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## Raisa L'vovna Berg (March 27, 1913–March 1, 2006)

DOI: 10.1134/S1022795406120180



On March 1, 2006, in Paris, shortly before her 93th birthday, passed away the prominent Russian biologist, specialist in population and evolutionary genetics, evolutionary morphology, historian of science Raisa L'vovna Berg. As a former student of Schmalhausen and Muller Doctor of Biological Sciences, the founder and head of Laboratory of Population Genetics at the Institute of Cytology and Genetics, Siberian Division of the Russian Academy of Sciences from 1963 to 1968, she has made a significant contribution to population genetics and variation theory by her studies of mutation bursts in population of *Drosophila melanogaster*.

Raisa Berg was born on March 27, 1913 in St. Petersburg, in the family of the member of the Russian Academy of Sciences Lev Semenovich Berg. It was not surprising that, following the family tradition, after graduation from a specialized German-language school Raisa decided to major in biology after having enrolling to Leningrad State University in 1930. Her diploma studies were done on *Drosophila* at the Institute of Genetics, Russian Academy of Sciences, under supervision of the future Nobel Prize winner Herman Muller (invited to work in the Soviet Union by Nikolai Vavilov). Graduating from the Department of Genetics

and Experimental Zoology of Leningrad State University in 1935, she started post-graduate studies at this Department. In 1939, Berg defended dissertation on “Differences between Natural and Laboratory Strains of *Drosophila melanogaster*: A Hypothesis on Genetic Correlations.” Immediately after that, she moved to Moscow and began her doctorate studies at the Severtsov Institute of Evolutionary Morphology of Animals, then headed by Schmalhausen.

In the first years of her scientific work, Berg performed a series of studies on estimation of mutation rates in *D. melanogaster* chromosomes, showing a special role of the sex chromosome in this process. The evolution of mechanisms underlying sexual dimorphism was also studied. Raisa Berg attempted to correlate cytogenetics mechanisms, realization of hereditary traits in development, and the process of evolution. In the 1930s–1940s, Berg studied factors of evolution of the insect wing. The following series of studies was devoted to natural populations of *D. melanogaster*. In her studies of spontaneous mutation process, Berg has found temporal mutation fluctuations in natural populations of *D. melanogaster*—“mutation bursts.” Berg is the author of the concept of the role of isolation in evolution of mutability. The contribution of Berg to population genetics was not confined to analysis of mutation bursts. Her main discovery was the establishment of genetic regularities of mutation process. Population mutability and the degree of dominance of characters are negative correlated. She formulated the statement on parallelism of mutability in human and *Drosophila* populations.

From 1944 to 1947, Raisa Berg worked as a senior researcher at the Severtsov Institute of Evolutionary Morphology of Animals and part time at the Zoological Institute of Moscow State University.

In 1947, Berg returned to Leningrad. In 1948, she started working as associate professor at the Department of Zoology and Darwinism of the Herzen Leningrad Pedagogical Institute, and in 1949 shifted to the All-Union Research Institute of Lake and River Fish Management.

From 1950 through 1954, Berg was unemployed. However, this did not mean that she abandoned research work. Quite the contrary, she was completely immersed in science, and the scope of her interests even broadened. At that time Berg carried out a brilliant

study that involved biometrical analysis of vegetative and generative parts in plants, establishing correlated sets of characters in them and formulating evolutionary and biocenotic principles of their formation. In the early 1950s, Berg was concerned with the history of geographic discoveries, geophysical aspects of the origin of life on Earth, and evolutionary morphology of plants. She published several articles and essays on the history of geographical discoveries of her father. In 1955, the Geografiz publishing house published her book *Lakes of Siberia and Central Asia*, devoted to travels of L.S. Berg and P.G. Ignatov.

From 1954 to 1957, Raisa Berg worked as assistant, and from 1957 to 1960, as associate professor at the Department of Darwinism of Leningrad State University. In 1960 through 1963 she was appointed a senior research associate of the Biological Institute of this University.

In 1954, Berg was awarded the academic degree of senior research associate in genetics; in 1957, that of associate professor. In this period, she lectured on evolutionary genetics and genetic bases of evolution and on Darwinism at the Faculty of Biology and Soil Science of Leningrad State University.

1963 was marked by a significant event in Raisa Berg's life: on invitation by the director of the Institute of Cytology and Genetics, she moved to Akademgorodok near Novosibirsk. In this institute, she organized the Laboratory of Population Genetics, which she headed from August of 1963 through June 1968. Paradoxically, in spite of the fact that two classics of Soviet *Drosophila* genetics, Dubinin and Kerkis, from the very beginning participated in the organization of the Institute of Cytology and Genetics and formation of its scientific scopes, studies of *Drosophila* had been completely neglected before Berg's coming to the Institute. It was she who organized a "*Drosophila* kitchen" in both literal and figurative sense of the word in the Institute of Cytology and Genetics. It was Berg who "transplanted" to Siberian soil the "seedling" of the Leningrad and Moscow schools of general and population genetics of *Drosophila*, which since then has grown into a 40-year-old tree.

At the Institute of Cytology and Genetics, Berg has continued her large-scale studies of phenotypic and genotypic structure of natural populations of *D. melanogaster*. M.D. Golubovsky, who at that time had just graduated from Leningrad State University, started working at her lab on analysis of lethal mutations in natural populations of *D. melanogaster*.

In addition to *Drosophila* studies, Berg's laboratory was dealing with correlation pleiads in plants (together with L.D. Kolosova) and population genetics of human hereditary diseases (together with N.A. Kryshova, an associate of S.N. Davidenkov and keeper of his unique archive, and with physicians from specialized clinics).

Distribution of persons with hereditary diseases by years of their birth revealed a period when the birth rate

of carriers of a newly appeared genetic abnormality was elevated. This period lasted from 1935 to 1940. The mutation burst, i.e., an increase in mutation rate in germ-line cells of the patients' parents, occurred in the late 1910s–the early 1920s. The influenza pandemic of 1918, the so-called "Spanish influenza," which reduced the global population by 40 million, and the Russian epidemic of typhus in 1921 were catastrophes that caused a mutation burst in the parents of the patients who were born in the second half of the 1930s. This conclusion was formulated by Berg many years later, in United States, by analogy with her interpretation of the causes of mutation bursts in *Drosophila*. These studies were conducted by Raisa Berg in collaboration with Nadine Plus, a Frenchwoman of the Ukrainian origin.

Raisa Berg has substantiated the view on the key role of mutation in the maintenance of the high frequency of hereditary mental diseases in human populations.

In 1964, Raisa Berg defended doctoral dissertation on "Stabilizing Selection in the Evolution of Size of Flowers and Seeds of Flowering Plants" at the Komarov Botanical Institute, Russian Academy of Sciences (Leningrad). She is elected a member of the Academic Council of the Institute of Cytology and Genetics.

In 1965, a team of young researchers headed by N.N. Vorontsov, studying evolutionary karyosystematics, joined the Laboratory of Population Genetics.

Raisa Berg had a gift of storytelling and lecturing. During her "Novosibirsk period," she worked as a lecturer at the Biological Department of the Natural Science Faculty of Novosibirsk State University, giving courses on history of biology and Darwinism (1964–1965) and on population and evolution genetics (1965–1968).

1968 was the last "Siberian" year in Raisa Berg's life. However, she did not plan to leave the Siberian Akademgorodok so early. Her ardent personality was in keeping with the possibility to actively participate in genetics revival in the country, with research work in her chosen field (or, as she put it, "chasing flies"), and, after all, the whole creative atmosphere in Akademgorodok of the 1960th, built in the taiga. She felt good there, as she was always surrounded by interesting people and was in the midst of both scientific and public life not only of Akademgorodok, but, one can say, of the whole country, since Akademgorodok at that time was the most active and rapidly developing part of it, was, so to say, one of centers of its life.

However, the "thaw" in the Soviet Union was coming to the end. In January 1968, the "closed" trial of dissidents Ginsburg, Galanskov, Dobrovolskii, and Lyashkova took place. These legal proceedings attracted the attention of both Soviet and foreign press and public. With 46 researchers working in institutions of the Siberian Division of the Russian Academy of Sciences, Raisa Berg signed a letter to the Prosecutor General of the Soviet Union and the Supreme Court of the Russian Federation claiming the inadmissibility of

conducting closed trials of dissenters. This letter became available to foreign mass media, in which the persons who signed were accused as having clandestinely transferred it abroad. On March 4, 1968, the Academic Council of the Institute of Cytology and Genetics condemned Berg for "political irresponsibility," which manifested in her signing the letter. Shortly after that, in June 1968, Berg was retired from work. She, for the second time in her life, has returned to Leningrad, to her room in a communal apartment on the Maklin avenue.

For the rest of her life, Raisa Berg held grudge on the Academic Council of the Institute of Cytology and Genetics for its actions toward her. Nevertheless, she continued collaboration with her former laboratory and felt genuine warmth to the staff of the Institute.

In later years, she visited Akademgorodok three times. In 1971 and 1972, she organized expeditions jointly with Novosibirsk colleagues. At that time, beginning in 1968, mutation *abnormal abdomen* was rapidly spreading in *D. melanogaster* populations, and Raisa Berg, with her characteristic enthusiasm, investigated this second burst of mutability.

Her third visit to Novosibirsk was in the autumn of 1991 from the United States, on invitation of the Directorial Board of the Institute of Cytology and Genetics. She gave a lecture entitled "Evolution: Stochastic or Regular?", visited her former laboratory, met many colleagues and former students. The Academic Council of the Institute of Cytology and Genetics resolved to publish selected works by Raisa Berg in three volumes (the first volume *Genetics and Evolution* appeared in 1993).

The Novosibirsk period was most fruitful for Berg as an organizer of research in population genetics. In Novosibirsk, she had such students as Golubovsky and Kolosova. It is no exaggeration that her commitment to science was an example for many for applying their efforts and talents. The Laboratory of Population genetics that she created in Novosibirsk has been working for more than four decades.

From 1968 to 1970, Berg heads a group in the Agro-physical Institute of VASKhNIL (All-Union Academy of Agricultural Sciences); in 1968–1974, she was a professor of Leningrad Pedagogical University. The monograph *Heredity and Hereditary Human Diseases*, which she coauthored with Davidenkov, appeared in 1971.

In December 1974, Raisa Berg emigrated to the United States, where she worked at University of Wisconsin (Madison) from 1975 through 1981. In this period, she traveled to many countries: in 1976, participated in a conference in Belgium; in 1980 undertook a long trip to Europe—Germany (Freiburg, Gissen), Switzerland (Fribur), France, and Israel.

In 1981, she moved to St. Louis, Missouri, where worked for three years as visiting professor at Washington University. As she said herself, these were the happiest years of her life.

Immediately after coming to St. Louis, Berg left for Japan to attend a conference on environmental effects on mutation process. She gave talks in Tokyo University, in Kyoto, and in Mishima.

Raisa Berg participated in genetic congresses in Madras (India, 1983) and Toronto (Canada, 1989).

In 1984, she was invited to Maintz, Germany, to the celebration of 500 years since the invention of book-printing by Gutenberg. In Gutenberg University, Maintz, she was given a position of visiting professor for six months, and gave a course of lectures on population genetics in German. From Germany, Berg traveled to the Netherlands on invitation of a professor of Utrecht University, Jenny van Brink, where she gave a lecture on the history of genetics and fates of Soviet geneticists (in English).

In 1983, the book by Berg *Sukhovei: Memoirs of a Geneticists* dedicated to A.D. Sakharov, was published in Russian by Chalidze Publications (New York). The book was issued with considerable abridgments, in paperback. In 1998, this book (translated in English by David Lo) was published by Viking Penguin (New York), appearing in hard cover and with black-and-white abstract illustrations by the author. In Russia, it was published in 2003 in the series "Memorials of Historical Thought." These memoirs reflected the striking personality of Raisa Berg, her talent as an author, her controversial character, her personal attitude to the events, which she participated in or witnessed, and to people she encountered. To put it figuratively and succinctly, the attitude of Berg to the people she met can be compared with a flame, which can attract by its light, warm up, or scorch.

Raisa Berg did not attend the International Genetic Congress in Moscow, 1978. She attempted to organize boycott of the congress in the United States, demanding that a biologist and human rights defendant, Sergei Kovalev, be liberated from prison.

In October 1990, on invitation by N.N. Vorontsov, who was then a member of the government, Minister of Ecology, she arrives to Moscow and gives a talk at Moscow State University. The second time she came to the Soviet Union in 1991, to discuss the possibility to organize Institute for Monitoring Mutation.

In 1994, Raisa Berg returned to her beloved Europe, to France, where her eldest daughter, Elizaveta Kirpichnikova, lived in Paris. She settled in a small house with a garden in the Parisian suburbs.

In 1996, the three-volume *Dictionnaire du Darwinism et de l'évolution* was published by Universitaire de France Publishers with Patrick Tort as editor. In contrast to most other books on evolution (and not only on evolution), in which the Russian school of evolutionary biology is at best touched upon, this treatise reflected the evolutionary studies in the Soviet Union. This was possibly because a number of entries in the dictionary were written by Russian authors, including R.L. Berg, V.V. Babkov, and V.A. Ratner. Raisa Berg has written

the entries on her father, Lev S. Berg and its theory of nomogenesis, on her mentor, I.I. Schmalhausen, on V.I. Vernadsky, B.L. Lychkov, and A.A. Lyubishchev.

Raisa Berg is the author of 150 publications and several brilliant popular scientific articles.

She knew and loved Russian and non-Russian literature, prose and poetry. She was also an artist, her paintings were exhibited in Akademgorodok, in the hall of Novosibirsk State University. In 1982, her dream came true: her works of art were exhibited in Paris.

Raisa Berg was awarded the medal “For Heroic Work during the Great Patriotic War” (1946) and the medal for 250 years of Leningrad (1953). In 1990, she was awarded the order “People’s Friendship” for her merits in Russian Biology.

Raisa Berg was elected a member of the Russian Academy of Natural Sciences.

Berg belongs to the Russian geneticists of, so to say, the first professional generation (meaning that they received education in genetics in their graduate and post-graduate years), whose scientific life began in the 1930s, at the time when Soviet genetics occupied a leading position in the world. Even as young scientists,

these geneticists produced brilliant studies. Together with their great teachers, Kol'tsov, Filipchenko, Vavilov, Chetverikov, Schmalhausen, Muller, Serebrovsky, Karpechenko, and others, they created the high international prestige of Soviet genetics in the 1930s–1940s. They were destined to experience the repressions of Lysenkoism regime in all its power: denunciations and arrests, prisons and exiles, closed down laboratories and departments, dismissals and impossibility to work in their specialty, uncertainty in their fate and the fate of their relatives. But it was this generation of geneticists that took the charge of restoring genetics in the Soviet Union in the late 1950s–early 1960s. The signature of Raisa Berg is under the “letter by three hundred”—mass protest of Soviet scientists against Lysenkoism in 1955. We owe to this generation the continuity of genetics that was preserved in Soviet and Russian science.

Raisa Berg was buried in the Pere Lachaise cemetery in Paris.

**I.K. Zakharov, L.D. Kolosova, and V.K. Shumny**