

## IN MEMORIAM



**VORONKOV MIKHAIL GRIGOR'EVICH**  
**(12.06.1921-02.10.2014)**

In February of this year an unhappy event befell us: Mikhail Grigor'evich Voronkov, our prominent fellow countryman, great scientist, and Academician of the Russian Academy of Sciences, unexpectedly passed away at the age of 93.

His keen intellect and great talent, breadth of interests, and brilliant professional achievements have made the academic science of Russia famous. The chemical society of our nation has really suffered a heavy and irreplaceable loss. We have not simply lost a remarkable person. A truly magnificent scientist, who created in Russia a prominent school of global class in organosilicon chemistry and solved the most complex fundamental and applied research problems and also made a fundamental contribution to the development of a whole series of other directions in modern organoelement chemistry, has passed away. It seems that a whole epoch of silicon chemistry has ended – the Voronkov epoch, a time of great discoveries and breakthroughs that have for many years determined the accelerated development of scientific principles and advanced applied trends in this field of scientific knowledge.

We bid farewell to a scientist with capital letters, with a world-class personality, but his invaluable achievements in chemistry remain with us. M. G. Voronkov made a sensational discovery – he discovered the high biological activity of certain silatranes, and after his report "Biological Activity of Silatranes" at the 40th Nobel Symposium (Stockholm, 1977) the birth of a new direction in science "Bioorganosilicon chemistry" was declared.

Some of the most important measures of the performance of M. G. Voronkov's scientific school are the training of highly qualified staff and number of publications. Under his leadership more than 140 candidate's dissertations were defended, and among his students there are 35 doctors of science, of which nearly 20 are workers at his institute. The results of his investigations were reflected in more than 3000 scientific papers (200 of which were published abroad), in 37 monographs (15 published in the USA, England, Germany, Japan, and

---

Translated from *Khimiya Geterotsiklicheskikh Soedinenii*, No. 3, pp. 500-505, March, 2014.

other countries), in 60 reviews (including foreign issues), and also in many popular scientific articles. M. G. Voronkov was the author of about 500 inventor's certificates and more than 60 foreign patents. In 2014 the book "Silanones. From Elements to Monomers, Oligomers, and Polymers" will leave the press – this is the first monograph in the world on silanones. Memoirs "On Chemistry and Life (70 Years of Ideas, Investigations, and Accomplishments)" will also be published.

Mikhail Grigor'evich has enriched global chemical science with his fundamental investigations. In the number of publications in the period from 1981 to 1990 M. G. Voronkov took third place among all scientists of the world (Scientist, 1990). In 2001 the name of M. G. Voronkov was included by the International Bibliographic Center (Cambridge) in the book of outstanding intellectuals XXI, and in 2006 his name was included in the reference book "Leading Scientists of the World." According to the most authoritative bibliographic database "Web of Science," as at 03.3.2014 the list of authors of publications on the "Chemistry and Materials Science" specialization (in all 1395 Russian scientists, including those working abroad) gave M. G. Voronkov a citation index of 18115 (Hirsch index 37, <http://expertcorps.ru/science/whoiswho/info/40236>), and he took third place after scientists of other specializations from Ufa (physics of materials) and Michigan University (biomedical materials), [http://expertcorps.ru/science/whoiswho/by\\_branch/chem](http://expertcorps.ru/science/whoiswho/by_branch/chem). This is very significant in so far as the number of scientists in the data base with an index of more than 10 000 is only 15.

M. G. Voronkov was born on December 6, 1921 in Orel. In 1938 he entered the chemical faculty of Leningrad State University (LGU). In July, 1941, he joined the ranks of protectors in the Leningrad blockade as volunteer, but in December he was demobilized after suffering from concussion. In 1942 he was evacuated to Sverdlovsk, where he graduated early from university, and he then went as post graduate to the Institute of Organic Chemistry, Academy of Sciences of the USSR, which at that time had moved to Kazan. Returning to LGU, he worked as assistant lecturer and then as senior scientist (from 1944), group leader (1954), and head of the laboratory at the Institute of the Chemistry of Silicates, Academy of Sciences of the USSR (1959), where he completed his doctoral thesis (1961).

On the personal invitation of the director of the Institute of Organic Synthesis, Academy of Sciences of the Latvian SSR, S. A. Giller in 1961 Mikhail Grigor'evich moved to Riga, where he headed the laboratory of organoelement compounds. Back in Leningrad the element "SULFUR" was the first with which he became acquainted in class 10 while assisting at the department of chemistry of the M. N. Pokrovskii Pedagogical Institute next door to the school. He continued the "sulfur" theme in Riga, and this led to the discovery of previously unknown classes of organic compounds of sulfur and many new reactions, one of which was assigned his name – the "Voronkov reaction". His second greater love became "SILICON." At that time in conjunction with G. I. Zelchan and E. Ya. Lukevics M. G. Voronkov first synthesized and began to study a new unusual class of silicon compounds with an extended coordination number, which Voronkov called "silatranes." This term quickly became generally accepted and was widely used worldwide. All three chemists became authors of the book "Silicon and Life" (Riga, 1971 and 1978), which was republished in many countries of the world. At this time M. G. Voronkov acknowledged three important directions of scientific activity: chemistry, biochemistry, and pharmacology.

In 1969 the director of the Novosibirsk Institute of Organic Chemistry, Siberian Branch of the Academy of Sciences of the USSR, N. N. Vorozhtsov proposed M. G. Voronkov as head of the A. E. Favorsky Irkutsk Institute of Organic Chemistry (IrIOC) in the Siberian Branch, Academy of Sciences. To his question to the President of the Siberian Branch, Academy of Sciences "Am I not too young for such an elevated position?" Academician M. A. Lavrent'ev replied that this was the best age for a director. (Mikhail Grigor'ev was at that time 48 years old.) At that time the number of Voronkov's ideas and plans no longer fitted the facilities for their experimental verification and realization. This prompted him to replace the comparatively small laboratory in Riga by an enormous academic institute in remote Siberia. As it happened the Irkutsk institute bore the name of A. E. Favorsky, who was official supervisor of the post-graduate Voronkov at the Institute of Organic Chemistry, Academy of Sciences of the USSR.

Having started work in Irkutsk, M. G. Voronkov wanted to expand considerably the scientific potential of the institute. For this purpose he first reorganized the work of young and promising local scientists and then invited "varyags" from Riga, Leningrad, Kishinev, and Novosibirsk. New laboratories were also created at the institute.

The laboratory of biological activity (A. T. Platonov) made it possible to realize a long-standing dream of Voronkov – to carry out fundamental research on the biological activity of organosilicon compounds in a vivarium. The results of this research over many years were reflected in the monograph of M. G. Voronkov and V. P. Baryshok "Silatranes in Medicine and Agriculture" (Novosibirsk, 2005).

The laboratory of structural chemistry (V. A. Pestunovich) significantly increased the contribution of theoretical investigations to the scientific output of the institute. On the basis of theoretical data (NMR and IR spectroscopy) the theory of a three-center hypervalent bond was developed for the compounds of pentacoordinated silicon (silatranes). The  $\alpha$ -effect for geminal groups was studied in detail for chlorine-containing organoelement compounds by  $^{35}\text{Cl}$  NMR, and this was included in the monograph of V. P. Feshin "Geminal Interaction in Organic and Organoelement Chemistry" (Yekaterinburg, 2009).

Work at the laboratory of organic compounds of sulfur (V. A. Usov) was reflected in the monograph "Reactions of Sulfur with Organic Compounds" (Novosibirsk, 1979), which was also published in the USA and England. By a resolution of the Department of Chemical Sciences, Academy of Sciences of the USSR, the institute was nominated the leading institute for research in the field of organic compounds of sulfur.

The laboratory of organoelement materials for microelectronics (R. G. Mirskov) developed the novel at that time technology for plasma-chemical deposition of thin films for integrated circuits in microelectronics.

The laboratory of polymerization processes (V. Z. Annenkova) discovered a "path to life" to feracryl – the parent of a new generation of hemostatic agents with a broad spectrum of pharmacological activity, which effectively heals cuts, wounds, and burns. It was used successfully in many of the nation's medical establishments (including use in a military hospital (where the wounded from Afghanistan were treated).

In the laboratory of organic synthesis (V. A. Lopyrev) original methods were developed for the utilization of highly toxic rocket fuel (heptyl), and investigations were conducted in the interests of the Russian naval fleet.

The laboratory of organochlorine compounds (A. N. Mirskova) created new biostimulants that proved so effective for the development of agriculture that a resolution was adopted at government level on the construction of a new experimental biotechnological body.

The following laboratories were also created with the support of Voronkov: phytochemistry (V. A. Babkin), the work of which led to the development of a whole series of technologies relating to pulp and paper and hydrolysis production and also pharmaceutical and veterinary products; natural compounds (A. A. Semenov) – for fundamental investigations of medicinal plants from Western Siberia and Mongolia, leading to the creation of original pharmaceutical agents for the treatment of many intractable diseases; the chemistry of carbofunctional compounds (A. S. Medvedeva), in which a technology was developed for bleaching sulfate pulp with the use of enzymes avoiding the use of molecular chlorine; means for the chemicalization of agriculture (E. N. Deryagina), in which new effective pesticides were developed; technological facilities (V. K. Stankevich) for pilot production of the products created at the institute.

In the new post M. G. Voronkov expanded the directions of research at the institute not only by creating new structures but also by updating the operation of the old laboratories. Thus, he substantially increased the work level of the institute on the basis of three principles: the fundamental nature of the studies, the originality of the investigations, and their assimilation into the national economy. M. G. Voronkov encouraged in every way possible researches resulting in practical applications, and for this reason the institute annually produced between 30 and 40 inventor's certificates. At the institute dozens of various medicinal products were produced and developed to pharmaceutical form. In fact modern scientific concepts in many fields of chemistry were developed by M. G. Voronkov's school. For instance, the theory of hypervalent compounds of silicon has been recognized and put into practice by the chemical community throughout the world.

M. G. Voronkov's investigations in the region of heteroorganic compounds have been summarized in 37 books published in the USSR, Russia, USA, England, and other countries including: with co-author E. Ya. Lukevics, "Organic Insertion Reactions of Group IV Elements" (New York, 1966) and "Organosilicon Heteropolymers and Heterocompounds" (Plenum Press, 1970); with V. P. Mileshekevich, "The Siloxane Bond" [in Russian] (Nauka, 1976); with E. A. Maletina, "Heterosiloxanes" (London, 1991 and 1992); and with A. N. Egorochkin "Electronic Structure of Organic Compounds of Silicon, Germanium, and Tin [in Russian] (Novosibirsk, 2000).

In 1966 M. G. Voronkov was elected corresponding member of the Academy of Sciences, Latvian SSR and in 1970 active member of the Academy of Sciences of the USSR (now Russian Academy of Sciences).

M. G. Voronkov's contribution to the development of national science, industry, medicine, and agriculture was marked by many high scientific titles, prizes, and awards. In 1981 he was awarded the State Prize of the Ukrainian SSR for the creation and introduction of polymolecular organosilicon compounds, in 1983 he received the title "Honorable Chemist of the USSR" and his name was entered into the book of Honor of the Ministry of Chemical Industry of the USSR, in 1986 he was awarded the silver medal at the Exhibition of Achievements in the National Economy of the USSR (VDNKh) for successes in the development of the national economy, in 1991 he was awarded the prize of the Council of Ministers of the USSR for the creation of organosilicon materials for microelectronics and a special ceramic, in 1996 he was awarded the "300 Years Russian Fleet" medal and the Zhukov medal, in 1997 he was awarded a State Prize of the Russian Federation for the creation and development of the chemistry of pentacoordinated silicon, in 2003 he was awarded the A. N. Nesmeyanov prize for theoretical investigations in the region of organic chemistry of group 14 elements, and in 2009 he was awarded the D. I. Mendeleev prize for outstanding scientific results in the region of science and technology. M. G. Voronkov's work was recognized many times by diplomas and badges from various ministries and departments of the USSR and Russia. From 1972 the most topical practical achievements of the institute were displayed at the Exhibition of Achievements of the National Economy of the USSR, where 10 medals were received.

M. G. Voronkov was a veteran of the Great Patriotic War, took part in the defense of Leningrad, and was awarded orders of the Great Patriotic War class II, the Red Banner of Labor, the Friendship of Peoples, For Merit to the Fatherland Class IV, and 18 medals. By decree of the President of the Russian Federation in 2008 he was awarded the Order of Honor for advances achieved and for many years of productive work.

From the very beginning of his work M. G. Voronkov aimed to bring the institute into international science. He directed scientific investigations conducted in conjunction with foreign institutes and universities. Since 1971 the institute has been visited by more than 80 foreign students and also by trainees from more than 10 countries. The international recognition of M. G. Voronkov's scientific services was recognized in his election as member of the Latvian Academy of Sciences (1992), corresponding member of the Braunschweig Scientific Society (Germany, 1976), doctor honoris causa (Poland, 1975), and member of the chemical societies of Japan and Latvia. He was also elected member of the international society for environmental research and health care "SIREs" (France), full member of the Asiatic-Pacific Ocean Academy of Materials (1998), and honorary member of the Florida Center of Heterocyclic Chemistry (USA, 1998). For outstanding contribution to world science M. G. Voronkov received the title of honorary professor at Ulan-Bator university (2000), and honorary member of the Mongolian Academy of Sciences (2008), and in 2010 he was awarded the international A. Einstein prize for outstanding contribution to science and industry. As member of the organizing committee and plenary speaker M. G. Voronkov took part in nearly all the international symposia on organosilicon chemistry and the chemistry of organic compounds of sulfur and also in many foreign international conferences, including American ones. M. G. Voronkov was member of three foreign academies. He was awarded the order of the Pole Star and a "Friendship" medal by the great people's khural of the Mongolian Peoples' Republic and also medals of the Mongolian Peoples' Republic Academy of Sciences and Gdansk Medical Academy.

M. G. Voronkov's great scientific work was combined with great scientific managerial and social activity. For a quarter of a century (1970-1994) he directed the Irkutsk Institute of Organic Chemistry, Siberian

Branch, Russian Academy of Sciences. From 1982 to 1989 he was employed as general director of the science and production association Khimiya. From 1965 he was vice-president of the science council of the Science and Technology Committee of the USSR (later the Ministry of Industry, Science, and Technology, Russian Federation) on "Chemistry and Technology of Organic Compounds of Sulfur." He was member of three departments and two science councils of the Russian Academy of Sciences.

M. G. Voronkov was one of the organizers and then Editor-in Chief of the journals "Bulletin of the Academy of Sciences of the Latvian SSR, Chemistry Series" and "Siberian Chemical Journal." He was compiler and editor of the six-volume collection "Chemistry and Practical Application of Organosilicon Compounds" (Leningrad, 1958, 1961) and of the collection "Advances of Organosilicon Chemistry in the USSR" (Moscow, 1988), published in English. He was member of the editorial board of the international journals "Journal of Organometallic Chemistry" , "Synthesis and Reactivity in Inorganic and Metal-Organic Chemistry" , and also the international electronic chemical journal "ARKIVOC."

Throughout his working life he always had a sense of humor. It was this that helped him as co-author to write amusing books "On Chemistry with a Smile or the Elements of Jocular Chemistry" (St. Petersburg, 1999) and "On Chemistry and Chemists in Jest and in Earnest" (Moscow, 2011), which have already become a bibliographic rarity.

This is far from a full list of his achievements reflecting his "modest" contribution to human civilization.

While possessing huge work capacity, an abundance of original ideas, a breadth of scientific curiosity, great erudition, inexhaustible humor, and an affable character, Mikhail Grigor'evich was afraid of not being able to achieve what he had planned and therefore worked restlessly right up to the end of his days. In the second half of last year he had sent to press the two books already mentioned, and literally in the few hours before his death he had corrected an article for a scientific journal. One can only be surprised by the enthusiasm with which he wrote these books despite his age and certain problems with his health.

Mikhail Grigor'evich was a person and scientist of such caliber that stood abreast of the caliber of the age, a age of great and momentous discoveries in science. Thanks to the scope of his creative interests and the enormous trail left in intellectual activity M. G. Voronkov really became a symbol of contemporary chemistry.

Mikhail Grigor'evich was an outstanding personality whose remarkable gift as organizer, exceptional strength of spirit, natural optimism, and steadfastness of convictions will always arouse the genuine respect of his colleagues, students, and followers. He has left a brilliant trail not only in science but also in the souls of many people who were lucky enough to work or meet with him. And if he understood that he was talking with a person who was honestly and truly engaged in science it didn't matter to him whether he was communicating with a student or an academician. Mikhail Grigor'evich always remained true to his principles: democracy, kindness, and a comradely and friendly attitude to all colleagues irrespective of their rank.

Mikhail Grigor'evich talked magnificently, acted magnificently, wrote magnificently, and created magnificently. This brilliant crystal, which is what he was, had many facets of talent, and we all stood in the brilliance of these excellent qualities.

We have lost a person of amazing caliber, amazing energy, and amazing scientific results. We are proud of the fact that we were his colleagues and lived at the same time as him.

**B. A. Trofimov,**  
**Academician of the Russian Academy of Sciences,**  
**Director of the A. E. Favorsky Institute of Chemistry,**  
**Siberian Branch, Russian Academy of Sciences**

**S. N. Tandura,**  
**Doctor of Chemical Sciences, Leading Researcher,**  
**N. D. Zelinsky Institute of Organic Chemistry,**  
**Russian Academy of Sciences**

The Editorial Board of "Chemistry of Heterocyclic Compounds" and colleagues at the Latvian Institute of Organic Synthesis profoundly mourn the sudden demise of worldwide renowned chemist Mikhail Grigor'evich Voronkov and convey their sincere condolences to his family, relatives, near ones, and colleagues.

For nine years Mikhail Grigor'evich directed the laboratory of organoelement compounds at the Institute of Organic Synthesis of the Latvian Academy of Sciences, Latvian SSR. Having headed the Irkutsk Institute of Organic Chemistry, Siberian Branch, Academy of Sciences of the USSR in 1970 M. G. Voronkov continued to follow the successes of the Latvian organic chemists in Riga with great interest, particularly for investigations in the field of organoelement compounds, at the early stages of which he stood.

Nobody that knew him could be indifferent to this unexpected and huge loss. A person devoted to science has passed away, a man of the age has departed...

The vivid memory of Mikhail Grigor'evich Voronkov will always remain in our hearts.