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A celebration of inorganic lives: Interview with Sergei V. Volkov

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Short biographic information

The Honored Scientist of Ukraine, Academician of the National Academy of Sciences, professor, DrSc, PhD Sergei V. Volkov was born on the 16th of November 1935 in Moscow (Fig. 1). In 1953 he entered the Faculty of Physical Chemistry of the D.I. Mendeleev Institute of Chemical Engineering in Moscow. In 1960 he moved to Kiev to the Institute of General and Inorganic Chemistry of the Academy of Sciences of Ukraine (IGIC-ASU), where he started to work on his PhD thesis "Thermodynamic characterization of molten mixtures of zinc chloride with chlorides of alkali metals"; this was successfully defended in 1964. In 1974 he defended his DrSc thesis "Coordination of the first row transition metals in molten salts: investigation by spectroscopic methods."

In 1975 he organized the Laboratory of High-Temperature Inorganic Chemistry at the IGIC-ASU. The laboratory focused its research on the chemistry of coordination compounds in ionic melts, high-boiling molecular melts, and vapor phase, as well as laser chemistry and quantum chemistry of condensed coordination systems.

In November 1992, S.V. Volkov was elected as an Academician of the National Academy of Sciences of Ukraine. The following month he became the director of the IGIC-NASU; since 1993 the Institute was awarded the name of its founder — the first President of the ASU, Academician V.I. Vernadskii.

In recent years S.V. Volkov's scientific interests are concentrated on physico-inorganic chemistry, nanochemistry, coordination chemistry of heterogeneous systems, "green" chemistry and chemistry of metastable states.

The personal input of S.V. Volkov into the development of science and technology in Ukraine was recognized by the Order of Prince Yaroslav the Wise (2004), the title of the Honored Scientist of Ukraine (1998), the State Prize of Ukraine (1995), L.A. Chugaev Prize of the Academy of Sciences of the USSR (1976), L.V. Pisarzhevskii and A.I. Brodskii Prizes of the NASU (1983 and 2001, respectively).

My (A.G.) first acquaintance with S.V. Volkov was in 1982, when as a young university graduate I became his PhD student. The Laboratory team immediately absorbed me. There, I acquired important knowledge and skills that contributed to my formation as a scientist. I warmly remember regular seminars in a friendly and intellectual team spirit. Then for a long time, I have been working abroad, so it was a pleasure for me to meet my mentor and to ask him some questions on the threshold of his 70th anniversary.

A.G.: *Could you tell us about your family and your childhood? Could you remember some events of the time that had influenced your choice of the future profession?*

S.V.: I was born in the family of an hydraulic engineer, who was building various hydroelectric plants in the USSR since 1925. Although I was born in Moscow, I spent the first years of my life until 1940 in the North Caucasus in the building yards of the power plants on Kuban and Teberda rivers. The War reached me at the age of six, already in Moscow, I only remember terrible years of bombardments, hunger, cold, etc.; so, there were no place for dreams of the future profession (Fig. 2).

A.G.: *In the former USSR (as well as in Ukraine now), the vocational choice was usually made during the senior high school years. How did you make your choice?*

S.V.: To a certain extent my choice of chemistry was semi-occasional. I was always more interested in natural sciences like physics, chemistry, and mathematics than in humanities. I found out from my elder friends in the yard about the Physical Chemistry Faculty of the D.I. Mendeleev Institute of Chemi-

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Fig. 1. Academician Sergei V. Volkov.

cal Engineering in Moscow. This faculty prepares specialists for prestigious areas of science and technology, especially for nuclear power engineering — the top-ranking area of the time, I made my decision. In June 1953, I handed in my documents there.

A.G.: *Why do you choose the Mendeleev Institute among Moscow institutes and universities? Do you remember your entrance examinations?*

S.V.: D.I. Mendeleev Institute (its actual name is D.I. Mendeleev University of Chemical Technology of Russia) perhaps was the most powerful and front-ranking chemical education institution in the USSR. I finished the high school with a silver medal and was exempted from the exams. I had an interview with the Rector of the Institute Prof. N.M. Zhavoronkov. At the time he was the Corresponding-Fellow of the Academy of Sciences of the USSR. Later, he became the Academician, the Head of the Physical Chemistry and Technology of Inorganic Materials Section of the AS-USSR, the Director of N.S. Kurnakov Institute of General and Inorganic Chemistry of the AS-USSR. After the interview I was admitted to the Physical Chemistry Faculty of the Institute.

Fortunately, I cooperated much with N.M. Zhavoronkov during my scientific career, he was always a fatherly patron to me.

A.G.: *Tell us, please, about your professors, how your scientific interests were formed? What was your first scientific research in the Mendeleev Institute?*

S.V.: I took courses from many famous chemists at the Institute: the Academicians of the AS-USSR G.K. Boreskov, V.V. Kafarov, I.V. Petrianov-Sokolov, V.M. Rodionov, N.P. Sazhin; the Correspondent Fellows of the AS-USSR P.P. Budnikov, A.P. Zafirov, N.A. Izgaryshev, A.F. Kapustinski, A.D. Petrov, B.A. Sakharov, V.V. Fomin, G.Ya. Yagodin; Professors O.E. Zviagintsev, A.G. Kasatkin, M.Kh. Karapetyants and a pleiad of other scientists and pedagogues well-known both in the country and abroad. I always remember them with gratitude and respect. I graduated from the Department of Prof. O.E. Zviagintsev and my dissertation dealt with fluorine technology for treatment of irradiated nuclear fuel.

Fig. 2. S.V. Volkov and his father V.N. Volkov (Kiev, 1964).

A.G.: *What was the atmosphere of student's life in the beginning of Khrushchev thaw?*

S.V.: Studentship is a very particular period of life in any country, in any kind of social system. Spontaneity, sincerity, fervor, and finding new friends are natural to these years. For us, the Krushchev thaw, possibly, came out as a change in look and behavior. Owing to a weakening of the "iron curtain" people began to be more stylish in clothing, as the Western fashion had appeared; they visited dancing-parties, where the boogie-woogie had entered the stage together with tangos and foxtrots; we read long works that were not published previously. In principle, the students remained eager for knowledge, conserved their love for sports and communication, however, our judgments and comments became more unfettered.

I remember, how in 1956 during a seminar, our professor of political economy labeled me as an adversary of the Soviet atomic power industry development, because I took the liberty to express the following:

- The USA is not the only country that builds atomic submarines, probably the USSR does also;
- I explained by economical reasons why the USSR was in advance of the USA in the building of atomic power stations (the first one in Obninsk): the state can afford experiments with more expensive electric power from nuclear sources (1 rouble/kW h, at the time), when compared to the much cheaper energy of hydroelectric origin (0.04 rouble/kW h, at the time). I supposed that private companies in the USA were not motivated to do so.

A.G.: *Then you moved to Ukraine. What was the reason for this shift, and how did your scientific career begin? What was the difference between Kiev and Moscow?*

S.V.: My leave for Kiev was due to both personal reasons (I married a Kiever, my son was born, etc.) and professional need. As a specialist in the chemistry of radioactive and rare elements, I received an invitation from the Institute of General and Inorganic Chemistry of the Academy of Sciences of Ukrainian SSR (IGIC-ASU, Kiev) which had a demand for such professionals.

In Moscow, especially during the last 2 years (5th and 6th) of the Institute, I worked in the leading Soviet radiochemical laboratories and saw de visu a level of the research developed therein. So, my first impressions from the Institute in Kiev were rather frustrating: research topics, facilities, possibilities, and rate. They were developing a technology of zirconium separation from hafnium by means of extraction, that was not of much interest to me. Some time later, I understood there were also another more interesting themes. The research at the Institute was particularly focused on melts, non-aqueous solutions, and electrochemistry (scientific schools of the Academicians V.A. Plotnikov, Yu.K. Delimarskii, and

the Correspondent Fellow V.A. Izbekov). It was, probably, one of the leading Institutes in the USSR in the mentioned areas.

A.G.: *You got into the environment of the Academy of Sciences after the University. What were your impressions of this change?*

S.V.: To my mind, an average university or academy environment does not exist. Each environment is very concrete and specific; it depends on its geographic location ("metropolitan" or "peripheral"), on the prestige of a specific institution, on its educational or research character. I still consider our educational system among the best in the world both in breadth of the knowledge and in depth. Surely, the overall scientific level in the "metropolitan" Mendeleev Institute in Moscow was broader and higher than in the IGIC-ASU in Kiev, which was focused on more narrow problems.

A.G.: *Tell us, please, about your scientific supervisor and your doctoral thesis.*

S.V.: In 1960, I entered the post-graduate course of Prof. B.F. Markov, who set me the problem to characterize thermodynamically a solution of molten salts that tend to complex with another component of the melt, and that have to break their own associated polymer structure. Since I already had working experience with high-temperature, melts, fluoride complexes of uranium and other fission products, I successfully completed this work in time. In 1964, I defended my PhD thesis; moreover, my official opponent (i.e. external examiner, A.G.) the Academician A.I. Brodskii suggested that I publish the overview of the thesis as a separate monograph.

A.G.: *How did you meet the Academician K.B. Yatsimirskii*[1] *and what was your research at the time?*

S.V.: Professor K.B. Yatsimirskii had been working in Ivanovo Institute of Technology, when he was elected the Corresponding Fellow of the ASU in Kiev in 1962. However, during some time he continued to live in Ivanovo but often came on business trips to Kiev, where he lived in the Academy's hotel. Prof. Yatsimirskii was my consultant on thermodynamic problems of complex formation in melts. When in 1964 he transferred to Kiev on a permanent basis, I already have been combining my research work on calorimetric measurements of the mixing heat of molten salts at the Institute, with consulting and coordinating activities at the Presidium of the Academy of Sciences of Ukrainian SSR. We started to work together (Fig. 3). K.B. Yatsimirskii proposed that I assume the duties of a scientific secretary of the Section of Chemistry and Chemical Technology of the Academy that he chaired. During the following 5 years, I worked at the Institute on the thermodynamics of molten salt systems with complexation (EMF, molar volumes, mixing heats, compressibility, etc.), and at the Presidium of the Academy as a scientific secretary of the Section. During this time I accumulated some primary thermodynamic data on the molten systems with complex formation; however, in this way it was only possible to characterize an overall process, i.e. complex formation and subsequent dissolution of some kind

Fig. 3. S.V. Volkov congratulates his mentor K.B. Yatsimirskii on occasion of his 70th anniversary (Kiev, 1986).

of a complex in the melt. It was not sufficient for me, I wanted to investigate the mechanism of formation of these complexes, their geometry and electronic structure.

A.G.: *How did you choose your scientific area, high-temperature coordination chemistry? What did you succeed to do at the time?*

S.V.: In 1969, K.B. Yatsimirskii suggested I join his Laboratory of Coordination Compounds, and I decided to create the first center, in the country, on the high-temperature spectroscopy of coordination compounds. First, I concentrated on melts. We designed a dozen high-temperature units for UV–vis, Raman, IR, ESR, and NMR instruments. In 1974, I defended the first thesis of Doctor of Chemical Sciences in the USSR on spectroscopic investigation of coordination modes of different metal ions in various melts: halogenide, nitrate, sulfate, thiocyanate, etc. in a temperature range of 100–1000 °C. In 1975, I organized a Laboratory of High-Temperature Inorganic Chemistry (Fig. 4), where the research area was expanded. We began to study volatile complexes in the gaseous phase, complexes in high-boiling molecular solvents and solutions, complexes under laser irradiation and in non-equilibrium low-temperature

Fig. 4. Visit of Prof. H. Hertz (Germany) to S.V. Volkov's laboratory (1986). From left to right: S.V. Volkov, Dr. O.B. Babushkina, Prof. H. Hertz.

[1] Interview with K.B. Yatsimirskii was published in this journal: Coord. Chem. Rev. 181 (1) (1999) 1–25.

plasma, i.e. in a broad range of phase states, temperatures, dielectric constants (electrolytes–semiconductors–isolators), etc.

A.G.: *The period before the early 90s in the USSR is an epoch characterized by the "iron curtain": the scientists had practically no possibility to publish their results in foreign journals, visits abroad were very rare. Foreigners also were a rarity. The USSR was a kind of "black box"; it was known merely by external manifestations, while there was practically no information on what was happening inside.*

Thereby, the economic and scientific potential of the USSR is often described in the world from two opposing viewpoints. The first one considers the country as a developed one, which, however, neglected the needs of its own population. The opposite one describes the country overflowing with weapons, representing a significant military threat to the rest of the world, while other branches of the economy were backward and underdeveloped. As it was said "the Upper Volta with missiles." Where is the truth, in your pinion?

S.V.: In order to answer correctly the question, one has to have broad information concerning the different spheres of human activity. This is rather difficult. I will respond from the viewpoint of my professional interests, i.e. the coordination chemistry and the chemistry of melts. I believe that we did not fall behind our "western" colleagues in these areas, moreover, sometimes we occupied the leading positions. For example such coordination chemists as L.A. Chugaev, I.I. Chernyaev, A.A. Grinberg, O.E. Zviagintsev, K.B. Yatsimirskii, A.V. Ablov, et al. represent the best of the world's coordination chemistry. Surely, in the USSR the priority was always borne by the military industrial complex at the expense of "civil production." Thus, there was evident distortion between the developed nuclear, missile, aerospace, etc. industry and rather weak agriculture, consumer and tertiary industries. So, the truth is at the middle point of your question.

A.G.: *S.V. Volkov, the scientist and the administrator. Tell us, please, about your administrative career. One part fell within a difficult transition epoch. You were a laboratory head in the times of the USSR and the Gorbachev's perestroika, but the time of your election as the director of the Institute practically coincided with the collapse of the USSR and establishment of an independent state of Ukraine. We gained much in the dimension of liberty and human rights, but, unfortunately, many things important for scientific development were lost. As the man at the wheel, please, appraise the status of funding of science, its human potential, instrumentation, and international cooperation in different periods of your career.*

S.V.: My scientific and administrative careers were developed simultaneously. In 1964–69 I was a scientific secretary of the Section of Chemistry and Chemical Technology of the ASU and participated in coordination of all research activities in chemistry in Ukraine. It was necessary and important, because we tried to avoid duplication of work; we were able to concentrate the efforts of different collectives on the solution of a specific important problem. Now, such coordination does not exist, and this is bad.

In 1974–1979, I was a deputy director of the Institute on scientific topics; I have been the Laboratory head since 1975, so I remember well how much effort was always necessary in order to implement scientific results into practice, in industry. It was always (and now in particular) the Achilles' heel of the Soviet economy. A competition-free development of the Soviet economy, the lack of companies and enterprises working "from an idea to a real machine" always was, and actually is the scourge of our management mechanism.

Since 1992, I have been the director of the IGIC-ASU. It was the time when the independent Ukraine was born; simultaneously, many economic, technical, scientific and other contacts between new independent states of the former USSR were broken. The government funding of science was practically cut off, many active young scientists traveled abroad or were gone to business structures. The actual situation is as follows: by Law, the State has to allocate 1.7% of the GDP for scientific research and development; whereas, only 0.37–0.43% are really allocated. Also, one has to consider that the GDP is decreasing, and not growing... In the former USSR, 7% of the GDP were allocated. Thus my priority tasks for today are:

- To save human resources, high-qualified academic staff, including retired scientists, capable of educating the young generation;
- Priority development of research areas, where the Institute has been traditionally recognized in the world;
- Involvement of the young scientists, as broad, as possible;
- Engagement of non-governmental funding to support the fundamental science.

A.G.: *The so-called "brain drain." Despite an opinion, widespread in the territory of the ex-USSR, it is a problem of many other countries with different levels of scientific and economic development. What is your attitude towards this problem? What measures must be adopted in Ukraine to motivate the return of the scientists?*

S.V.: Indeed, the "brain drain" is a global problem, it has always existed and will exist. Let us remember the USSR, for example, where talented people were seeking the possibility to move from the periphery to Moscow, in order to find acknowledgement, money, glory, etc. When the "iron curtain" disappeared, we witnessed a rapid stream of young people wishing to find money. Now this process is declining. In my opinion, such a flow will always happen from those places, where an excess of brain potential exists, to those places, where the means or possibilities to admit the youth are present. So, as for today, funding is the only motivation for return, it must include salaries, instruments, reagents, etc. Patriotism falls into the shade.

A.G.: *Let us approach the problem from the other side. The modern world shows a growing tendency for declining prestige of the natural sciences among young people. A growing number of university enrollees prefer to choose humanities: management, law, journalism, etc. that are more attractive both from the viewpoint of self-realization and that of living standard.*

How could the prestige of natural sciences be restored?

S.V.: Yes, the prestige of natural sciences with the young is declining in Ukraine, as all over the world. But to my mind, the phenomenon is observed now in relative figures, and not in absolute ones. The number of university enrollees and the

Fig. 5. With the President of the National Academy of Sciences of Ukraine the Academician B.E. Paton (right) and the Rector of T.G. Shevchenko National University of Kiev, the Academician V.V. Skopenko (left). Kiev, 2004.

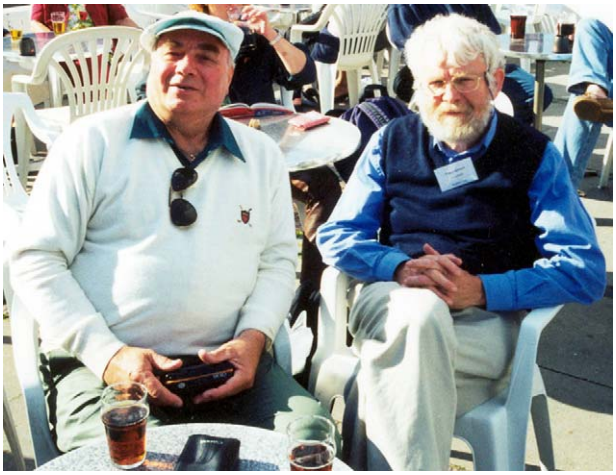

Fig. 6. With Prof. Dr. N.J. Bjerrum during "EUCHEM 2000" conference (Denmark, 2000).

entrance competitions in natural sciences remain the same. The huge increase in the enrollees and graduates in humanities is due to the appearance of a great number of private, semi-private, "European," "International," etc. universities and faculties. These graduates will have no job opportunities in Ukraine, because the labor market for them is already oversupplied. The Government is looking indifferently at the situation and does not do anything about it.

It was the "cold war" that stimulated, to a certain extent, the priority of the natural and technical disciplines in the USSR, in the USA, and in other western countries; such a job was rather prestigious. A large-scale popularization of scientific and technical disciplines supported by proper funding is necessary to change the attitude of the youth. I think, a global problem, supported by the corresponding PR-campaign, is necessary to re-orient the mentality of the authorities. Unfortunately, neither a threat of global terrorism, nor global warming is sufficient to do that.

A.G.: *You are the director of the oldest chemical institute in Ukraine. How do you appraise it's present status, what future do you see for the Institute?*

The question is very difficult. In 2004 the Institute celebrated its 75th anniversary. There were many guests including the President of the National Academy of Sciences the Academician B.E. Paton (Fig. 5), and the Presidium of the Academy in a body. We received greetings from the President of Ukraine, the Prime Minister, the Speaker of the Parliament, etc. Both the Institute and the "Ukrainian Chemistry Journal" edited by us are the oldest in Ukraine and in the academic sector of the ex-USSR as well.

Coordination chemistry, chemistry in non-aqueous media, first of all that of molten systems, electrochemistry and "green" chemistry are the principal areas of research since the creation of the Institute by V.I. Vernadskii. Now these areas are transforming into physico-inorganic chemistry, nanochemistry, coordination chemistry of heterogeneous systems, "green" chemistry, and chemistry of metastable states [1] (Fig. 6).

Modern inorganic chemistry became practically physico-inorganic upon consideration of its ideology, methodology, and practical application. Physical methods of investigation are gradually transforming from the analytical tool into the synthetic and technological one, e.g. electronic beams, chromatography, molecular epitaxy, electrodispersion, etc. These methods have seen and generated nanochemistry.

The practical application of coordination compounds has usually been realized on the interface between solid, liquid or gaseous phases. For example, sorption, extraction, catalysis, electrolysis, galvanics, CVD, tribochemistry, heterogeneous template synthesis, grafted complexes, and so on. These may be regarded from the viewpoint of the coordination chemistry of heterogeneous systems that realizes the following chain of conceptual steps: synthesis → composition → structure → properties → function. Previously, the heterogeneity was introduced externally by addition of sorbents, extraction agents, electrode or catalyst surface, etc., while actually, we know systems with self-arising internal heterogeneity, like supramolecular systems. With the "green" chemistry everything is clear.

The chemistry of metastable states. Discoveries that revolutionized modern science and industry were honorably mentioned by Nobel Prizes: non-equilibrium thermodynamics, I.R. Prigogine, 1977; high-temperature superconductivity (HTSC), J.G. Bednorz and A. Müller, 1987; nanochemistry (fullerenes), R.F. Curl, Jr., H.W. Kroto, and R.E. Smalley 1996. All of these discoveries deal with chemistry of non-equilibrium metastable states with an inherent determinant time factor. In the case of non-equilibrium thermodynamics, these are dissipation structures expressed by non-linear time dependent functions. It is the degradation time for the HTSC, when the superconductivity disappears under the influence of ampere, heat, etc. loads. It is the aggregation time for nanoparticles, when they are sticking

together and cease to be quantum dots under the influence of enormous excess of surface energy. Thus, the determinant time factor is revealed as spontaneous disappearance of the properties mentioned, which must be stabilized, i.e. prolonged, for practical applications. Otherwise, the exploitation time of such systems has to be adjusted so that it should be shorter than the lifetime of the above properties (degradation, aggregation, etc.).

A.G.: *In the majority of countries the award of doctoral (PhD) degrees is within the competence of universities. In Ukraine, as in the former USSR, the degrees are awarded at the State level. The country retains a two-stage system of scientific degrees, a separate system of scientific titles also exists. All this is a prerogative of the Supreme Certifying Commission (SCC) of the Council of Ministers. For a long time you were a member of the Commission, and head of it's Expert Body in chemistry. What is your opinion, will this system be retained and developed or must it be substituted by some common standard in the modern globalized world?*

S.V.: The system of scientific degrees adopted in Ukraine has a long historical tradition; it is also connected with a government subsidy — a reward for scientific degree and title. Some people invite us to substitute this system with the western one (award of the PhD by universities); however, in this case the universities either have to pay this reward instead of the state or an overall reform of the academic staff remuneration should be put into practice.

During the last 8 years, I was the head of the Expert Body of the SCC of Ukraine. We always tried to maintain a high level of originality, reliability, and novelty of the theses. We did not approve any weak PhD or Doctor of Science thesis. Since May 2005, Ukraine adopted the Convention of Bologna. I am worried that drastic implementation of this Convention may destroy the academic system in the country that continues to function despite miserable funding and absence of sponsors.

A.G.: *For several decades you have devoted yourself to organizing, publishing, and public activities. How do you estimate your personal input in these areas?*

It is very difficult to appraise my personal input. There are some positive results (Fig. 7). To summarize: since 1975, nine of my PhDs defended their Doctor of Science theses and became full professors, one of them is the Correspondent Fellow of the NASU; 27 PhD theses were defended under my supervision.

I am the Editor-in-Chief of Ukrainian Chemistry Journal (Ukr. Khim. Zh.). Despite great financial difficulties, the Journal appears regularly and publishes articles in any of three languages: Ukrainian, Russian, and English.

I am the head of the Scientific Council on Inorganic Chemistry at the NASU. We organize our sessions in different regions of the country in order to support there the development of chemical research, to coordinate the research in order to avoid the duplication of themes and avoid a reduction in standards, to give a preliminary appraisal of DrSc and PhD theses in preparation, to support young scientists, etc.

As an expert of the State Committee of Ukraine on National Prizes in Science and Technology, I tried to give an unbiased assessment of the contributions presented. I tried to stop weak

Fig. 7. Books published by S.V. Volkov [2–16].

contributions or those having no novelty, like a technology of soda production, or those having nothing to do with chemistry, like argon for welding. However, the most powerful chemistry we have, is the "political" one!

A.G.: *Tell us, please, about your family, what do your wife and children do?*

My wife, Tatiana Tabenskaya is a professor of analytical chemistry, and the Dean of the Preparative College of the T.G. Shevchenko National University of Kiev (Fig. 8). My son, Sergei Volkov, Jr. graduated from two faculties of the National University: those of Chemistry and of International Relations; actually, he is a manager in the UNO representation in Kiev.

A.G.: *What is your hobby? You travel much, do you have any preferred places to visit?*

S.V.: Fortunately, my hobby coincides with my profession. I like my work, and I am happy to wake up early in the morning and go to the Institute. The only thing I like very much is travel that often coincides with my professional activity: participation in international congresses, lectureships, etc. So, I have practically never been a tourist. In the book "Who is who in Ukraine" my hobby is described as "scientific tourism" (Fig. 9).

Fig. 8. Prof. Dr. D.R. Sadovey (MTI, Cambridge, MA, USA) meets S.V. Volkov and his wife T.V. Tabenskaya (Cambridge, MA, 2002).

My preferred place on Earth is my home, where I return each time with a lot of impressions, reminiscences, and new ideas to realize.

A.G.: *What do you prefer to eat and drink?*

S.V.: I try to taste the national cooking always and everywhere, even if the taste of some dishes may sometimes be inadequate for me. Natural grape wine is my preferred drink.

A.G.: *What trends do you foresee in the development of coordination chemistry in the 21st century?*

S.V.: To my mind, the most attractive way for coordination chemistry to develop is connected with functional heterogeneous systems and their practical applications. As far as coordination chemistry in general is concerned, then we have to consider both the ability to form coordination compounds inherent to a majority of elements of the Periodic System (at least, 80 metals) and a wide variety of known organic compounds as potential ligands. Then we have to consider the application of complexes in different homo- and heterogeneous processes: catalysis, sorption, extraction, electrochemistry, CVD, etc. To conclude, it is possible to affirm with absolute certainty that coordination chemistry has an infinite outlook and possibilities.

Fig. 9. "A time to gather stones together. . ." (Eccl. 3, 5). At the place of the Baptism of Jesus (Israel, 2004).

A.G.: *Do you remember some interesting or funny episodes from your scientific career?*

S.V.: I remember the years of my PhD studentship (1960–1963), the visit of the twice Nobel Prize winner Prof. L. Pauling to our Institute. He visited my laboratory. At the time, our calculation equipment was rather primitive. I remember that despite my explanation about our impressive (as it seemed to me) research results, Prof. Pauling fixed his eyes on my steel pinwheel calculator "Felix." May be he considered it as a museum specimen. . .

A.G.: *What would you wish for a generation of young researchers, who decided to devote themselves to chemistry?*

S.V.: I would wish the young scientists to love the science inside themselves, and not themselves in science, to be avid for research. I wish them to master chemical literature to the maximum extent and to recognize achievements of previous generations. Unfortunately, such recognition has a certain tendency to decline. I wish the youth to look for interesting facts that do not settle into accepted notions, to reveal a certain fantasy, to pay more attention to non-equilibrium processes and metastable states, because life is a non-equilibrium.

A.G.: *Thank you very much, for very interesting talk.*

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