

## **ANNIVERSARIES AND DATES**



### **NIKOLAI SERAFIMOVICH ZEFIROV SEVENTIETH BIRTHDAY**

Nikolaev Serafimovich is a distinguished Russian scientist working in the field of organic and medical chemistry. The range of his interests and the subjects of his investigations include organic synthesis, stereochemistry, conformational analysis, the theory of reaction mechanisms, mathematical chemistry and computer synthesis, and investigation of the quantitative relationships between structure and biological activity of organic compounds.

N. S. Zefirov was born on September 13, 1935 in Yaroslavl. He followed a brilliant path from schoolboy – a gold medallist – to Academician of the Russian Academy of Sciences, finishing at the Chemical Faculty of Moscow State University (1958), becoming Doctor of Chemical Sciences (1966), Professor (1973), and head of the Department of Organic Chemistry of Moscow State University Chemical Faculty (1994), Corresponding Member of the Academy of Sciences of the USSR (1981), and Academician of the Academy of Sciences of the USSR (1987). Since 1989 Academician Zefirov has worked as director of the Institute of Physiologically Active Substances of the Russian Academy of Sciences.

Zefirov has been the author of more than 1300 scientific publications, five monographs, numerous patents, and a discovery registered at the registry of the USSR.

The scientific activity of Academician Zefirov has received worldwide recognition. Of fundamental significance for chemical science was the discovery of the competitive binding of nucleophilic anions in carbocationic processes, which radically changed ideas about nucleophilicity as the most important concept in

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chemistry. This discovery gave a powerful thrust to the development of organic synthesis, and more than 20 new previously unknown reactions and unique structures like organic perchlorates, chlorine chlorosulfates, compounds with an inert gas–carbon bond, and others were discovered. It formed the basis of research into the creation of tests for various types of drug addiction; tests were created for the detection of drug addiction types by an extremely simple procedure that can be used in medical establishments at any level.

In addition, this effect has been used as the basis of a series of technological processes (a State Prize of the USSR in 1989).

Zefirov introduced into the practise of organic synthesis a series of fundamentally new reagents (hypervalent compounds of iodine, selenium, and tellurium; halo- and nitrosulfates; xenon carboxylates; new fluorinating agents, etc.), and the widely used reagent that in the world chemical literature was named Zefirov reagent.

Zefirov is one of the founders of the Russian School of Mathematical Chemistry and Computerized Molecular Design, a field of science on which the creation of substances with previously designated properties in the modern world is based.

In the last five years Zefirov and his coworkers have obtained fundamental results in the fields of organic synthesis and of reaction mechanisms, mathematical chemistry, and medical chemistry. Among them some of the most important and practically significant are the following:

✧ Methods of mathematical chemistry that form the basis of molecular modelling of the structure and action of a series of most important human receptors and computer design of their potential ligands were developed. A patent was obtained for a new drug for the treatment of Alzheimer's disease, with a mode of action that differs fundamentally from all previously described products.

✧ Methods of molecular docking were developed for the investigation of ligand–protein interactions in protein structures, making it possible to predict binding of chemical compounds with receptors on the basis of a virtual experiment. Leader compounds with a unique range of neuroprotector and cognition-enhancing characteristics were discovered (IP-5051 and IP-9040).

✧ An effective synthesis was developed for the effectors of glutamate receptors and, primarily, antagonists of NMDA receptors and positive modulators of AMPA receptors; for this purpose new methods were developed for the synthesis of large series of compounds of several classes, exhibiting high calcium-blocking and anti-NMDA activity, i.e., potential neuroprotectors.

✧ A model of neurodegenerative processes was created and was used to develop a synthesis for heterocyclic neuroprotectors that are promising for the treatment of Alzheimer's and Parkinson's diseases.

✧ An approach was made to solution of one of the most important ecological problems of modern times, i.e., reduction of the amount of technogenic carbon oxides in the atmosphere. A technology for the continuous conversion of carbon dioxide into propylene carbonate, using new-generation phthalocyanine complexes as original catalysts, was developed, patented, and prepared for practical application.

✧ Methods were developed for the controlled synthesis of cyclic tetrapyrrole compounds, which are highly important for industrial chemistry (Government Prize of the Russian Federation, 2003).

Academician Zefirov created his own scientific school. He prepared more than 65 candidates of sciences, and 15 of his students have become doctors of science. His students work with him at the Institute of Physiologically Active Substances, Russian Academy of Sciences, in the Laboratory of Organic Chemistry at the Chemical Faculty of Moscow State University, and in the Laboratory of Mathematical Chemistry and Computerized Synthesis at the Institute of Organic Chemistry of the Russian Academy of Sciences.

On the initiative of Academician Zefirov the Scientific Study Center of Medical Chemistry, based on the Chemical Faculty of Moscow State University and the Institute of Physiologically Active Substances, was created.

Alongside his concentrated scientific and pedagogical activity Zefirov is involved in energetic scientific management activity. He is head of a series of scientific councils and societies.

The scientific management and pedagogical activity of Academician Zefirov has been highly appraised. He was awarded the Order of the "Badge of Honor" (1985), the Order of the People's Friendship (1995), and the order of Honor (2001); he has more than once been awarded the prize of the D. I. Mendeleev Chemical Society, and also the Lomonosov prize and the medal of M. V. Lomonosov Moscow State University (1983), the prize of the Butlerov Russian Academy of Sciences (1994), the Chemical Structure Association Trust Award (1993), the Government award of the Russian Federation in the field of science and technology (2002), the Humboldt Foundation prize (Germany, 2003), and a series of other awards.

Zefirov has several honorary titles, including Full Member of the Russian Academy of Natural Sciences, the Russian Academy of Informatics, the international academy "Assembly on the Use of Iodine," Honorary Academician of the Bashkirostan Academy, and Honorary Professor at Middle West University, USA.

Zefirov is a scientist with a worldwide reputation; in particular, his accomplishments are recognized in the fact that he is a member of the editorial teams of the most prestigious chemical journals; for many years he has been a member of the editorial team of our journal "Chemistry of Heterocyclic Compounds."

The editorial board of the "Chemistry of Heterocyclic Compounds" wish the birthday celebrant long years of creative and happy life, new successes and achievements, good health and happiness, and fulfilment of his ideas and aspirations – and many years of our continued collaboration.

#### **MAJOR PUBLICATIONS BY N. S. ZEFIROV FOR THE LAST 10 YEARS**

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