

ANNIVERSARIES AND DATES



On the 95th birthday of
Afanasii Andreevich AKHREM

1st February 2008 was the 95th birthday and the 60th year of scientific work of Academician of the Belarus National Academy of Sciences (1970), laureate of the State Prize of the Belorussian Soviet Socialist Republic (1988), honored scientist of the BSSR (1983), outstanding scientist and organizer of science Afanasii Andreevich Akhrem.

Afanasii Andreevich was born in the village of Uruch'e, Vileisk district, Minsk region. His scientific career began in the Belorussian Polytechnic Institute from which he graduated in 1934. He began to work in the Department of Organic Chemistry under the leadership of Academician of the Academy of Sciences of the BSSR, corresponding member of the Academy of Sciences of the USSR N. A. Prilezhaev. Research of novice scientist was prevented by war. For his war service and his manifest heroism in the Great Patriotic War Afanasii Andreevich was awarded the order of the Red Banner (1943) and medals of the Patriotic War of the 2nd (1944) and 1st degree (1945).

In 1945 A. A. Akhrem became an aspirant under the leadership of Academician I. N. Nazarov in the Laboratory for Unsaturated Compounds of the N. D. Zelinsky Institute of Organic Chemistry, USSR Academy of Sciences, where he undertook a cycle of studies on the oxidation of α,β -unsaturated carbonyl compounds, which served as the subject of his candidate's dissertation. A. A. Akhrem thesis for a doctor's degree was connected with the study of steroidal hormones, which was the subject of further study in the Corticosteroid Laboratory, created by him in the N. D. Zelinsky Institute of Organic Chemistry. The distinctive marks of the scientific and organizational work of Afanasii Andreevich are: creativity and innovation, scientific sagacity and civil courage, skill in detection, establishment, and involvement in the solution of scientific and industrial problems of young researchers, constant focus on the solution of important problems of the theory and practice of organic chemistry and the introduction of results into practice.

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The first considerable contribution to the theory of organic chemistry and the chemistry of steroids was the discovery of the anionotropic rearrangement of glycidic oxides of steroids, later called the Akhrem rearrangement.

The observation by A. A. Akhrem and his co-workers of the mobility of double bonds in cyclic dienes was recognized as discovery in 1976. Investigations in the synthesis of steroids and their analogs, alkaloids and other classes of biologically important substances with the objective of creating physiologically active materials with predetermined properties led to the preparation of steroidal pentaranes with high contraceptive activity, analogs of doisyonic acids with high estrogenic and anabolic activity, and neurotropic substances effective for the treatment of disturbances of the central nervous systems.

In 1961-1962 A. A. Akhrem worked in the laboratory at Harvard University headed by a Nobel Laureate R. B. Woodward and then in the Stanford University headed by K. Djerassi, Laureate of The National Medals in Science and Technology.

In 1970 A. A. Akhrem was chosen a member of the Academy of Sciences of BSSR and began to organize the Institute of Bioorganic Chemistry of the Belarus National Academy of Sciences. (1974). This stage of the scientific organizational activity of Afanasii Andreevich coincided with the turning point into the development of the science of life, with a change to the study of the mechanism of vitally important processes at the molecular level, with the comprehensive use of physico-chemical methods for the study of the structures of substances and processes underlying the basic the metabolic processes of organisms and functioning of living systems, and the creation of new methods of investigation and a new scientific discipline – bioorganic chemistry.

With his great scientific-technical and experimental experience in the field of low-molecular bioregulators (steroids), and possessing an exclusive sensitivity for the novel, Afanasii Andreevich clearly determined the basic directions for the new Institute in correspondence with the real problems of the new discipline – bio-organic chemistry: study of biopolymers (proteins, enzymes, nucleic acids) and low-molecular bioregulators (steroids, steroidal glycosides, ecdysones, peptides, phospholipids, prostaglandins, and their synthetic analogs).

Study of the chemistry of steroids, which was traditional for A. A. Akhrem, was concentrated on the development of new methods for the partial and complete synthesis of steroids and substances with related structures, the investigation of their chemical and pharmacological properties and the establishment of the relation between their structures and activity with the objective of creating substances with targeted physiological effects. Studies by A. A. Akhrem and his co-workers on the chemistry of natural steroids carried out at the Institute of Biorganic chemistry of the National Academy of Sciences of Belarus placed it at the forefront of world science – the synthesis and study of insect and plant hormones – ecdysones and brassinolides. The use of cyclic azomethines and α -acylcyclane- β -diones as valuable synthons permitted the development of effective methods for the synthesis of heterocyclic analogs of steroids – 8-azasteroids, which have high immunomodulating activities. In these scientific-practical developments A. A. Akhrem and his co-workers coupled the use of multipurpose multifunctional block-synthons in the total synthesis of natural compounds and observed a series of new reactions and regularities. The results of these studies were introduced into the daily practice of organic synthesis (synthesis of pheromones, prostaglandins, steroids, and their heterocyclic analogs, alkaloids), triacylmethanes, and natural β -difunctional compounds. Investigation of α -acyl- β -amino-vinylcarbonyl compounds of the 8-azasteroids led to the observation of balanced electrotopic isomerism, which by analogy with valent tautomerism is defined as mesomeric tautomerism. The brilliant confirmation of the correctness of Afanasii Andreevich consist in the results of his last studies and achievements of pupils and colleagues in discovery of *keto-enol* tautomerism of β -di- and β,β' -tricarboxyl compounds, which realize on background of polarization and isomerization dynamics of the mesomeric anions and establishment of the mechanism of the annelation of cyclic Schiff's bases of β -di- and β,β' -tricarboxyl compounds.

Biosynthesis and the biological effects of steroid hormones are closely linked with steroid-protein interactions and their complex formation with bonding ("transporting") proteins of the blood. Of especial value in this respect is the establishment of the chemical structures and the biological role of hormone-bonded glycoproteins. As a result of these studies A. A. Akhrem and his co-workers developed the methods for the isolation of specific hormone-bonded proteins of the blood, and carried out comparative studies of the properties of these proteins in dependence of the sex and physiological state of the organism, estimated their amino acids and carbohydrate composition and the thermodynamic parameters of the ligand-protein interaction. They obtained important results on the nature of the interaction of proteins with steroids in complexes and the structural organisation of the bonding centers of the proteins, and studied the molecular aspects of the reception which is the basis of the transfer of biological information by low-molecular bioregulators.

An important place in the studies of A. A. Akhrem and his co-workers is taken by the investigation of the importance in the synthesis and metabolism of steroids of multiple enzyme systems, including cytochrome P-450. Studies in this field led to the isolation and characterization of cytochromes P-450 from different biological tissues, the protein components of multienzyme systems of adrenodoxine, adrenodoxine reductase, NADPH-cytochrome P-450 reductase, cytochrome B₅, determination of the amino acid sequence of cytochrome P-450 from mitochondrial cores of the adrenals, study of the mechanisms of multienzyme hydroxylating systems containing cytochrome P-450, and discovery of the characteristics of electron transport in microsomal and mitochondrial hydroxylating assemblies.

The formation of the mechanism of activation of molecular oxygen by cytochrome P-450 and its analogs was studied. An important place in the biopolymers investigation was connected with the function of the microsomal membranes in the mechanism of hydroxylation and with the role of phospholipids in the activation of cytochrome P-450 and their regulatory functions.

Academician A. A. Akhrem and his co-workers were distinguished with Prizes of the Academies of Sciences of the USSR and the GDR (1988) for their work on the steroid-hydroxylation systems, carried out in conjunction with the Institute of Molecular Biology (Berlin-Buch). Studies of systems containing cytochrome P-450 are currently continuing and producing new important results in the diagnostics and treatment of genetic pathologies and healing.

Interesting results were obtained in the investigation of induced conversions of hydroxyhemoglobin into methemoglobin, generated in some pathologies and interactions of DNA with ligands.

The final aim of fundamental studies of A. A. Akhrem is to put them into practice. For example, investigations of steroid-protein interactions created the scientific basis for the production of diagnostic sets for radioimmunological determination of hormones in biological fluids from human and other creatures, and supported and introduced by the organization at the Institute of Bioorganic Chemistry's Experimental factory (1986) for radioimmunological sets for the determination of hormones, their accompanying proteins and other biologically important antigens. For creating the scientific base and for introducing the radioimmunological kit into diagnostic and medical practice, A. A. Akhrem and his coworkers were awarded the State Prize of the BSSR (1988) and the Institute of Bioorganic Chemistry, AS BSSR became the principal organization for the development of technology and experimental-industrial manufacture of radiodiagnostic sets for the USSR as a whole. In later years Afanasii Andreevich oversaw the development of new generations of media for immunodiagnosics – immunoenzymes and immunofluorescent test-systems.

A. A. Akhrem is distinguished for his exclusive sensitivity to novelty, and his love and devotion to science which determined the originality and the high methodological level of his work. Such creativity and leadership of a large collective by A. A. Akhrem is characterized by a broad scientific view and interest. His interest in the Institute produced the development of the newest methods in physicochemical investigation. Time has confirmed the correctness of the choice by A. A. Akhrem of the direction of the activity of the Institute of Bioorganic Chemistry of the Belarus National Academy of Sciences.

A. A. Akhrem is the author of more than 900 scientific works, including 13 monographs, some of which have been translated abroad and have received world-wide recognition, more than 100 author's certificates and patents. According to *ACI*, Afanasii Andreevich is one of the 100 most cited scientists in the USSR. He has participated in the largest international conferences and meetings, their reports, and has taken part in discussion of all the discussions concerned with the living interest of the college.

A. A. Akhrem made a large contribution to the preparation to scientific cadres. Among these scientists are 25 doctors of science and more than 70 candidates of science, who today work in different scientific centers around the world. Afanasii Andreevich always supported young people in science and paid attention to the work of young researchers.

Afanasii Andreevich carried out such major scientific-organizational work and public activities as Editor-in-Chief of "Izvestiya AN SSSR" (Chemistry Series) and "Vestsi AN Belarus" (Chemistry Series), member of the editorial boards of "Doklady AN Belarusi", "Bioorganicheskaya Khimiya", member of councils of USSR State Committee for Science and Technology and the Presidium of Academy of Sciences of the USSR, and of many other organizations and committees.

The scientific and organizing activity of A. A. Akhrem was noted by a high awards – the Order of Lenin (1976), "The Badge of Honor" (1952) and "Honor" (2004).

At the time of his jubilee A. A. Akhrem became a pensioner, but today he still has his full creative forces, has a prompt interest in new scientific advances, takes feasible participation in carrying out research and where possible carries out important experiments with scientists and colleagues. The judgment of Afanasii Andreevich is regarded with great authority today and his devotion to science is an example for the young.

His-co-workers from the Institute of Biorganic Chemistry of the NAS of Belarus with all one's heart congratulate the highly esteemed Afanasii Andreevich and wish him vigorous strength, warmth and health, and the regard of his countrymen, colleagues, and pupils, a healthy and happy many years of life. Happy Jubilee to you, dear Afanasii Andreevich!

A. L. Mikhalschuk

The editors and editorial board of the journal "Khimiya Geterotsiklicheskikh Soedinenii" (Chemistry of Heterocyclic Compounds) congratulate a hero of the anniversary and wish him all best and many years of life.