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100 Anniversary

The man behind the name: Professor Mikhail Temkin

It is my great pleasure to pay a tribute to my teacher Professor Menassii (Mikhail) Temkin (Fig. 1) in commemoration of his centennial birthday. I worked as a PhD student and a staff member in the Laboratory of Chemical Kinetics at Karpov Physico-Chemical Research Institute in Moscow under his direction for nearly 6 years from 1986 until 1991, the year he passed away. Professor Temkin headed this laboratory for more than 50 years. When I started to do research in his laboratory, there were just 15 staff members, many of them were working with Professor Temkin for several decades, thus I could benefit from lengthy discussions with my supervisor on various scientific and non-scientific topics, being his only PhD student at that time and as it happened the last one. I still remember his very explicit phrase: "You are my PhD student; therefore, I have to teach you".

Interestingly enough despite the very large age difference, he and other colleagues at Karpov Institute were using the formal greeting "you" (like "Sie" in German), which was very unusual for me, since it was not the habit of the teaching staff at my undergraduate years at Mendeleev University in Moscow. It was in fact during the class of physical chemistry at Mendeleev University when I heard for the first time about the Temkin–Schwartzman method for calculation of thermodynamic functions. Acquaintance with Temkin isotherm, Temkin–Pyzhev equation of ammonia synthesis kinetics, Horiuti–Temkin theory of complex reactions and Temkin equation for calculation of activities in molten salts came later.

Besides already mentioned contributions of Temkin to physical chemistry, electrochemistry, thermodynamic, kinetics and catalysis there are many other ideas (for instance virtual pressure, kinetics on nonuniform surfaces, etc.) which are already part of several textbooks. He had witnessed the development of physical chemistry in the 20th century, possessed encyclopaedic knowledge of the field and was personally acquainted with many great scientists. Discussions with him were very stimulating, albeit challenging, since they required also substantial intellectual efforts from his discussion partner.

Professor Temkin had a broad knowledge not only in chemistry, but also in history, literature, arts, culture and politics and was eager to share it, especially with the young generation. He liked to tell stories from his past, which unfortunately I did not write down, not really thinking that I would regret it after many years. In fact, he was an excellent story-teller and lecturer and I am still using some of his tips, when giving scientific presentations.

One story was about the trip to USA in order to attend the International Congress of Catalysis in 1972. At that time not only the entrance visa was required, but the Soviet citizens had to get a permission to leave the country (so called "exit" visa). According to Temkin, who was not a member of the Academy of Sciences, some of his fellow professors, members of the Academy, were not happy that a plenary lecture was offered to Temkin. There were a number of delays with granting the permission, and only the involvement of Academician Ya. Kolotyrkin, the director of Karpov Institute, who had very good connections in the higher Communist Party hierarchy, accelerated the formal considerations. At the end the permission was granted, but too late and Temkin was not able to visit USA and present the lecture. The same happened with the Soviet-Japanese meeting on catalysis, where Professor Temkin got an invitation to take part in the first seminar in Novosibirsk, but was greeted too well by the Japanese scientists. As a consequence the invitation came to attend not the second seminar in Japan, but the third one held once again in Russia. This invitation was of course declined by Temkin.

These examples illustrate that Professor Temkin, despite all the fame and influence, was not really part of the catalytic elite, e.g. members of Academy of Sciences of the USSR. He tried four times to be elected to the Academy, but without success, which can be partially understood knowing his biography.

Menassii Temkin was born in a Jewish family on 16th of September in 1908 in Belostok, which nowadays is a part of Poland. His family (parents and his sister Roza) soon moved to Moscow, where Temkin attended the famous Lepeshinkii school where children of the Soviet leaders were studying. For instance, Roza was in the same class as Vassily Stalin, son of Joseph Stalin. According to what she told me, her brother Mikhail gave Vassily first lessons in cross-country skiing near Kremkin. Temkin spent 2 years after school working at several chemical plants in Moscow before entering Moscow State University, from which he graduated in 1931. His interest in physical chemistry, which he considered as a cornerstone of catalysis, ignited at that time. In fact possessing profound knowledge in physical chemistry, Temkin was very critical about those, who did not appreciate this part of chemistry. I remember his critical comments about one of his lecturers, a very famous scientist in the field of organic catalysis (the name was mentioned), who according to Temkin did not know thermodynamics at all.

His Master's thesis was done in the Laboratory of Professor N. Kobozev, known for the ensemble theory. Many years later Temkin showed me a copy of the letter, written by Kobozev in 1952 to the Central Committee of the Communist party, accusing Jews, working in the field of catalysis and physical chemistry, in particular Temkin, of being "enemies" of true Russian scientists. It was the time when anti-Semitism was particularly strong in the former Soviet Union and there was even a campaign in the mass media against medical

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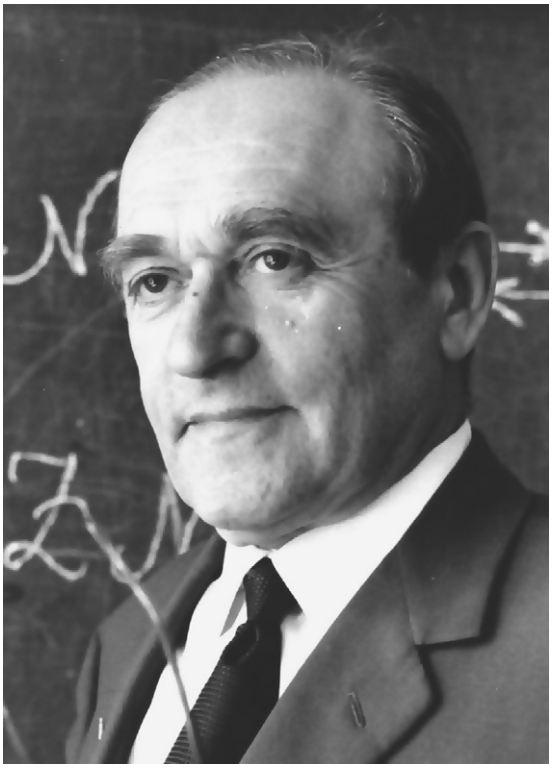

Fig. 1. Professor M.I. Temkin (1908–1991).

doctors of Jewish origin. The atmosphere in Karpov Institute was very harsh at that time and Temkin was offered by Nobel Prize winner N. Semenov (Fig. 2) the possibility to move the whole laboratory to Institute of Chemical Physics, where Semenov was the director. In fact the relationship between them was very friendly since the early 1930s when Semenov was developing his chain theory and Temkin visited his lab in Leningrad several times and even spent few nights on a sofa in that lab.

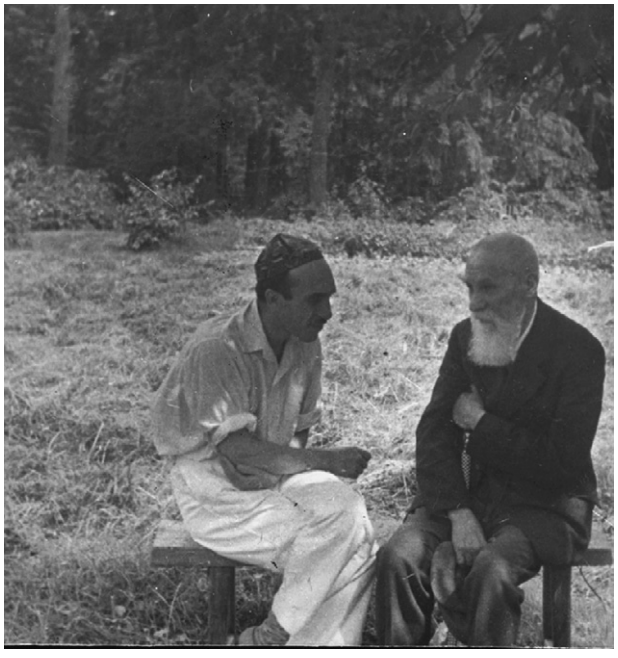

Fig. 2. Professors N.N. Semenov and A.N. Bakh.

Fig. 3. I. Langmuir, M. Temkin and A. Frumkin at Karpov Institute (ca. 1948).

Attitude towards Jews was never very good in the Soviet Union, which explains why Temkin in the everyday life was not using his given name Menassii, but a more easily accepted name Mikhail. While preparing this short letter, I was surprised to learn, that in 1952 Temkin even faced a trial. The reason was that a drunken passenger in a bus started to say some anti-Semitic phrases towards Temkin, and the latter used the method of brute force to stop it. Obviously after the death of Stalin in 1953 all accusations were dropped and there was no need to leave Karpov Institute, the place where Temkin started his scientific life in 1932.

His thesis adviser was the famous Russian biochemist A.N. Bakh, who was more than 75 years old and at first hesitated taking a new PhD student (Fig. 2). Another teacher of Temkin was Professor A.N. Frumkin, the founder of electrochemistry in Russia (Fig. 3). Soon it became very clear that Temkin was a rising star in the field of chemistry and he was sent in 1935 to the Lab of Professor Michael Polanyi in the UK, the place where he spent several months and got to know not only Professor Polanyi, but also Sir Hugh Taylor and Professor Juro Horiuti. The latter became a long-term scientific friend of Temkin. The interest in transition state theory, originally developed by Polanyi and Henry Eyring, commenced at that time, and soon after returning from the UK Temkin applied the transition state theory to heterogeneous catalytic reactions and developed the theory of adsorption and catalysis on nonuniform surfaces. This theory was applied to ammonia synthesis, resulting in the famous Temkin–Pyzhev equation for ammonia synthesis utilized for design of ammonia converters. A more detailed description of the Temkin' contribution to chemistry in general and to ammonia synthesis in particular appeared some time ago (N.V. Kul'kova, D.Yu. Murzin, Kinet. Katal. 36 (1995) 7–10 and M. Boudart, Topics Catal. 1 (1994) 405–414, respectively).

The example of ammonia synthesis illustrates the scientific philosophy of Mikhail Temkin, whose analysis of fundamental theoretical questions was always related to reactions of practical importance. In fact that was the general approach practiced in Karpov Institute, which was dealing with fundamental topics, however, not belonging to Academy of Sciences, but to Ministry of Chemical Industry. Reactions, studied in Temkin's Lab were mainly related to ammonia and methanol synthesis, steam reforming of natural gas, water gas shift, production of ethylene oxide. In the 1980s the scope of the work was expanded to liquid-phase hydrogenation reactions, including hydroxylamine synthesis and hydrogenation of aromatics. Not typical for a classical chemist was his interest in modelling of catalytic reactions, more a feature of chemical engineers.

The area of organic catalysis was the field which I wanted to pursue myself being a chemical engineer with specialization in organic

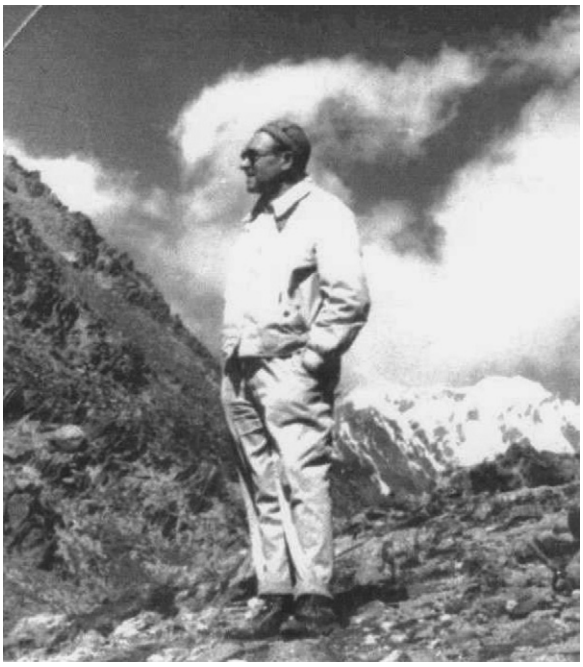

Fig. 4. Learning the mountain climbing (1970s).

chemistry and technology. My first research proposal after the PhD defence was dealing with hydrogenation of substituted phenols, elucidating stereoselectivity of this reaction with the aim of eventual modelling of trickle bed reactors. Professor Temkin's comments after reading the proposal were very positive. He mentioned that he was never interested in studying kinetics of similar type of organic reactions, since previously kinetic knowledge was not really used during scale-up and industrial implementation of such reactions, but then he realized that the times were changing.

I should say that Temkin had a very critical mind and it was not that easy to hear superlative phrases from him about somebody's work. In fact I can remember maybe only two or three times, when he in public very positively commented my own work.

I suppose that it was partially due to his critical style, that his election to the Academy of Sciences never materialized. Such elections were very much steered by the communist party officials, thus another reason for not being elected was his decision during the World War II not to join the Communist Party after several years being a candidate. The last argument (also showing the mind set of people at that time) against the election (loudly presented by one of the party officials) was his personal life. He was married three times and had three children from different marriages. His youngest daughter died from cancer at a rather young age, which influenced the mental health of his last wife. In 1988 Professor Temkin became a victim of a car accident and broke his leg. He underwent a surgery and had to spend several months in a hospital. During this period his wife passed away. In these difficult times of limited mobility his co-workers, including myself, very often visited his tiny apartment in Moscow, combining scientific discussions with small talks.

Professor Temkin maintained his interest in science at that time, which helped somehow to cope with loneliness. At the age of 80 he was still eager to learn new things (Fig. 4). I remember him coming to the room, which I shared with Dr. N. Kul'kova, saying, that he understood what and how simple Bessel functions really are. He significantly contributed to our paper devoted to calculations of specific energy dissipation in shacked reactors, which turned out to be his last paper. The galley proofs of the paper, published after he passed away, were checked by us together, when Professor Temkin was recovering from an operation in the oncology centre in Moscow. Even at that time he did not lose his famous sense of humour, which had a very sarcastic flavour.

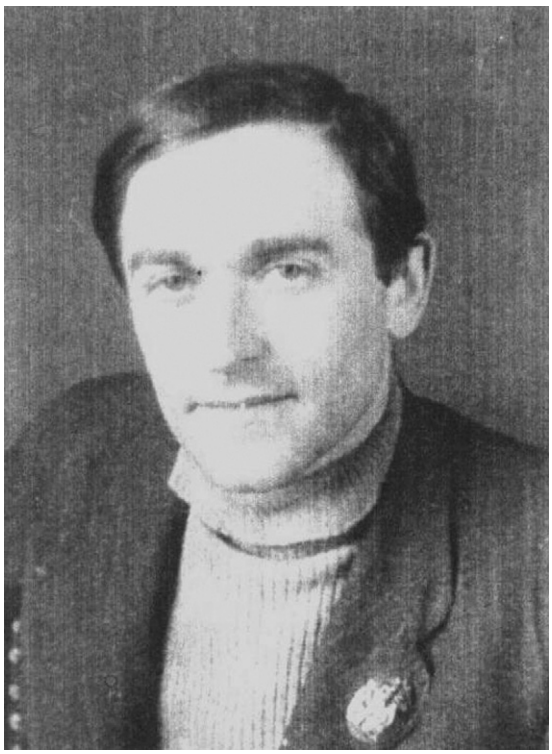

Fig. 5. M.I. Temkin in 1939.

His character, which lacked "flexibility" needed in the Soviet Union at that time, maybe prevented Professor Temkin to receive more formal recognitions of his contribution to science in terms of positions and awards. For more than 50 years from 1938 (Fig. 5) he held exactly the same position of the Laboratory Head. Fortunately contributions of Professor Temkin to science were finally recognized by the government in 1978 by awarding the State Prize in Chemistry for his work in the field of catalytic kinetics. The following year a review appeared in "Advanced in Catalysis", which even up to now serves as an inspiration for PhD students.

The obituary of Temkin also appeared in "Advances in Catalysis" and was written by Michel Boudart, another giant in the field of catalytic kinetics. I am taking the liberty to finish this short article about my scientific teacher Mikhail Temkin with the words of Professor Boudart "Jean-Paul Sartre is reported to have said "I shall die twice, the first time physically and the second time when no one shall read my works". Mikhail Temkin will live a long, long second life, as his name will remain known by new generation of kineticists, who will not even need to read the original writings, since the main ideas of Temkin are already in all textbooks and monographs on heterogeneous catalysis".

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