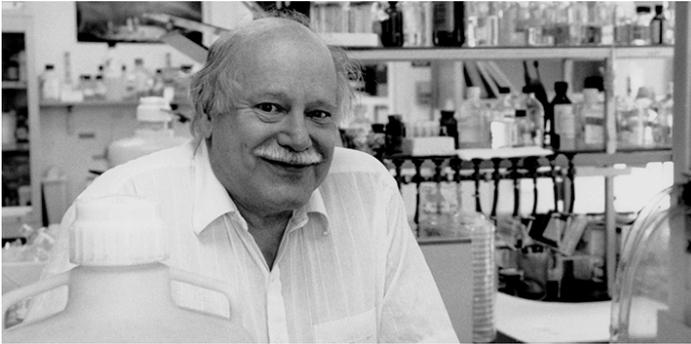


Fig. 2. M. Müller in his laboratory. USA, New York, the beginning of 2000s
Рис. 2. М. Мюллер в своей лаборатории. США, Нью-Йорк, начало 2000-х гг.

Yet another of Prof. Müller's diverse interests is collecting the works of modern, primarily Hungarian art. Over many decades, he has assembled an impressive collection, highly appreciated by connoisseurs. Much of Miklós Müller's and his wife's collection comprises the works of graphic art that total more than five hundred pieces. These are the works from almost all important periods of Hungarian graphic art and distinctive Hungarian art groups of the 20th and 21st century.

In 2007, Prof. Müller, a world-renowned protistologist and President of the International Society of Protozoologists (1983), was awarded the Knight's Cross of the Order of Merit of the Republic of Hungary for his scientific work and support of art in Hungary. In 2006, he became the sixth recipient of the Eduard-Reichenow-Medal from the German Society for Protozoology, which was awarded to him for his life's work on the comparative analysis of energy metabolism, its evolution, and its organellar localization in parasitic anaerobic protists. He is External Member of the Hungarian Academy of Sciences and member (or honorary member) in many other societies (for parasitology, microbiology, evolutionary protistology, archeology, and art history).

Let me briefly mention the main events in my friend's life story. Miklós Müller was born in Budapest, Hungary, on November 24, 1930. His father was an architect and his mother studied art so that he grew up in an intellectual environment. His life, like the lives of many others, drastically changed during the 1944–1945 Siege of Budapest. Shortly after that his father passed away, having told his son to start learning Russian. Miklós had never been interested in politics and just wanted to become a scientist. In any case, Russian language plays a rather important role in his life.



Fig. 3. M. Müller and S. Fokin. Germany, Liebenwalde, 2006
Рис. 3. М. Мюллер и С. Фокин. Германия, Либенвальде, 2006

In the article, dedicated to the discovery of hydrogenosome, a peculiar metabolic organelle discovered by himself and Donald G. Lindmark in anoxic protist cells, Miklós wrote:

My involvement with single-celled protists began almost sixty years ago. I read avidly about astronomy, chemistry, and biology, experimented with a chemistry kit, and loved to use a good microscope belonging to my cousin. We looked at water samples from everywhere, and I am certain that I saw my first *Vorticella* before I was ten" <...>. When I was a high school student, I regularly spent time in the laboratory of Nándor Gimesi, professor at the Budapest University of Sciences, whose binocular microscope with oil immersion lens seemed the eighth wonder of the world. I also participated in an essay competition on "Sexuality in Protozoa" and soon became inspired to consider a higher education in biology. During my years (1949–1955 — SF) at the Budapest Medical School, Imre Törö, professor of histology and embryology, introduced me to systematic scientific study on the cytochemistry of protists (Müller, 2012, p. 305).

Miklós Müller received his M.D. from the Budapest Medical University in 1955 and continued on the medical faculty as an instructor and assistant professor. He was fascinated with various functions of protozoans, and cultured *Tetrahymena pyriformis*, *Paramecium multimicronucleatum* and *Amoeba proteus* with the primary aim to study their food vacuoles, using histochemical methods. The detection of acid phosphatase activity in the ciliate *T. pyriformis* led Müller to assuming a correlation between the detected activity and a structural element of the cell, the food vacuole. At the time, mammalian lysosomes discovered by C. de Duve in 1955 had not been considered in relation to such "primitive" unicellular organisms. These results were soon published and summarized in 1963 (Müller et al., 1963). These results attracted the attention of the biggest experts in lysosomes, professors C. de Duve and A. Novikoff. Müller was invited by de Duve and Heinz Holter to work in their laboratories at the Rockefeller Institute and the Carlsberg Laboratories in Denmark.



Fig. 4. S. Fokin, J. Török and M. Müller. Hungary, Budapest, 2008
Рис. 4. С. Фокин, Ю. Тёрк и М. Мюллер. Венгрия, Будапешт, 2008 г.

He spent a fruitful year in New York, followed by a year in Copenhagen. When he was in Denmark, M. Müller received an invitation from de Duve to return to the Rockefeller University (called The Rockefeller Institute at the time). Thus, in 1964 he joined The Rockefeller Institute as research associate with the Cell Biology Laboratory of Prof. de Duve and later became a tenured associate professor and head of laboratory. He was promoted there to full professor in 1999 at the age of 68.

Until the closing of his laboratory at the Rockefeller University (2005), Prof. Müller's research concerned several important unicellular human protest parasites: *Trichomonas vaginalis*, *Giardia intestinalis*, and *Entamoeba histolytica*⁵. These organisms lack typical mitochondria and have an unusual anaerobic fermentative metabolism. The research at Müller's laboratory focused on the molecular and biochemical exploration of this metabolism with the goal of understanding its adaptive significance and evolutionary history. In the course of these studies, Müller and his colleagues identified in trichomonad flagellates a novel cell organelle, the hydrogenosome, which was a great success. This organelle produces hydrogen as a metabolic end product. Similar organelles have been found subsequently in many other anaerobic unicellular organisms (primarily, in anoxic Ciliophora, i.e. ciliated protists), while others contain a smaller structure — the mitosome — that has no role in energy metabolism. Typical mitochondria, hydrogenosomes, and mitosomes are currently regarded as closely related cell organelles, which derive from the ancestral protomitochondrion by divergent evolution.

Leaving experimental work behind, Prof. Müller continued the comprehensive analysis of the metabolic organization and evolutionary history of these divergent types of mitochondrion-related organelles. This analysis has led to novel insights into the origin of the ancestral eukaryotic cell and its diversification⁶.

Miklós Müller first came to the USSR in 1958/59 and, since then, he has repeatedly visited our country to meet with colleagues, participate in scientific forums and work in the archives and libraries.

⁵ There are, respectively, members of Tritrichomonadea, Diplomonadea and Ameoboza — sublinages of Kingdom Protista.

⁶ URL: <https://www.rockefeller.edu/our-scientists/emeritus-faculty/920-miklos-muller/>



Fig. 5. M. Müller with wife Jan Keithly. Germany, Berlin, 2011
Рис. 5. М. Мюллер с женой Дж. Кейтли. Германия, Берлин, 2011 г.

As a young researcher, he wished to obtain postgraduate training (aspirantura) in the USSR with Prof. Yu.I. Poljansky, the leader of the national protistological school in the second half of the 1950s. However, probably due to the 1956 events in Hungary, he failed to get it. Nevertheless, he several times visited Poljansky's department at Leningrad State University as well as his laboratory at the Institute of Cytology of the USSR Academy of Sciences. As a result, later on he dedicated two extensive and deeply felt articles to the memory of this outstanding Russian protistologist (Müller, 1999, 2018, 2019). Only recently he recollected on his time in St. Petersburg:

The last physical contact I had with the Sankt Petersburg School of Protistology was during the European Congress of Protistology in 2007, when I visited the Department of Invertebrate Zoology at the State University and spent several pleasant hours working in the "Professors' office" where I met Yuri Ivanovich and his colleagues many years earlier. This brought back many pleasant memories (Müller, 2019, p. 122).

Among the reviews and translations made by Prof. Müller when he was getting acquainted with Russian protistological literature, were a review of Prof. V.A. Dogiel's *General Protozoology*, 1965 (Müller, 1966); translation of L.N. Seravin's large article "Mechanisms and coordination of cellular locomotion" (1971); the reviews of the serial publication "Protozoology" (Протозоология): 6 issues (Müller, 1979; 1982) as well as translations of numerous articles from Russian into Hungarian for the Medical Documentation Center in Budapest.

After his scientific career as protistologist was over, Prof. Müller completely switched to the history of science. He wrote to me, "As professor emeritus, I am a free agent. For the

past 10 years I did not have a research team and focused on research of the history of biology in Eastern Europe — especially in the period of the rule of Stalin in the USSR⁷».

Prof. Müller translated into Hungarian Prof. Tokin's book “Теоретическая Биология и творчество Э.С. Бауэра” (*Az elméleti biológia és Bauer Ervin munkássága — Theoretical Biology and Works of E.S. Bauer*) (1966); he participated in the writing of some articles for the encyclopedia “Биология в Санкт-Петербурге: 1703–2008” (*Biology in St. Petersburg. 1703–2008*) (2011) and explored the scientific work and fates of J. Gelei, E.S. Bauer, M.M. Mestergazi, T.D. Lysenko and O.B. Lepeshinskaya (Müller, 2011, 2017; Palló, Müller, 2017).

Miklós Müller is a true intellectual, a man of diverse interests and broad views, always a friendly and attentive interlocutor. Twice (2005 and 2008) I had a pleasure of being invited to stay with him in Budapest, which he regularly visited as a member of the Hungarian Academy of Sciences. We spent several days together, visiting various scientific institutions in and around the capital of Hungary. A very informative and scientifically valuable visit to the Hydrobiological Station on Lake Balaton was organized by Miklós for both of us⁸. During this trip I also learned about his artistic interests and found that Prof. Müller is well known among the artists, art historians, and art collectors. It turned out later that he is also quite famous in the field in the USA.

The most important thing is that, even at the age of 90, he has lost neither his interest in life and scientific work nor his inherent benevolence. I would like to wish Miklós to remain like this as long as possible. Obviously, the combination of these qualities made it possible for him to achieve so much in life. I wish you good health, happy disposition and everlasting creativity, dear friend!

References

- Kolchinsky E.I. (ed.). (2011). *Biologija v Sankt-Peterburge. 1703–2008. Entsiklopedicheskiĭ slovar* [Biology in St. Petersburg. 1703–2008. Encyclopedic dictionary], St. Petersburg: Nestor-Istoriia.
- Müller M. (1966). Review of Dogiel's General Protozoology (1965), *Acta Biologica Academiae Scientiarum Hungaricae*, 17, 375–376.
- Müller M. (1979). Review of serial publication Протистология № 1, 2, 3 (1976, 1978, 1978), *Journal of Protozoology*, 26, 338–339.
- Müller M. (1982). Review of serial publication Протистология № 4, 5, 6 (1979, 1980, 1981), *Journal of Protozoology*, 29, 643–644.
- Müller M. (1986). The protistological legacy of József Gelei (1885–1952). In Bereczky M.Cs. (ed.), *Advances of Protozoological Research, Symposia Biologica Hungarica*, (Vol. 33, pp. 59–66), Budapest: Akadémiai Kiadó.
- Müller M. (1999). Per aspera ad Protozoa et Astra. Yuri I. Polyansky and Russian Protozoology, *Protist*, 150, 431–437.
- Müller M. (2011). Lisenko emlékezetes előadása a Magyar Tudományos Akadémián, 1960-ban. [Memorable lecture of Lysenko at the Hungarian Academy of Sciences in 1960], *Magyar Tudomány*, 172, 1355–1359. (in Hungarian).

⁷ Prof. Müller retired in 2007.

⁸ Thanks to the Professor's connections and courtesy of the Station staff, I managed to collect valuable specimens of ciliates around the entire lake.

Müller M. (2012). Discovering the Hydrogenosome. In Moberg C.L. (ed.), *Entering an Unseen World. A Founding Laboratory and Origin of Modern Cell Biology*, (pp. 305–309), New York: The Rockefeller University Press.

Müller M. (2013). A Kossuth-prize in 1952 — The short term rule of dialectic Soviet cell biology in Hungary, *Orvostörténeti Közlemenyek — Communicationes de Historia Artis Medicinae*, 59, 43–58.

Müller M. (2017). A Russian evolutionist of Hungarian descent, M.M. Mestergazi, *Orvostörténeti Közlemenyek — Communicationes de Historia Artis Medicinae*, 63, 115–125.

Müller M. (2018). Greeting sent to memorial meeting of 25th anniversary of Poljansky's passing in Sankt-Peterburg (ppt).

Müller M. (2019). Yuri Ivanovich Poljansky from far afar, *Историко-биологические исследования* [Studies in the history of biology], 11, 118–123.

Müller M., Röhlich P., Törő I. (1963). Fine structure and enzymic activity of protozoan food vacuoles. In de Reuck, A.V.S, M.P. Cameron (eds.), *Ciba Foundation Symposium on Lysosomes*, (pp. 201–216), London: Churchill.

Palló G., Müller M. (2017). Opportunism and enforcement: Hungarian reception of Michurinist biology in the cold war period. In W. de Jong-Lambert, N. Kremontsov (eds.), *The Lysenko controversy as a global phenomenon*, (Vol. 2, pp. 3–36), Cham: Palgrave-Macmillan.

Seravin L.N. (1971). Mechanisms and coordination of cellular locomotion, *Advances in Comparative Physiology and Biochemistry*, (Vol. 4, pp. 37–111), New York: Academic Press. [translated by M. Müller from a manuscript in Russian].

90-летие профессора Миклоша Мюллера — долгая жизнь, посвящённая протистологии, истории науки и искусству

С.И. Фокин

Пизанский университет, Пиза, Италия; Санкт-Петербургский государственный университет, Санкт-Петербург, Россия; sifokin@mai.ru

Профессор Миклош Мюллер, широко известный венгерско-американский протистолог, историк биологии и владелец значительной коллекции современного венгерского искусства. За свою долгую профессиональную жизнь в протистологии (более 50 лет!) он принимал активное участие в различных исследованиях протистов, связанных с их клеточной и молекулярной биологией, в первую очередь связанных со сравнительным анализом энергетического обмена, его эволюции и его органеллярной локализации у паразитарных анаэробных протистов. Следует особо отметить, что на протяжении десятилетий профессор Мюллер, достаточно свободно владеющий русским языком, знакомил англоязычный мир с основными результатами исследований, проведёнными советскими протозоологами в 1960–1980 гг. С 2007 г. он занимается историей биологии, в основном историей Восточной Европы в сталинский период.

Ключевые слова: биохимия, цитология, коллекция изобразительного искусства, история биологии, Венгрия, Миклош Мюллер, протистология, США, СССР.

Читайте в ближайших номерах журнала

Ю.В. Наточин. Академик Евгений Михайлович Крепс (страницы подлинной биографии).

В.В. Рожнов, С.В. Найдено. История биологической науки в истории академического здания на Ленинском проспекте в Москве.

Р.А. Фандо. «Перелистывая страницы жизни...». Интервью с профессором Е.Б. Музруковой.

Е.В. Рыбакова. От фотосинтеза к хроматографии (к юбилею историка науки д. х. н. Е.М. Сенченковой).

С.И. Фокин. Н.П. Вагнер. Воспоминания о Казанском университете.

Журнал «Историко-биологические исследования» входит в перечень рецензируемых научных изданий ВАК по специальностям: 07.00.10 — История науки и техники (биологические науки), 07.00.10 — История науки и техники (исторические науки).

Направляемые в журнал рукописи статей следует оформлять в соответствии с правилами, размещёнными на сайте журнала в разделе «Авторам» (<http://shb.nw.ru/ru/authors/manuscript/>).

Подписной индекс журнала 70681 в каталоге НТИ («Издавания органов научно-технической информации») агентства «Роспечать». Цена подписки на один год составляет 920 рублей (без учета почтовых услуг). Редколлегия советует вам своевременно оформлять подписку на журнал «Историко-биологические исследования».