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# ANNIVERSARIES AND DATES

## YAKOV LAZAREVICH GOL'DFARB

### (On his 100th birthday)

100 years have passed since the birth of Ya. L. Gol'dfarb (January 6, 1901 to October 28, 1985). He is an eminent organic chemist and prominent expert in the field of heterocyclic chemistry. A man born in the same year as the Twentieth Century, a witness and participant in many of the most important events in the history of Russia, Yakov Lazarevich belonged to that generation of Soviet intelligentsia who had studied directly under the leaders of Russian science and culture, who preserved their admirable traditions and selflessly devoted themselves to the younger generation.

After completing gymnasia and short courses in teaching methods, Ya. L. Gol'dfarb worked as a teacher in a comprehensive trade school in Zhitomir. In 1920-1921, he served in the Red Army, and after demobilization from the Army he went to Moscow to continue his education. While pursuing his studies in the education department of Second Moscow State University and then in the Chemistry division of the Physical sciences and mathematics department of First Moscow State University, Yakov Lazarevich worked at the L. Ya. Karpov Institute, in the Coal Chemistry Laboratory of the Scientific and Technical Administration of the USSR Supreme Council on the National Economy, and he taught chemistry and mathematics in secondary school. Although Yakov Lazarevich early on showed himself to be an independent researcher, he happened to work with remarkable teachers whose influence shaped his broad scope and his choice of specific scientific specializations. Ya. L. Gol'dfarb's thesis was devoted to acylation and alkylation of thiophene in the presence of

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tin tetrachloride (1929) and was completed under the guidance of Professor Georgii Leont'evich Stadnikov (1880-1973), being one of the N. D. Zelinsky's first students, an original and versatile scientist who is known for his papers on the chemistry of amino acids, complex compounds, and fossil fuels. A reviewer of his thesis, Academician N. D. Zelinsky, like his thesis adviser, noted the capability of the young researcher and recommended that he continue scientific work. It is worth mentioning that Stadnikov–Gol'dfarb acylation of thiophene is a classic method, well known to every specialist in the field of thiophene chemistry, and recommended by such an authoritative collection as "Organic Syntheses".

After graduating from the university, Ya. L. Gol'dfarb worked at the All-Union Pharmaceutical Chemistry Scientific-Research Institute, where he developed a synthesis of veronal and started up production of it, and in 1930 he began to work under a grant from the Committee for Introduction of Chemical Methods and Products of the Supreme Council on the National Economy at the Laboratory for Synthesis of Animal and Plant Compounds (LASIN), founded back in 1922 and directed by Academician Aleksei Evgen'evich Chichibabin, for the Commission on Study of Natural Productive Forces (KEPS), Academy of Sciences of the USSR (since 1938, the Laboratory of Heterocyclic Compounds of the Institute of Organic Chemistry, Academy of Sciences of the USSR, now the N. D. Zelinsky Institute of Organic Chemistry of the Russian Academy of Sciences). Ya. L. Gol'dfarb worked to the end of his days in this laboratory, going from post-graduate student (in modern terms) to head of laboratory (from 1945 to 1985).

Despite his brief direct association with A. E. Chichibabin, who soon left for France in connection with the tragic death of his daughter, the influence of the remarkable scientist (one of the pillars of Russian organic chemistry) determined Y. L. Gol'dfarb's activities for many years afterward. For 20 years, the efforts of Yakov Lazarevich were directed toward investigations in the field of the chemistry of nicotine, which had been entrusted to the young scientist by A. E. Chichibabin. In 1936, Ya. L. Gol'dfarb was awarded the academic degree of Candidate of Chemical Sciences without a defense, and in 1946 he defended his doctoral dissertation "Research in the field of nicotine derivatives" and obtained the rank of Professor.

The atmosphere itself at LASIN, the daily contact and (as desired) competition with many representatives of the Chichibabin school working in the laboratory played no less of a role in the formation of Ya. L. Gol'dfarb as a scientist than the subject matter. Among his colleagues, we cannot neglect to mention the remarkable chemist and charming man O. A. Zeide, to whom together with his teacher belongs the honor of discovering amination of pyridine; M. M. Katsnel'son, prominent scientist and excellent organizer who successfully directed the laboratory after the departure of A. E. Chichibabin; and eminent organic chemist N. A. Preobrazhenskii, who as head of his group at LASIN made a decisive contribution to development of a synthesis for pilocarpin. Among the "younger generation" were such very prominent scientists as I. L. Knunyants, G. V. Chelintsev, and also M. I. Kabachnik, who arrived at the laboratory after the departure of A. E. Chichibabin.

An important feature of the work at LASIN in the long-ago 1930's was the organic combination of basic and applied research, and many of the applied research projects were conducted at a very high scientific level. Among the work in which almost all the colleagues participated to some degree, it is sufficient to mention the industrially used original synthesis of vitamin $B_1$ and methods for obtaining antimalarial drugs, based on comprehensive studies of the structure and development of syntheses for key intermediates. The level and style of research at LASIN undoubtedly became a quite irreplaceable school for Yakov Lazarevich, and to a significant degree determined his original scientific "signature".

Ya. L. Gold'farb produced more than 400 scientific publications and about 90 patents. His research touched on a broad range of problems in organic chemistry, especially the chemistry of pyridine, thiophene, and furan. Distinguishing features of his research include exceptionally scrupulous work (it is not for nothing that his colleagues often called Yakov Lazarevich a "jeweler") and unwavering interest in theoretical questions of organic chemistry. Such topics include the problem of the effect of acid–base properties of compounds on their reactivity, the nature and properties of complexes (including chelates, which he considered as unusual

heterocycles). During all his scientific work, Ya. L. Gol'dfarb displayed great interest in conversions of heterocycles into compounds of other series. Never losing sight of potentially useful properties of the synthesized compounds, among these properties he clearly gave preference to physiological activity.

Ya. L. Gol'dfarb's research on nicotine chemistry was especially devoted to studying the relationship between the structure of various transformation products of this alkaloid (aminonicotines, products of opening of the pyrrolidine ring, N-oxides) and their physiological activity, and an important problem was synthesis of compounds which, while retaining the activity intrinsic to nicotine, would lack its high toxicity. In particular, the α-acetylaminonicotine (peracetin) obtained by Ya. L. Gol'dfarb has acquired practical importance as an auxiliary substance in treatment of diphtheria. These investigations are also connected with work on cleavage of saturated N-, O-, and S-heterocycles, and also study of the relative basicity of nitrogen atoms in systems of the α-aminopyridine type and N-alkyl-α-pyridonimines. Yakov Lazarevich concluded earlier than other researchers that for α-aminopyridine, the equilibrium is practically completely shifted toward the amino form.

The outstanding research of Ya. L. Gol'dfarb in the field of thiophene chemistry made the laboratory he directed the leading scientific center in the world in this field. It is important to emphasize that here success was ensured to a significant degree owing to the nontrivial approach: the major attention was not focused on the similarity between the behavior of thiophene and benzene (which had been known since V. Meyer's time), but rather on the reactions differentiating these compounds. Among such conversions, even during his thesis research Yakov Lazarevich's attention was attracted by electrophilic substitution reactions occurring under mild conditions, and also by direct metallation of thiophenes and ring opening processes leading to compounds of other series, especially reductive desulfurization by treatment with skeletal nickel. Based on these reactions, he designed original methods for synthesis of diverse β-substituted thiophenes, sulfides, complex-forming compounds and chelates, and also aliphatic amino acids and macrocyclic compounds.

The chemistry of furan attracted Ya. L. Gol'dfarb with a view toward comparing with thiophene, which made it possible to discover a number of features of the behavior of furan as a heteroaromatic system, to develop original methods for obtaining β-substituted furans that were not easily accessible. Of significant interest are conversions of sulfides in the furan series under Diels–Alder reaction conditions which do not stop at the adduct stage but rather lead to polysubstituted benzenes.

Along with studying specific conversions of heteroaromatic compounds distinguishing them from the benzene analogs, Yakov Lazarevich did not overlook some general problems in the chemistry of aromatic compounds, which he solved for the examples of compounds in the benzene series: the relative activity of substrates and reagents in acylation reactions and especially generation and conversion of lithioarynes.

A distinguishing characteristic of Ya. L. Gol'dfarb was his interest in everything new and progressive in science. Back in the 1940's, in his research he systematically used UV and IR spectroscopy, adsorption chromatography, and later TLC, GLC, NMR spectra, X-ray diffraction and kinetic studies. In the laboratory he directed, quantum-chemical calculations have been widely used in studying the reactivity of heteroaromatic and aromatic compounds since the beginning of the 1970's. Many coworkers at the Institute of Organic Chemistry remembered well the tremendous erudition of Yakov Lazarevich, his clear lectures devoted to topics in heterocyclic chemistry, theoretical problems of organic chemistry, and physiologically active compounds. The great authority of Ya. L. Gol'dfarb was based not so much on his rather modest "regalia" and official position as on his tremendous erudition, uncommon sharpness of mind, and solid moral principles. For everyone who knew Yakov Lazarevich, he remains the paradigm of a man of science, a scientist of inexhaustible creativity, a wise and demanding teacher.

Ya. L. Gol'dfarb was not only a teacher for his co-workers. Over a period of many years, he combined research with teaching in secondary schools and colleges; he was the author of a number of textbooks and laboratory manuals which have served and continue to serve many generations of students and teachers. The tenth-grade organic chemistry textbook that he wrote jointly with V. N. Verkhovskii and L. M. Smorgonskii

from 1932 to 1948 has gone through 13 editions and been translated into 24 languages. The work done by Ya. L. Gol'dfarb in compiling collections of chemistry problems for secondary schools was unprecedented. The first edition of the textbook *Chemistry Problems and Exercises* by Ya. L. Gol'dfarb and L. M. Smorgonskii was published in 1934. Such a book had never before been published anywhere in the world for secondary schools. Over the next 30 years, the book was published in the Russian language 25 times and was translated into 34 national languages of the USSR and some foreign languages. After the death of Professor L. M. Smorgonskii, the book underwent major revisions three times by Ya. L. Gol'dfarb and Yu. V. Khodakov in accordance with changes in the school programs, and from 1965 to 1978 it went through 12 editions; four more editions, published after the death of Professor Yu. V. Khodakov, were revised with involvement of Yu. B. Dodonov (Candidate of Chemical Sciences). The collection of chemistry problems and exercises with which several generations of students grew up had a total printing of about 90 million copies. The "driving force" and chief author of this whole long-term project was Ya. L. Gol'dfarb: thanks to his work and talent as a scientist, teacher, and science popularizer, a book was created whose basic principles have retained their value over a period of more than 60 years through regular updates of the factual material (the last edition was published by the Drofa publishing house in 1999).

The last 20 years of Ya. L. Gol'dfarb's life were closely associated with the work of the journal *Khimiya Geterotsiklicheskikh Soedinenii* (Chemistry of Heterocyclic Compounds); he was a member of the editorial board from the time the journal was founding.

Readers may become acquainted with the life and work of Yakov Lazarevich in more detail in issue No. 6 (1986) of the journal *Khimiya Geterotsiklicheskikh Soedinenii* (Chemistry of Heterocyclic Compounds) which is dedicated to his memory, and also includes a bibliography of his publications.

**L. I. Belen'kii**