NIKOLAI V. TIMOFÉEFF-RESSOVSKY (1900 – 1981)

by Manfred F. Rajewsky

Moscow - Berlin

At the end of June 1925, after traveling by train from the Belorussky station in Moscow, a young Russian scientist arrived in Berlin, accompanied by his wife – a scientist like him – and their two-year-old son Dmitri. Nikolai Vladimirovich and Elena Alexandrovna Timoféeff-Ressovsky had married in 1922 and, at the invitation of the eminent brain researcher Oskar Vogt, director of the Kaiser Wilhelm Institute (KWI) for Brain Research, they were coming to his institute to do research. They had been suggested and especially recommended by Nikolai Konstantinovich Koltsov, director of the Moscow Institute of Experimental Biology, with the support of the People's Commissioner (Minister) of Health, Nikolai A. Semashko. At that time an agreement for scientific exchange and cooperation existed between the German and Soviet governments, enabling the stay of Nikolai and Elena Timoféeff-Ressovsky in Berlin for a limited period.

Nikolai V. Timoféef-Ressovsky in the early 1930s in the doorway of the genetics vivarium, an annex of the former Kaiser Wilhelm Institute (KWI) for Brain Research Berlin-Buch, now the Oskar and Cécile Vogt Building. In the course of the renovation in the nineties of the last century, the vivarium was demolished.

Prior to that, Vogt had acted as adviser to the Russian government concerning the establishment of an institute for brain research and the medical treatment of Lenin and later the autopsy of his brain. During this time he had become acquainted with the high scientific quality and originality of the research in Koltsov's circle in the field of theoretical and experimental genetics, particularly with regard to the basic principles of ontogenesis, the role of mutations and population genetics. Koltsov was one of the most important figures in Russian biology during this period.[1] Already in 1911 he had founded the world's first department of experimental biology at the Moscow City People's University named after A. L. Shanyavsky, out of which the Institute of Experimental Biology evolved in 1916. This institute was the origin of and, over a long period, home to the Russian school of genetics, population genetics and evolution biology, with its brilliant theorist Sergei Sergeevich Chetverikov. Vogt soon recognized the great significance of the Russians' groundbreaking work for future investigations of gene characteristics and how these are influenced by other genes (gene interactions) and environmental factors, in particular with regard to identifying and influencing genetic diseases of the central nervous system. He therefore decided to integrate genetic research into his Berlin Institute for Brain Research and to recruit highly talented young scientists from Koltsov's circle to work there. At Vogt's behest, Timoféeff-Ressovsky was to establish a laboratory for genetics which was to become the nucleus of a new genetics department in the new institute building opened in Berlin-Buch in 1930. Several greenhouses ("the genetic vivarium") constituted part of the Department of Genetics. The task of building up and heading the department was assigned to Timoféeff-Ressovsky, who remained a Soviet citizen and formally was still a staff mem-

ber of the Moscow Institute of Experimental Biology, but without a university diploma or PhD. In 1936 his department in the KWI for Brain Research attained autonomous status with its own budget. In 1938 Timoféeff-Ressovsky was named a scientific member of the Kaiser Wilhelm Society. The scientifically extraordinarily productive and successful chapter of his life which had begun with his arrival in Berlin ("...the most wonderful years of my life"[20]) continued. Looking back, by far the largest part of his genetic research work forming the basis of his international acclaim was done during the years prior to World War II. In the field of history of science, many published accounts have dealt with his outstanding scientific work and the vicissitudes of his life. [2-7, 9-15, 17, 19-21, 40-46]

1900 – 1945: Russia – Germany

The life experiences, the personality and the fate of Nikolai V. Timoféeff-Ressovsky are in many respects an expression of the revolutionary developments of the 20th century with all of their drama and tragedy. He was born in Moscow on September 7, 1900. His father Vladimir Viktorovich Timoféeff-Ressovsky (1850-1913), originally an astrophysicist, belonged to the Russian aristocracy. At the turn of the century he was no longer well-to-do and worked as a transportation engineer. He lived with his family on their estate in the Kaluga district on the Ressa River (which explains the traditional addition of Ressovsky to the last name of the eldest son). The maiden name of his mother Nadezhda Nikolaevna (1868-1928) was Vsevolozhskaja. The history of the family Timoféeff-Ressovsky is closely interwoven with the history of the Russian empire. The family included Cossacks of the legendary Stephan Rasin, descendants of the Viking King Rurik, the founder of the Russian prince dynasty, admirals of the Russian navy, the famous anarchist Prince Pyotr Kropotkin and many Russian intellectuals and officers.

From 1911 on, Nikolai V. Timoféeff-Ressovsky attended the First Czar Alexander Grammar School in Kiev, then from 1914 the equally renowned private Flerov Grammar School in Moscow. In 1917, the year of the October Revolution, he completed his school-leaving examinations, receiving a gold medal as distinction. He began studying zoology, science and art history at the People's Shanyavsky University and transferred in 1918 to the natural sciences department of the Division of Physics and Mathematics of Moscow State University.

Already as a young high school student Timoféeff-Ressovsky demonstrated a special love of nature, in particular of zoology, to which – compared with other branches of science – he always attributed an especially high importance. At a mere 13 years of age he prepared a bird collection for the Zoological Museum and observed and described fish mutants. Moreover, the teachers at university who influenced him most, Koltsov and his student Chetverikov, were originally descriptive zoologists before turning to experimental biology and population and evolution genetics. His later teachers included the ornithologist and biogeographer Mikhail A. Menzbir, the geographer Dmitri N. Anuchin, the hydrobiologist Sergei N. Skadovsky and the geneticist Alexei N. Severtzov.

Politically, the young student showed no particular inclination to support either the 'red' or 'white' side of the conflict. Thus, as admirer of Prince Kropotkin (see above), he volunteered to join a small anarchist ('green') cavalry unit. In the further course of events, however, the anarchist groups joined the Red Army, which is why Timoféeff-Ressovsky took part in the last battles of the civil war in the Crimea and on the Polish front on the side of the Red Army (12 army corps, battalion 117). It was almost a miracle that in 1920, despite all of the chaos of war and a serious case of typhoid fever, he managed to make it home again. This testifies to his physical robustness and his exceptional energy and drive, but also his *good fortune*, which later often came to his aid. To earn his living while he was a student during these years of deprivation, Timoféeff-Ressovsky was a biology teacher on the workers' faculty, apart from being an assistant to Koltsov at the Institute of Experimental Biology and at the university.

Besides that, he also worked as a transport worker, sang first bass in the Moscow military choir and in church choirs, and maintained his contacts with intellectual circles. Timoféeff-Ressovsky had an extraordinarily good memory and was always the center of any gathering – a brilliant, impulsive and imaginative storyteller ("...one or the other embellishment may vary, but the core of the story must be true and always remain the same....."). [9] Thus, many of his descriptions of events during the revolution and civil war have been passed on, often in anecdotal form, and have been recorded in Daniil Granin's literary biography published in English in 1990[9].

Since a visit of the American geneticist Hermann Joseph Muller[47] in 1922, the Department of Genetics to which Nikolai and Elena Timoféeff-Ressovsky belonged in Koltsov's Institute of Experimental Biology was headed by Chetverikov. His research group had received special lines of the fruit fly *Drosophila melanogaster,* which since 1910 were being used in Thomas Hunt Morgan's research group in the U.S. to cross-analyze chromosomal hereditary mechanisms on the basis of Mendel's Laws of Heredity. In contrast, Chetverikov and his team carried out cross-analyses using these lines to explore the emergence of species during evolution. The results were groundbreaking for the later so-called "synthetic evolution theory". Aldous Huxley characterized it as the "new synthesis", the fusion of genetics with classical evolutionary doctrine. At that time Chetverikov founded *Drozsoor* (from Russian, which means "joint shouting of drosophilists"), an extraordinarily productive discussion group which met regularly and in which Timoféeff-Ressovsky took part. He, like all of the other participants, remembered these discussions all of his life and later used them as a model for his discussion groups in Berlin. In his recollections, Timoféeff-Ressovsky also remembered as exceptional the intensive two-year internship under Koltsov, which every student had to complete. They (the students) later often said that this had been the best time of their lives.

During these years Timoféeff-Ressovsky also had his first contacts with the famous Russian biologists Nikolai I. Vavilov and Vladimir I. Vernadsky, whom he always highly admired and venerated. While still at the Moscow Institute, Timoféeff-Ressovsky published the results of his first experiments on the reversibility of spontaneous gene mutations (reverse mutations), using *Drosophila funebris* as an example. This research topic interested him, because he held the hypothesis – which later proved to be true – that mutations as the basis of evolutionary changes may not only be of a destructive nature. The research on this problem was then continued and extended in Berlin on the model of x-ray-induced mutations in *Drosophila melanogaster* immediately after Muller in 1926 had shown that x-rays could induce a high yield of mutations in *Drosophila* (Nobel Prize 1946).[47] In 1932/33 Muller was visiting professor with Vogt and Timoféeff-Ressovsky in Berlin-Buch, and from 1932 to 1936 he was member of the Board of Trustees of the KWI for Brain Research. During his Berlin period (1925-1945) Timoféeff-Ressovsky published 140 papers (among them [16,18,24-32]), which formed the basis of his world renown and which brought him the nomination for the Nobel Prize in Physiology and Medicine by Boris Rajewsky in 1950.

Not to be overlooked is the contribution of his wife, the outstanding geneticist Elena Alexandrovna Timofeev-Ressovsky. She, too, was influenced by the Koltsov/Chetverikov research group, and with her precise, systematic approach and her balanced, unflappable way of working and her insight into human nature, she was an ideal counterpart to his quite impulsive, sometimes even chaotic nature. In the year of Elena Alexandrovna's death (1973) he was to say[21,40]: "She was a completely remarkable woman in every aspect. There are remarkable women, but they are quite rare in the world. But completely remarkable women are even rarer. My wife was such a completely remarkable woman. We worked in the same laboratory for 53 years, with four hands and two heads, and we were married for 51 years. During this time we were only separated for 2 ½ years (during my imprisonment)."

Corresponding to the cosmopolitan nature of the Timoféeffeev-Ressovskys (and Vogt's Kaiser Wilhelm Institute for Brain Research), their Berlin apartment – first in

Steglitzer Strasse (today Pohlstrasse) and, after the construction of the new building of the institute, in the gatehouse of the Berlin-Buch park premises – was always open to guests from all over the world. It was the place of social gatherings and many rounds of discussions, which often took place up into the wee hours and usually were dominated by the deep voice of the host. Besides colleagues and scientist friends, artists were frequently among the guests, especially during the twenties. Like the education of the two sons – the second son Andrei was born in Berlin in 1927 – the hospitality of the Timoféeff-Ressovskys mainly rested on the shoulders of Elena Alexandrovna. She was, besides Cécile Vogt, wife of Oskar Vogt and scientific member of the Kaiser Wilhelm Society, at that time the only female scientist at the KWI for Brain Research who combined her research activity with marriage and motherhood.

Elena Alexandrovna Timoféeff-Ressovsky

Overall considered, all of Timoféeff-Ressovsky's seminal work in experimental mutation research (mostly on *Drosophila)* was directed toward the nature of genes and mutations and their significance in evolution biology and population genetics. First, using mature spermatozoa, he confirmed the linear relationship between x-ray dosage and mutation rate and showed that the relationship between gender-related lethal mutations/visible mutations remained constant with increasing dosage, and that dose effectiveness, dose fractioning and irradiation at the same dosage level and at temperature differences in the range of 10 – 35 degrees Celsius did not influence the mutation frequency. His classic phenogenetic studies explore the influence of the remaining genome ("genotypic milieu"), the external environmental conditions ("external milieu") and physiological variables ("internal milieu") on the expression of mutants. They were predominantly carried out on mutant *venae transversae incompletae* (*vti)* of *Drosophila funebris.* Along with Vogt, Timoféeff-Ressovsky distinguished between the *penetrance*, *expressivity* and *specificity* of mutated genes[14]. He found that these selected indicators of gene expression could to a certain degree vary from each other independently and that the "genotypic milieu", e.g. with respect to the influence of *vti* expression, can be differently active in geographically differently localized lines of a species. This all affected the way from the gene to the phene (phenogenetics), population genetics, e.g. the splitting of a species population into smaller (territorially isolated) subpopulations (microevolution processes), the generation of phenotypical characteristics in general and the genetics of ontogenesis.

In the thirties it was especially important to elucidate whether recessive lethal mutations in fact represent the far most frequent kind of mutations or whether in reality innumerable other mutations are also present which do not appreciably impair the ability of an organism to survive until it reaches a reproductive age. In extraordinarily elaborate series of experiments Timoféeff-Ressovsky was able to show that x-rays induce approximately twice as many mutations of the last-mentioned kind, i.e. without immediate recognizable effect, as lethal or sublethal mutations. The evolutionary significance of mutations also became clear when Timoféeff-Ressovsky analyzed the survivability of different mutations of *Drosophila funebris* at the same temperature in different combinations with other mutations. His results showed that the survivability of the mutant combination was sometimes just as good as that of the most effective mutation alone, in other cases it was just as poor as the least effective mutation alone, and in other cases it corresponded to a mean. The mutant combination could also be more effective than the most effective individual mutation or, however, less effective than the least effective. The American geneticist Bentley Glass, who in 1933 worked for half a year with Timoféeff-Ressovsky in Berlin-Buch, wrote the following about these experiments: "From the standpoint of clarifying the selective process upon the raw material of evolution, the mutations, this investigation is one of the most important ever made by anyone"[10]. In 1934, apart from "The experimental production of mutations", still today considered a classic survey and in which

he – by the way – already used the term "genetic engineering", Timoféeff-Ressovsky published his most comprehensive work on phenotypical gene manifestation during the pre-war period "The link between the gene and the morphological character"[26]. In his publication "Genetics and Evolution"[29], which appeared in 1939 and like the aforementioned publication was also met with much acclaim, he summarized for the first time his notions on the genetic mechanisms in the processes of microevolution. In 1940, together with his wife, he reported the results of his population-genetic studies on temporal and spatial distribution in the open landscape (park area in Berlin-Buch) and on the action areas of different species of *Drosophila*[30,31]. The above-named studies, including further experimental data, formed the basis for the models of microevolution which were developed as a consequence of Timoféeff-Ressovsky's research.

Due to his spectacular research work, his lectures in Germany and in other countries and, not least, his originality and his personal charisma, Timoféeff-Ressovsky soon became acquainted with leading geneticists and also with many physicists and biophysicists, who particularly appreciated him. He exchanged ideas or worked with a number of German scientists including e.g. the cytogeneticist Hans Bauer, the plant geneticist Georg Melchers, the geneticist and zoologist Alfred Kühn, the biophysicist Boris Rajewsky, the crop and radiation geneticist Hans Stubbe and the virologist Gerhard Schramm, and also the physicist and Nobel laureate Erwin Schrödinger, the physicists Karl Günter Zimmer, Max Delbrück, Robert Rompe, Pascual Jordan and Friedrich Möglich (student of Max von Laue) and the chemist Nikolaus Riehl (Auer Society).

Outside of Germany he regularly took part in the famous seminar circle of the physicist Niels Bohr in Copenhagen along with the six-years younger Max Delbrück, as well as with Paul Dirac, Pierre Auger, Francis Perrin and William T. Astbury, and the biologists Muller, Theodosius G. Dobzhansky, Vavilov, Boris Ephrussi, Vernadsky, Cyril D. Darlington, John B. S. Haldane, Adriano Buzzati-Traverso, Torbjörn O. Caspersson and Åke Gustafsson. Supported by the Rockefeller Foundation and together with Ephrussi, he headed a small international group of eminent scientists (geneticists, physicists, chemists, cytologists, biologists and mathematicians), which before the beginning of World War II met regularly off-season in Dutch, Belgian and Danish seaside resorts to hold discussions about the most current research problems in biology. Correspondingly, in Timoféeff-Ressovsky's department in Berlin-Buch an international atmosphere prevailed, with visits, lectures and guest stays of foreign researchers, among these not seldom scientist friends from Timoféeff-Ressovsky's Moscow period, like Koltsov, Vernadsky, Vavilov, Alexander S. Serebrovsky, Yuri A. Filipchenko, Grigory A. Levitsky, Georgy D. Karpechenko, Solomon G. Levit and Chetverikov. Even the genetics department itself was multinational, although it had a certain 'Russian propensity', because e.g. Timoféeff-Ressovsky's wife Elena Alexandrovna, the geneticist Sergei Romanovich Tsarapkin and the technical assistant Natascha Kromm worked there.

Nikolai V. Timoféeff-Ressovsky (standing on the right) with his colleagues (Natascha Kromm, sitting on the left) in the dry and heated greenhouse of the genetics vivarium

The increasing mutual interest and collaboration between biologists and physicists in the twenties and thirties did not develop by happenstance. These were dictated by the general issue whether the laws of physics and biology were compatible, more specifically, whether life processes and structures obey well-known physical laws, including the quantum theory. For Timoféeff-Ressovsky, the paramount issue was the molecular nature of the gene with its exceptional stability, and connected to that,

the molecular mechanisms of mutation. As Delbrück recalled in his Nobel lecture in 1969[8], the nature of the gene was at that time an issue of speculation: "From the hindsight of our present knowledge one might consider this ('that genes had a kind of stability similar to that of the molecules of chemistry') a trivial statement: what else could genes be but molecules? However, in the mid-thirties this was not a trivial statement. Genes at that time were algebraic units of the combinatorial science of genetics, and it was anything but clear that these units were molecules analyzable in terms of structural chemistry. They could have turned out to be submicroscopic steady-state systems, or they could have turned out to be something unanalyzable in terms of chemistry, as first suggested by Bohr ..."

Kolyusha hurrying from his apartment to his laboratory, drawn by Oleg Zinger*
**dimunitive form for Nikolai V. Timoféeff-Ressovsky*

In intensive discussion rounds which took place between 1932 and 1937 and in which Muller also took part in 1932 and 1933, Timoféeff-Ressovsky became Delbrück's most important teacher in genetics and quantitative mutation research. In Delbrück's words (1969)[8]: "Our principal teacher in the latter area (*biology*) was the geneticist, Timoféeff-Ressovsky, who, together with the physicist K. G. Zimmer, was at that time doing by far the best work in the area of quantitative mutation research." Timoféeff-Ressovsky began his research on the mutagenic effect of x-rays in 1928/1929, first in an x-ray laboratory in building V of the Hufeland Hospital in Buch and then continued with it from 1930 on in the "x-ray pavilion" of the new KWI for Brain Research, an annex to the connecting corridor between the institute and the hospital.[4,5] His first radiation-genetic publications date back to 1929-30. In 1935 the classic work "On the Nature of Gene Mutation and Gene Structure" by N. V. Timoféeff-Ressovsky, K. G. Zimmer and M. Delbrück appeared in *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen*[28]. It also became known as the "three-man paper" or the "green pamphlet". In a masterly way, this publication summarized the results of experimental, quantitative mutation research up to that time and the model hypotheses that had been developed on the mutation process and on gene structure. The most important conclusions were, first, that a spontaneous mutation must be due to a rare and single-step (in analogy to the principles of quantum mechanics) stable molecular alteration via atomic rearrangement; and second, that mutations induced by ionizing rays are correspondingly dose-dependent, more frequent atomic rearrangements of the same kind (cumulative, direct one-hit events without threshold value, in the sense of target theory)[32], triggered by ion pairs or small ion clusters. The possibility of an indirect triggering of a mutation through radiation-induced, short-term free radicals and/or chemical mutagens could not yet be taken into consideration at that time because these mechanisms were not discovered until years later. By contrast, first estimations – which later proved to be untenable – were already presented as to the size of a gene (derived via the volume of the mutation-triggering spatial target area). This and the notion that genes are molecules with stable atomic structure in which energy-conductive processes in turn lead to stable structural changes (mutations) of the same kind, has contributed considerably to the development of molecular genetics.

According to the activity report of the genetics department for 1937/1938 (minutes of the Board of Trustees meeting of the KWI for Brain Research from December 1938, Archives of the History of the Max Planck Society)[21], Timoféeff-Ressovsky had also at that time attempted to determine by x-ray structure analysis a crystal structure of chromosomes and to produce electron diffraction images of salivary gland giant chromosomes of *Drosophila*. The results were not published, but in principle these approaches corresponded to the later application of similar methods elucidating the structure of DNA in the 1950s. The significance of the seminal works of the Berlin-Buch research group on the nature of genes and mutation was emphasized by Schrödinger (Nobel Prize for Physics in 1933 for his contribution to quantum theory, together with Dirac) in his book "What is Life ?" published in 1944[22], and in part even served as basis for this excellently written text. Schrödinger's book strongly influenced the development of biology after the end of World War II. The internation-

al reputation of the work of Timoféeff-Ressovsky and Delbrück, the latter who went to the U.S. in 1937 and there became one of the fathers of molecular genetics, grew even more.

From 1937/1938 on Timoféeff-Ressovsky's department had a powerful Philips neutron generator (linear accelerator with voltage up to 600 000 volts) at its disposal, with the aid of which radionuclides could be produced. Neutrons cause higher ionization densities in tissue than x-rays, and also in the case of neutrons the mutation rate was proportional to the radiation dose up to a saturation value, and a threshold value was not detected. Again, one ionization was postulated as a hit. Incidentally, even back then Timoféeff-Ressovsky had expressly pointed to the danger of radiation damage – including genetic damage – to humans through ionizing radiation, especially with respect to medical personnel in radiation diagnostics and therapy.

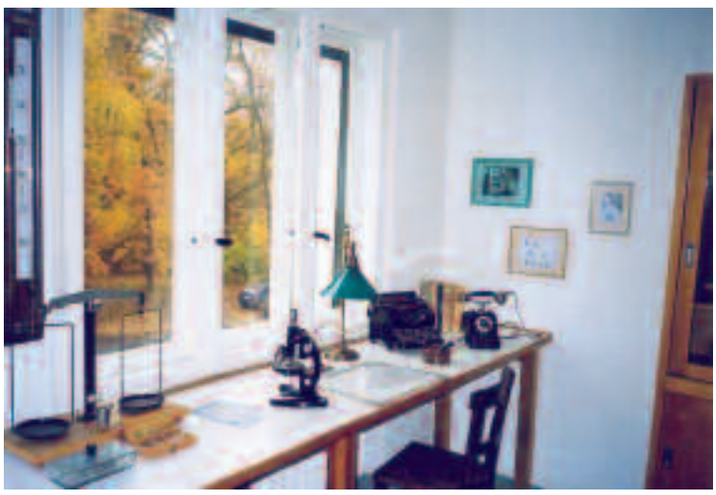
Apart from genetic and mutation research, Timoféeff-Ressovsky's department also experimented with radionuclides from about 1940 on. They were produced with the aid of the department's own neutron generator and purified by his colleagues Hans-Joachim Born (student of Otto Hahn) and Zimmer. The measurements were primarily carried out by Elena Alexandrovna Timoféeff-Ressovsky, Born, Joachim Gerlach and Paul Max Wolf (Auer Society), using the radioactive tracer methods developed by Georg von Hevesy in the thirties. They pertained to the absorption, distribution, storage and excretion of radioactive isotopes of phosphorous, chlorine, arsenic and manganese in the mouse (in the case of radium 224 also the retention time, circulation time, in humans). After the end of the war alleged human experiments in the genetics department were an issue of controversy – quite unfairly so, because the doses used were very low and completely harmless. Experiments were also conducted on rabbits with thorium 234. It accumulated in the lymphatic system and later was used as a contrast agent (Thorotrast) in radiation diagnostics, but due to negative long-term effects (thorotrastoses, malignant thorotrastoma) it has no longer been used since the 1950s.

Nikolai V. Timoféeff-Ressovsky, 1943

However, worthy of mention are also cell- and molecular biological studies, which were important to establish basic methodology. An example of this is described in one of Timoféeff-Ressovsky's letters to his friend Boris Rajewsky, dated March 17, 1941: "Dear Boris Nikolaevich! ... Sometime ago you ran the risk of promising me schnaps, if we should succeed in radioactively labeling chromosomes or filterable viruses. I herewith have the pleasure of informing you that the latter has been successful: By biological means we have incorporated radioactive phosphorus into the tobacco mosaic virus (by breeding tobacco plants on a radioactive phosphorous-containing nutrient solution and propagating the mosaic virus on such radioactive plants). It is quite amusing! Kind regards from house to house, Yours (signature)".

As the Nazi period continued, especially with the beginning of World War II and the German attack on his fatherland on June 22, 1941, a shadow fell on Timoféeff-Ressovsky's life. The war and the responsibility for his family, staff and department increasingly became a psychological burden to him. Muller had left Berlin-Buch after the first attacks of SA troops on the KWI for Brain Research in 1933. Vogt was attacked by the Nazis because of his pacifist and cosmopolitan attitude (among other reasons because he employed women, including Jewish women, at his institute) and had received his dismissal in 1934 for political reasons. However, thanks to the support he received from Gustav Krupp von Bohlen and Halbach and Max Planck, president of the Kaiser Wilhelm Society, he remained acting director of the institute until April 1, 1937. Vogt complained at that time that the atmosphere at the KWI for Brain Research had drastically worsened due to denunciations of staff members. His successor Hugo Spatz actually intended to shut down the genetics department, which he considered to be an "alien element" in the institute. He finally had to consent to

an agreement between the Kaiser Wilhelm Society and the responsible ministry, according to which the department was to remain preserved with a simultaneous budget increase. However, as far as the administration and the budget were concerned, the department was to be independent of the KWI for Brain Research. The continued existence of the genetics department was then ultimately secured in 1938 when Timoféeff-Ressovsky was named scientific member of the Kaiser Wilhelm Society at the KWI for Brain Research.



Workplace of Nikolai V. Timoféeff-Ressovsky in the Department of Genetics in the Oskar and Cécile Vogt Building, the former Kaiser Wilhelm Institute for Brain Research, in the mid-1930s

In 1932 Timoféeff-Ressovsky held a much acclaimed plenary lecture at the 6th International Congress of Genetics in Ithaca, New York, USA, in the presence of many world-renowned geneticists, among them Vavilov, Morgan and Muller. Following the conference, he was invited to work at the laboratories of the Carnegie Institution in Cold Spring Harbor for several months. Finally, in 1936 he was offered a position at the Carnegie Institution, which he rejected after much reflection. In his correspondence with Miroslav Demerec[21] he based this decision on his responsibility for his scientific and technical staff in Berlin-Buch and the fact that his sons attended the French secondary school in Berlin, and he did not want to ask them to make this adjustment. Another reason for his refusal was that in comparison to Germany, scientists had a lower status in the U.S., which Muller had pointed out to him.

In May 1937 Timoféeff-Ressovsky turned to the Soviet embassy in Berlin with the request of extending his and his family's permit to stay in Germany. This was rejected. Although this decision was very difficult for them, the Timoféeff-Ressovskys decided against returning to the USSR under the conditions prevailing there. Upon his request Timoféeff-Ressovsky had also been urgently warned beforehand by his teacher Koltsov via the Swedish embassy ("... of all the methods of suicide, you have chosen the most agonizing and difficult. And this not only for yourself, but also for your family.... If you do decide to come back, though, then book your ticket straight through to Siberia!")[10]. Vavilov, at that time president of the Academy of Agricultural Sciences of the USSR, also pointed out via Muller that only arrest and hard punishment awaited him under Stalin's rule with its waves of purges in the period of the repression of genetics and geneticists by Trofim D. Lysenko and Isaak I. Prezent. After Timoféeff-Ressovsky became a scientific member of the Kaiser Wilhelm Society, the German Minister of Science Bernhard Rust suggested to him in July 1938 that he assume German nationality. Timoféeff-Ressovsky politely refused ("I was born a Russian and see no possibility of changing this"[17]). He always remained a Russian patriot (according to his assistant Natascha Kromm: "More than a patriot – a chauvinist"[17]) and during the war repeatedly remarked that he was sure of Russian victory, for which he was admonished by the secretary general of the Kaiser Wilhelm Society.

For Timoféeff-Ressovsky it was especially depressing and hard to grasp that the best Russian geneticists – many of them his teachers – were arrested one after another as a consequence of the official damning of genetics in favor of the Lysenko doctrine during the waves of purges between 1929-1931 and 1936-1940. Most of them perished in prisons and labor camps. Chetverikov was denounced in 1929, arrested and banished to Sverdlovsk (today Yekaterinburg); he died in 1959. Koltsov lost his position as institute director and died in 1940. Vavilov died of starvation in prison in 1943. Karpechenko, Levitsky and Levit also died in prison. Timoféeff-Ressovsky's younger brothers Vladimir and Dmitri were likewise arrested and lost their lives, as did many of Elena Alexandrovna Timoféeff-Ressovsky's relatives.

Another blow of fate followed in 1943. Timoféeff-Ressovsky's older son Dmitri had – without informing his parents in detail – at age 18 become a leading member of a

young anti-Nazi resistance group which also helped prisoners of war, among them two French pilots and East European and Western foreign workers, by providing them with hiding places and medication.

A provocateur blew their cover in 1943, and about 50 people were arrested as a consequence. Natascha Kromm had to watch from a window in the gatehouse in Berlin-Buch how Dmitri was arrested on the street. Afterwards a number of leading German scientists tried to intervene for Dmitri, but without success. The head of the Reich Security Central Office, Ernst Kaltenbrunner, wrote Timoféeff-Ressovsky in an official letter that Dmitri could not be rescued because he had worked against the Führer and the Reich. Dmitri was sent in August 1944 to the Mauthausen concentration camp, transferred later to the affiliated Melk camp and apparently perished there in 1945 a few days before the war ended. After a last sign of life in December 1944, his parents hoped for months that they would see their son again alive; Elena Alexandrovna never gave up this hope until her death on Easter Sunday 1973. Still in July 1944 the Gestapo had offered – through Professor Julius Hallervorden, a department head of the KWI for Brain Research – to keep Dmitri in prison instead of sending him to a concentration camp, in case Timoféeff-Ressovsky declared his willingness to head the Nazi sterilization program for people of Slavic descent.[2,4] Timoféeff-Ressovsky refused this categorically.

During the last years of the war the situation for Timoféeff-Ressovsky, who already was under severe psychological pressure, became increasingly perilous. Although he was a world famous geneticist, he was considered to be an "enemy alien", since he had a "consular" passport (issued outside of his native country) of the USSR. Moreover, he was neither a member of the Nazi party nor any of its organizations, and was often the target of suspicion in connection with the anti-Nazi activities of his son and his hardly reserved way of expressing his political views. Despite this, the Timoféeff-Ressovskys continued to aid many people who were in need. They hid individuals at home and in the institute who were threatened because they had Jewish relatives and helped forced laborers and prisoners of war to get jobs as temporary workers in the genetics department. The Timoféeff-Ressovskys' quick-witted, spontaneous willingness to help becomes very clear in a report of Professor Bernhard Hassenstein.[46] He describes how Timoféeff-Ressovsky issued him a certificate (not based on fact) during his last visit in Berlin-Buch on February 10, 1945, without explaining it in more detail.

For Timoféeff-Ressovsky himself this was very risky, but for Hassenstein it was possibly life-saving in the coming chaotic period at the end of the war, which Timoféeff-Ressovsky foresaw. "Berlin-Buch, February 10, 1945 C e r t i f i c a t e This is to certify that Mr. Bernhard Hassenstein is working as a laboratory assistant in the Department of Genetics of the Kaiser Wilhelm Institute at Berlin-Buch. Signature and department seal": "At that time I had no idea that Timoféeff-Ressovsky had saved the lives of many people in a similar fashion. Even though I never needed this certificate, it is one of the most deeply moving documents of my life."

Fighting on the Eastern Front was getting closer and closer to Berlin, and for that reason, already in 1944 the evacuation began of entire departments of the KWI for Brain Research to the western part of Germany. However, this did not apply to Timoféeff-Ressovsky's genetics department. He had decided to hold out, because he believed that he as a Russian could best negotiate with the approaching Soviet military units to preserve the department and the safety of the staff. He stuck to this decision, although many friends and colleagues urged him to evacuate to the West. Among these was also Boris Rajewsky from Frankfurt am Main, who went to see him in Berlin-Buch with the same intention right before the end of the war, but without success. It would be wrong to believe that Timoféeff-Ressovsky was sure of his course. On the contrary, he had been in a desperate state of mind for months – abstracted and hardly approachable. (N. Kromm, personal communication)

In Berlin during the last weeks before the end of the war, continual bombardments, destruction and chaotic conditions prevailed. Berlin-Buch, which had been comparatively spared, was overrun on April 21, 1945 by a first wave of attack of the Soviet Army and then occupied. Following a conversation with General A. P. Savenyagin, deputy to the People's Commissioner for Internal Affairs of the USSR and responsible for certain areas of Soviet research, Timoféeff-Ressovsky was named acting director of an institute of genetics and biophysics, his former Department of Genetics, by a department of the Soviet Secret Service NKVD responsible for atomic research. With that, the institute came under the authority of the Soviet Military Administration. Besides that, the Soviets put him in the post of mayor of Berlin-Buch. A Soviet guard was stationed on the institute's premises to preserve law and order.

Five months later, however, in the night from the 14th to the 15th of September 1945, Timoféeff-Ressovsky was "requested" by another department of the NKVD to come to an approximately one-hour meeting and was transported away in a black limousine. A follower of Lysenko, Nikolai N. Nuzhdin, had denounced Timoféeff-Ressovsky. His Russian colleague, the geneticist Tsarapkin, was also arrested. The institute equipment was dismantled and taken to the USSR. Elena Alexandrovna remained in Berlin-Buch with her son Andrei and like everyone in Berlin-Buch, did not receive news that her husband was still alive until two years later when word came from a secret research station in Sungul in the southern Ural Mountains. Soon afterwards, Elena Alexandrovna and Andrei were allowed to join him there. In the meantime she had first been out-of-work in Berlin-Buch, supported by Care packages sent by American colleagues. However, from May 1946 on she was employed as an assistant to Hans Nachtsheim in the Institute of Zoology of the University of Berlin. Andrei Timoféeff was able to begin studying physics at the same university.

1945 – 1981: Russia

After his arrest Timoféeff-Ressovsky was first sent to the infamous Moscow Lubianka remand prison, and then subjected to interrogations in the Butyrka prison. In 1946 he was condemned to ten years of forced labor, disenfranchisement of his rights for five years and seizure of his assets by the military tribunal of the Supreme Court of the USSR for betrayal of the fatherland (failure to return to the Soviet Union in 1937; collaboration with the Nazis). He was then transferred to a prison camp in Kazakhstan. In prison and later in the GULAG Timofeev-Ressovsky became acquainted with Alexander Solzhenitsyn, who mentioned him in his work "The GULAG Archipelago"[23] and stressed with admiration his unbroken enthusiasm for science, in particular his knowledge of atomic physics. It is quite telling that Timoféeff-Ressovsky both in prison and in the prison camp gathered a so-called scientific society around him in order to preserve fellow imprisoned scientists and himself from intellectual starvation.

Timoféeff-Ressovsky was probably only able to survive the labor camp despite malnutrition and lack of vitamins, which caused him to become increasingly blind, due to the untiring inquiries of General Savenyagin, who at that time was deputy to Interior Minister Lavrenty P. Beria. Savenyagin had – as already mentioned – made Timoféeff-Ressovsky's acquaintance before his arrest and desired to have him work as radiation geneticist in the Soviet atomic program. The intercession of the French Nobel laureate Frédéric Joliot-Curie with Beria may also have been beneficial for Timoféeff-Ressovsky.[19] In the beginning of 1947 he was finally found in extremely critical health in the prison camp and, as Solzhenitsyn reported, had to be carried by NKVD officers to a car due to his physical weakness. During nearly the whole train ride to Moscow he had to stand in an overcrowded carriage and was unconscious when he arrived in the capital. In the central hospital of the interior ministry his condition gradually improved to the extent that he could be brought to a secret research station in an undisclosed location in the southern Ural Mountains. A short time lat-

er this station was transferred to the nearby city Sungul on Lake Sungul ("Object 0211"; "Laboratory B"). There, in August 1947, Timoféeff-Ressovsky was assigned the task of heading a department of biophysics which was to be concerned with the consequences of radiation and with decontamination procedures within the framework of the atomic project. Prisoners of war or deported German scientists were working here, among them his Berlin-Buch colleagues Tsarapkin, Zimmer, Alexander Catsch and Born, and from 1948 on also Elena Alexandrovna Timoféeff-Ressovsky. Andrei Timoféeff was allowed to continue his studies of physics at the University of Sverdlovsk as a long-distance student.

Nikolai V. Timoféeff-Ressovsky at Mozhaisk Reservoir, Zvenigorod, 1960

After Stalin's death in March 1953 and the following "de-Stalinization" period initiated by his successor Nikita S. Khrushchev, many innocent detainees were released from prison. The two Timoféeff-Ressovskys were also allowed to visit Moscow, Kiev and Leningrad for the first time at the end of 1955 and to meet friends and colleagues there who had survived the period of repression. As nonrehabilitated former prison camp detainee, however, Timoféeff-Ressovsky did not receive permission to move to these cities and work there. After the secret research station in Sungul was closed in 1955 and their release, Elena Alexandra and Nikolai Timoféeff-Ressovsky went to the Department of Radiobiology and Biophysics of the branch of the Academy of Sciences of the USSR in Sverdlovsk in the Ural Mountains. There they worked until 1964. This department, with its (unofficial) annual genetic workshops, rapidly became a magnet for scientists from the entire USSR, who here gained their first knowledge of the – until 1965 officially prohibited – research field of genetics. Even more famous in the same sense were the summer courses in radioecology, radiation- and population genetics which Timoféeff-Ressovsky initiated and conducted in the experimental station on Lake Miassovo ("Miassovo Biostation"; today the Institute of Ecology of the Academy of Sciences). Many Russian geneticists, young at that time and intent on learning, still speak with enthusiasm about these summer courses. In February 1956 Timoféeff-Ressovsky and Igor E. Tamm held tandem lectures before a tightly packed auditorium at the Moscow Institute of Physics and Technology headed by Pyotr L. Kapitsa. Their subjects were radiation genetics and mutation mechanisms, and the structure of DNA. At that time the two lectures posed a public challenge to the prevailing monopoly of Lysenko dogmaticians. They were a sensational success and were interpreted as a change for the better.

For reasons of secrecy, nothing has been revealed in detail about the research findings of the Department of Biophysics in the "Object 0211" between 1947 and 1955. As part of the atomic program the results remained classified. But from later publications between 1956 and 1963, it can be concluded that from 1947 on the research of both Timoféeff-Ressovskys focused on the influences of climatic, chemical, and physical environmental conditions on living organisms. Starting in 1957, Timoféeff-Ressovsky used the term "biogeocenology" to designate interactive ecological systems. The term is originally ascribed to the forestry scientist Vladimir N. Sukachev and to Vernadsky. Elena Alexandrovna made a major contribution to this work because during her last years in Berlin-Buch she had been conducting research on the distribution and enrichment of radionuclides, first in laboratory animals and then in fresh water organisms. This was also the topic of her highly acclaimed PhD/*Habilitation* dissertation at the academy institute in Sverdlovsk in 1963 in which she proposed, among other things, to decontaminate radioactive water by having it flow in cascades over particularly enrichment-active plants, in order to extract radionuclides from it. Timoféeff-Ressovsky himself, after years of chicanery by his political opponents, received the title of Doctor of Biological Sciences (corresponding to a *Habilitation*) in 1964.

In that year Timoféeff-Ressovsky took charge of structuring and heading the Department of Genetics and Radiobiology at the Institute of Medical Radiobiology of the Russian Academy of Medical Sciences in the "closed city" of Obninsk, not far from Moscow in the Kaluga region. Here the first nuclear power plant of the USSR – also the world's first – had been built in 1954. After Khrushchev's resignation in October 1964 Lysenko was finally disempowered. Timoféeff-Ressovsky headed the laboratories of radiation genetics and radiation ecology. His department also included the laboratories of molecular radiation genetics (head: Zhores A. Medvedev) and cellular radiation biology (head: Vladimir I. Korogodin). Medvedev wrote[15]: "For me, the work under Timoféeff-Ressovsky was a great and unforgettable experience. His competence in many fields of genetics and biology, his great dynamism and personal magnetism were enormously stimulating factors in the work of the entire department."

Nikolai V. Timoféeff-Ressovsky (left) and Alexander Solzhenitsyn in Obninsk, 1976

Several of the most eminent Russian geneticists did their first research in Timoféeff-Ressovsky's department in Obninsk, among them Nikolai Bochkov and Vladimir I. Ivanov of the Institute of Medical Genetics of the Russian Academy of the Medical Sciences in Moscow. Timoféeff-Ressovsky continued to regularly hold his traditional discussion rounds in Obninsk with great resonance; the same was true for the summer courses on genetics and biophysics. Through his energy, wit and lively and provocative way of discussing, he still stimulated his colleagues and listeners just as he used to ("Don't treat science with savage seriousness").[19] From Obninsk he published over sixty papers in the fields of population genetics, radiation biology and evolution research as well as a series of textbooks, including "The Application of the Target Principle in Radiation Biology"[36] published in 1968, which he dedicated to the English biophysicist Douglas E. Lea, who died young, and in 1969 the textbook "Brief Outline of Evolution Theory"[37], i.e. on "synthetic evolution theory". In Obninsk the Timoféeff-Ressovskys also established the first research group in the USSR for the genetic study of *Arabidopsis thaliana*, today the most prominent plant 'model counterpart' to *Drosophila*.

During this time various Russian scientists tried to push through Timoféeff-Ressovsky's long overdue election to membership in the Soviet Academy of Sciences, but without success due to political/ideological resistance. In the meantime Timoféeff-Ressovsky had devoted himself more and more to the importance of the biosphere and its protection. With one of his lectures on this theme, especially on the dangers and consequences of low radiation doses and radioactive contamination of the environment, he made a strong impression on the nuclear physicist Andrei D. Sakharov, academy member and later Nobel Peace laureate. As is well known, Sakharov made the demand to stop nuclear weapons testing and to control nuclear weapons worldwide the main focus of his activities to protect the biosphere and the population.[2] In 1967 Timoféeff-Ressovsky's publication "Biosphere and Mankind" appeared.[34] Years later the N. V. Timoféeff-Ressovsky Society "Biosphere and Mankind" was founded with headquarters in Obninsk.

Due to his free manner of thinking and speaking and his influence on young scientists and students, however, Timoféeff-Ressovsky became increasingly unpopular with the local party leadership and was prematurely retired from his position in August 1969. Possibly because of an intervention by Delbrück with the President of the Academy of Sciences Mstislav V. Keldysh, Academy Member Oleg G. Gazenko was

able to take him on in his Institute of Medical-Biological Problems (biology and astronautic genetics) in Moscow as scientific consultant, later also at the Moscow Institute of Developmental Biology and Moscow University.

His weekly stays in Moscow enabled Timoféeff-Ressovsky to meet foreign colleagues who, with exceptions (e.g. a visit of Boris Rajewsky in 1967), were not allowed to come to Obninsk. In 1972, together with his wife Elena Alexandrovna, he was able to see his old friends Hans Stubbe and Georg Melchers at a conference of the N. I. Vavilov All-Union Society of Geneticists and Selectionists at Moscow University. When Elena Alexandrovna died quite unexpectedly in 1973 in Obninsk, this was a loss for Timoféeff-Ressovsky which he never overcame. It was characteristic of the atmosphere of the period that the party leadership prohibited the staff members of the institute to attend Elena Alexandrovna's funeral.

In the following years Timoféeff-Ressovsky increasingly became a legendary figure in Moscow. He was often visited by colleagues and students who read to him, who wanted to listen to his reminiscences and who even recorded many of them on tape.[40] His son Andrei had meanwhile become professor at the Institute of Metal Physics of the Academy of Sciences in Sverdlosk. At the 14th International Genetics Congress in the summer of 1978 in Moscow, Timoféeff-Ressovsky was a celebrated honorary member and was once again able to greet many of his foreign friends and admirers.

In the meantime he had also received many prestigious awards. He was the 13th prizewinner and second non-American after Haldane to receive the Kimber Gold Medal and the Kimber Prize for Genetics of the U.S. National Academy of Sciences, the highest distinction for geneticists (1965). He was also awarded the Mendel Medal of the Czech Academy of Sciences (1965), the Darwin Plaque of the German Academy of Natural Scientists Leopoldina in Halle (1959), of which he had been a member since 1940, and the Mendel Prize of the Leopoldina (1970). He was not given permission to receive any of these awards personally. Already in 1939 he was awarded the Lazzaro Spallanzani Medal of the University of Pavia. He was an honorary member of the Mendeleev Society in Lund, the Italian Society of Experimental Biology, the American Academy of Arts and Sciences (Boston), the British Genetic Society (Leeds), founding member of the German Biophysical Society and founding and honorary member of the Vavilov Society of Geneticists and Selectionists of the USSR. A small planet discovered by the Russian astronomer Nikolai S. Chernykh in 1975 was named after Timoféeff-Ressovsky (3238 *Timresovia*).

Nikolai Vladimirovich Timoféeff-Ressovsky died in his 82nd year on March 28, 1981 in Obninsk, 18 days after the death of Max Delbrück in Pasadena, California. Nikolai Timoféeff-Ressovsky's grave is to be found in the Obninsk cemetery, near the grave of Elena Alexandrovna and only a few kilometers from his father's country estate. In September prior to his death, before he went to the hospital, he had invited old and new friends, probably as a farewell, to his home for the last time. Two months after his death he was posthumously elected member of the Linné Society in London. Ten years later, on June 29, 1992, in the wake of Mikhail Gorbachev's "Perestroika", the Supreme Court in Russia rescinded the sentence of the military tribunal from July 4, 1946 and exonerated him from all charges. With that, 46 years after his sentencing, Nikolai Vladimirovich Timoféeff-Ressovsky was finally rehabilitated. Only six years before, in 1988, this had still been rejected.

In conclusion, let us remember the accusations raised against Timoféeff-Ressovsky which led to his arrest and conviction in 1945: first, his decision contrary to the contract agreement not to return to the USSR in 1937 and second, his purported concessions to the enemy German Nazi state. Both accusations were combined under the term "treason". Timoféeff-Ressovsky accepted the first accusation in the interrogations following his arrest on September 13, 1945 by staff of the NKVD as justified. Some of his reasons for the decision not to return to the USSR are presented above.

In contrast, Timoféeff-Ressovsky could not accept the second reproach that he had collaborated with the Nazi regime. This reproach led to many suspicions and accusations from various sides and even continued to smolder in Russian colleague circles openly or latently for years. It is characteristic that alone in the central archives of the Ministry for State Security (STASI) of the GDR the "case" of Timoféeff-Ressovsky encompasses 130 volumes with 5046 pages.[11] One of the main arguments for this second reproach was that despite his Soviet nationality, Timoféeff-Ressovsky was able to carry out his research work in Berlin-Buch until the end of the war with hardly any interference and with comparatively generous financial support, even though his son Dmitri had perished in a concentration camp due to anti-Nazi underground activities (see page 31). One must assume that Timoféeff-Ressovsky as world-class geneticist appeared especially important to the Nazi leadership due to the Nazis' genetic aims and goals of racial hygiene. It can be held against him that he accepted several invitations to give lectures for Nazi-oriented institutions on the fundamentals of genetics and mutation research, also with respect to the increase of genetic anomalies in human populations "due to reduced natural selection", and that some of his publications on the fundamental principles of population genetics gave representatives of Nazi eugenics material for their measures of racial hygiene. Speculations that in the genetics department in Berlin-Buch experiments on people were carried out with Timoféeff-Ressovsky's consent have long been proven incorrect. As has already been pointed out above, he supported prisoners of war and forced laborers at high personal risk to himself at that time by providing them a place to hide or an extra job in his department. His pride, however, never allowed him to use this in his own defense.

On September 20, 1988 the investigative department of the Committee for State Security of the USSR requested legal aid from the Ministry for State Security of the GDR in the case of Timoféeff-Ressovsky in the form of an expert assessment. This ministry in turn requested an expert assessment from the Academy of Sciences of the GDR, which was completed in 1989.[11] This expert assessment came to the following conclusions:

(1) The Institute for Brain Research and the Department of Genetics headed by Timoféeff-Ressovsky should not be counted as one of the institutes of the Kaiser Wilhelm Society which were relevant to the war effort; (2) no participation by Timoféeff-Ressovsky and the Department of Genetics headed by him in research to support the fascist race ideology and policy as well as the development and perfection of military-technical equipment can be derived; (3) research contracts carried out by other scientists in the Department of Genetics using radioactive or ionizing materials, underlying the obligation to secrecy and which touched on military-technical problems were not in any way related to the research of Timoféeff-Ressovsky and brought no significant results for the fascist war effort. In addition, it states that: "It follows from the documents made available and from the additionally evaluated materials that the research of the Soviet scientist Nikolai Vladimirovich Timoféeff-Ressovsky at no time consciously contributed to the support of the fascist dictatorship in Germany or supplied the means to carry on warfare." ... "As far as can be foreseen from here, upon recognition of the present expert assessment by the Soviet judiciary authorities, the offense of betrayal of the fatherland cannot be upheld, so that a rehabilitation of Timoféeff-Ressovsky cannot be ruled out."

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Major Events in the Life of Nikolai V. Timoféeff-Ressovsky

1900	Born in Moscow on September 7th.
1911	Attends the First Czar Alexander Grammar School in Kiev.
1914-1917	Transfers to the private Flerov Grammar School in Moscow; school leaving examinations in 1917 with distinction.
1917	Begins to study zoology, science and art history at the People's Shanyavsky University in Moscow.
1918-1920	Transfers to Moscow State University; voluntarily joins a cavalry unit during the civil war in the Crimea; continues his studies after the war and works with Nikolai Konstantinovich Koltsov and Sergei Sergeevich Chetverikov at the Moscow Institute of Experimental Biology; there he meets the neuropathologist Oskar Vogt from Berlin and the American geneticist Hermann Joseph Muller.
1922	Marries the biologist and geneticist Elena Alexandrovna Fiedler.
1925-1929	In 1925 the Timoféeff-Ressovskys arrive in Berlin with their two-year old son Dmitri, invited by Vogt; at the Kaiser Wilhelm Institute (KWI) for Brain Research Timoféeff-Ressovsky establishes the Department of Genetics which he heads from 1929 on; in 1927 birth of the second son Andrei in Berlin.
1933	After the Nazis seize power, first attacks of SA troops on the KWI for Brain Research.
1935	"On the Nature of Gene Mutation and Gene Structure" by Timoféeff-Ressovsky, Karl Günter Zimmer and Max Delbrück is published (known as the "three-man paper" or the "green pamphlet").
1937	Timoféeff-Ressovsky's request for extension of his and his family's permit to stay in Germany at the Soviet embassy in Berlin is rejected; he decides against returning to the USSR; many family members become victims of Stalin's waves of purges.
1941	On June 22nd the German Army attacks the Soviet Union.
1943-1944	Son Dmitri becomes a member of an anti-Nazi resistance group; denounced and arrested in 1943; Timoféeff-Ressovskys refuses to collaborate with the Gestapo; he and his wife continue to aid persons with Jewish relatives, forced laborers and prisoners of war.
1945	A few days before the end of World War II Dmitri perishes in the concentration camp Mauthausen; Soviet troops occupy Berlin-Buch on April 21st; they install Timoféeff-Ressovsky as acting director of an institute of genetics and biophysics, his former Department of Genetics; they also put him in the position of mayor of Berlin-Buch. Five months later (on September 14th/15th) he is arrested and deported to the Soviet Union.

1946-1947	In 1946 the Supreme Court of the USSR sentences him to ten years of forced labor for treason against the USSR; he gathers a "scientific society" around him to preserve imprisoned fellow scientists and himself from intellectual starvation; transfer to secret research area near the city of Sungul on Lake Sungul; in August 1947 assigned the task of heading a department of biophysics within the framework of the USSR atomic program; there he meets prisoners of war or deported German scientists, among them his Berlin-Buch colleagues.
1948	After two years of uncertainty about the whereabouts of her husband, Elena Alexandrovna is permitted to travel to the Soviet Union and to stay with her husband in Sungul. Their son Andrei can continue his studies of physics at the University of Sverdlovsk as a long-distance student.
1955-1964	In 1955 the Timoféeff-Ressovskys are released from internment by Nikita S. Khrushchev; the secret research station in Sungul is closed; until 1964 they then work at the Department of Radiobiology and Biophysics of the branch of the Academy of Sciences of the USSR in Sverdlovsk in the Ural Mountains.
1964-1981	Timoféeff-Ressovsky becomes head of the Department of Genetics and Radiobiology at the Institute of Medical Radiobiology of the Russian Academy of Medical Sciences in the "closed city" of Obninsk, near Moscow.
1973	Elena Alexandrovna dies at the age of 74 on April 29 in Obninsk.
1981	Timoféeff-Ressovsky dies at the age of 81 on March 28 in Obninsk.
1992	On June 29, 1992, in the wake of Mikhail Gorbachev's "Perestroika", Nikolai Vladimirovich Timoféeff-Ressovsky is finally rehabilitated.