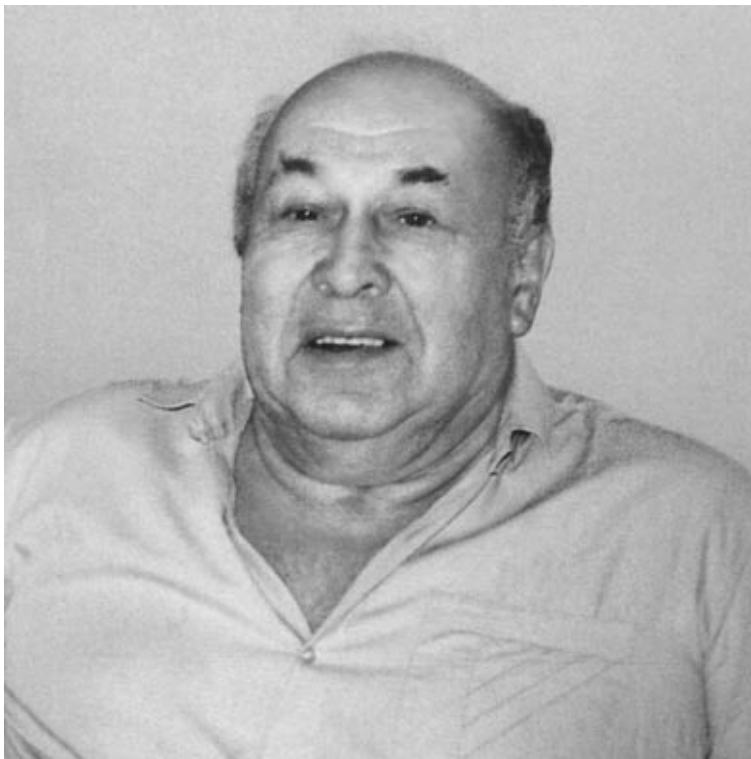

PEROXIDES-XI

Vilen Lazarevich Antonovskii Memorial



On June 24–26, 2003, in Moscow at the Semenov Institute of Chemical Physics of the Russian Academy of Sciences, the XI International Conference on the Chemistry of Organic and Organoelement Peroxides was held. In the introduction to the Book of Abstracts of this conference (Peroxides-2003), V.L. Antonovskii wrote, “In the field of peroxide chemistry now and in the nearest future, further studies of the role of peroxides in normal and pathological biochemical processes, as well as in ecochemical systems, are the most promising.”

Professor Antonovskii was the organizer of this successful conference. There were 11 plenary lectures, 63 reports, and 109 poster presentation on the synthesis, physical chemistry, and biochemistry of peroxides. Proceedings of the conference are published in this issue of the journal.

Antonovskii was born on January 31, 1928, in Odessa. In 1945, he was admitted to the Faculty of Chemistry at Moscow State University and graduated in 1950 from the Department of Chemical Kinetics (the head of which was Academician N.N. Semenov). After graduating from Moscow State University, he started to work as a chemical engineer at the

Novokuibyshevsk Oil Refinery, which was under construction at that time. In 1956, he graduated from the extramural school of the Department of Philosophy of Moscow State University.

After returning to Moscow, he became a graduate student at the Department of Chemical Kinetics of the Faculty of Chemistry, and in 1958 he defended his candidate's dissertation, “*A Study of the Relationships between the Structure and Reactivity of Hydrocarbons in Radical Processes Using Tritium.*” His advisor was I.V. Berezin. In 1968, he defended his doctoral dissertation, *A Study on the Chemistry of Organic Peroxides*. In 1968–1974, he worked at the Institute of Biochemistry and Microorganism Physiology in Pushchino of the USSR Academy of Sciences. From 1974, he worked at the Institute of Chemical Physics of the USSR Academy of Sciences. In 1991, he became a professor.

The first papers by Antonovskii published in 1951 dealt with the kinetics and chemistry of gas-phase propane oxidation. He managed to interpret the nature of the negative temperature coefficient of oxidation and proposed the idea of the isomerization of peroxy radicals in the gas phase. In his candidate's work, he developed a method for the study of reactivity of organic

compounds in the liquid phase using the radioactive isotope of hydrogen.

At the Novokuibyshevsk Oil Refinery, which was under construction at that time, Antonovskii was very active and creative. Thanks to his nonstandard way of thinking, initiative, and knowledge, he did his best to solve complicated engineering problems associated with putting new equipment into operation. At the Novokuibyshevsk Division of the Research Institute of Synthetic Alcohols, he was the head of the laboratory and carried out research studies on the kinetics and mechanism of the technological process of combined phenol and acetone synthesis to improve this process.

The intermediate product of this process was cumyl hydroperoxide, and Antonovskii became interested in this class of compounds. By that time, the Soviet chemical industry produced only two peroxides (cumyl peroxide and benzoyl peroxide), whereas foreign companies produced several dozens of peroxides. Knowing the state of the art in Soviet and foreign industries, Antonovskii proposed and did everything in his power to create a laboratory of organic peroxides. There were many obstacles because these chemical compounds are explosive and create fire hazards. However, in 1963 the laboratory was founded and Antonovskii became its head. He started extensive studies on the development of technology for obtaining the most important peroxides for Soviet industry. The work was carried out in comprehensive fashion. As a result, Antonovskii developed scientific grounds for producing organic peroxides. Extensive studies into perester pyrolysis, condensation reactions of the peroxide group with alcohol and carboxylic groups, and condensation reactions of the peroxide group with carbonyl compounds made it possible to elucidate the detailed mechanism of these processes and develop new ideas in the field of peroxide chemistry. Antonovskii codeveloped 13 new processes for the synthesis of peroxide initiators. We can state that he is the founder of a scientific school on the synthesis, kinetic and mechanistic study, and technology for manufacturing organic peroxide compounds in our country. Antonovskii has many followers. He supervised six candidate's dissertations in the field of peroxide chemistry.

The laboratory of organic peroxides at the Research Institute of Synthetic Alcohols (now the All-Russia Research Institute of Organic Synthesis) proved to be one of the most viable during the economical crisis in Russia. Until recently, Antonovskii was a permanent consultant for the researchers of the laboratory who still work on the development of new peroxide initiators. When Antonovskii started to work at the Institute of Biochemistry and Microorganism Physiology, he became interested in biochemistry. He applied his knowledge of the kinetics and mechanisms of enzymatic reactions to biochemical studies and developed new promising research directions in molecular biology: kinetics and mechanism of enzymatic catalysis

and physical chemistry of nucleic acids. The largest success was gained due to the NMR study of the nature of forces and the structure of complexes formed in the course of the reactions of nucleic bases in aqueous solutions. This study made it possible to find new approaches to explaining the mechanism of action of heterocyclic antitumor preparations.

The Semenov Institute of Chemical Physics of the USSR Academy of Sciences (and then Russian Academy of Sciences) became the center of the study and applications of organic peroxides due to Antonovskii's enormous activity. It is among the institutions that have carried out systematic studies of the chemistry, kinetics, and engineering aspects of synthesis of hydroperoxides, dialkyl peroxides, peroxides of ketones and aldehydes, peroxyketals, diacyl peroxides, and peroxyesters; kinetic and mechanistic studies of organic peroxide thermolysis; and application studies of the peroxides as polyester resin hardeners, polymer structuring agents, and polymerization initiators. In the 1990s, hard years for Russian science, Antonovskii found new methods and approaches to the conditions and, together with colleagues, continued active work on peroxide chemistry. He carried out X-ray structural and quantum chemical studies of organic peroxides and studies of their spectral and electrochemical characteristics. *Ab initio* quantum chemical methods were used to study the structure and conformational lability of peroxides and peroxy nitrates.

Complex studies of the mechanism of biological action on plants and electron transport in chloroplasts, as well as on the enzymatic systems of organic peroxides, herbicides, and others, were carried out. The relationships of the structure and kinetics of the reactions of peroxides were studied *in vitro*. Together with the Russian Scientific-Production Complex of Cardiology of the Ministry of Health of the Russian Federation, he studied the transformations of hydroperoxides in the systems of enzymatic regulation of hydroperoxide metabolism.

Antonovskii's research was close to practical work. Together with the OAO Research Institute of Elastoplastic Materials, Antonovskii studied the pathways of free radical processes in the technology of rubber. This study showed that the application of peroxides finds new pathways for vulcanization and modification of rubber. When solving practical problems, Antonovskii considered environmental safety the first priority. Thus, he showed that, in the manufacturing of mold cores and molds (large-scale processes), it is more environmentally friendly to apply organic peroxides than hydrogen peroxide.

In his last years, Antonovskii paid much attention to the environmental chemistry of atmosphere and the special role of peroxides. One of his monographs was devoted to peroxy nitrates, one of the components of photochemical smog, which has a negative effect on human and animal health. He readily devoted his lec-

tures to the environmental chemistry of the atmosphere (Volgograd, Ufa, Kemerovo, Kazan, and other cities).

Antonovskii spent a great deal of time on the organization of science. In the USSR State Committee on Science and Technology, he was the head of the Commission on Peroxide and Other Radical Initiators and coordinated fundamental and applied papers in this field. Antonovskii was a member of the Section of Kinetics of the Scientific Council on Chemical Kinetics and Combustion of the USSR Academy of Sciences for more than 20 years, as well as a member of other scientific councils. He was a member of the International Academy of Creativity.

Over many decades he was a member of the organizing committee of conferences on peroxides, and in 1998 and 2003, he was the organizer and chairman of X and XI International Conferences on the Chemistry of Organic and Organoelement Peroxides held in Moscow at the Institute of Physical Chemistry of the Russian Academy of Sciences.

Antonovskii received the Award of the Mendeleev All-Union Chemical Society for his research work. He is the author of 11 monographs, more than 400 research papers, 27 inventor's certificates and patents of the Soviet Union, Russia, Great Britain, and FRG, and several educational brochures. He wrote several monographs together with Margarita Mikhailovna Buzlanova, who was his wife, a friend, and a fellow researcher.

Antonovskii's papers are characterized by their complex and comprehensive approach and are recognized in our country and abroad. In the last five years, 41 of his papers were cited 91 times in the A-skic form; 12 of his papers, 20 times in the A-skyc form.

His research projects were supported by grants from the Russian Foundation of Basic Research.

Antonovskii was a highly qualified and erudite person. At the same time, he was very sociable, affable, and well-disposed. He had quick wits and a good sense of humor. He had many friends in Russia and CIS countries (Azerbaijan, Armenia, Byelorussia, and the Ukraine). He helped several generations of his followers to become scientists.

An accident tragically interrupted the life of this talented scientist, active enthusiast, organizer of science, and kind and responsive man. Antonovskii had just held the conference on peroxides, was awaiting the publication of the new monograph *Fizicheskaya Khimiya Organicheskikh Peroksidov* (Physical Chemistry of

Organic Peroxides), and was planning new studies. Russian science and his family, colleagues, and disciples have suffered a great loss.

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