

Chemistry in Russia and in Spain: A personal recollection

Lecture delivered by Dr. José Elguero in Saint Petersburg, June 2000

Rector Magnífico, Professors of the Technical University of Saint Petersburg, Ladies and Gentlemen.

It is a great honor and a great moment of my life as a chemist to be here amongst all of you to receive an honorary degree from the Academic Council of Saint-Petersburg State Institute of Technology (Technical University). I don't think I have enough merits for this distinction but I will do my best afterwards to deserve it by contributing to the relationships between our Institutions and even between our countries.

Our countries being far away, it is normal that we don't know each other well. I must confess that when Dr. Rostislav **Trifonov** delivered in Madrid his lecture about the Saint Petersburg Institute of Technology most of us discovered the glorious past and the excellent research that chemists are doing here.

We discovered that the father of modern chemistry, Dmitry Ivanovich Mendeleev, was a Professor in this institution. He published his seminal papers on the periodic table in 18-69 writing his famous sentence "the properties of the elements are a periodic function of their atomic weights" and publishing his amazing prediction of eka-silicon properties (in 18-71), which almost coincide with those of element germanium discovered in 18-86, fifteen years later.

Famous scientists from other countries have been invited and have worked here with great success. Between 18-66 and 19-0-6, the German scientist, Friedrich Konrad Beilstein, author of the *Handbook of Organic Chemistry*, headed the Department of Organic Chemistry of this Institute. Also the Swiss chemist, Germain Henri Hess, who discovered the law which is named after him, worked here.

Many leading Russian chemists are part of the history of this Institution, such as Dimitrii Kostantinovich Chernov (the well know metallurgist), Sergei Vasilievich Lebedev (pioneer in synthetic rubber), Aleksei Evgrafovich Favorskii (both the Favorskii reaction and the Favorskii rearrangement are in all textbooks over the world), Lev Alexandrovich Chugaev (in our books is called Tschugaeff, who founded the Russian school of coordination chemistry), Alexander Evgenevich Porai-Koshits (who rationalized the Fisher-Hepp rearrangement and published many important papers on color chemistry) and the last directors of the organic chemistry department, Professors Semen Petrovich Vukolov and Lev Ilich Bagal, their contribution to high-energy compounds being still continued here.

Let me now summarize for you the contribution of Spain to the history of science and of chemistry. Few people know that Louis Joseph Proust was Professor in Spain from 17-77 to 17-81

and that two brothers, Fausto and Juan José de Elhúyar discovered element number 74, wolfram, in 17-83. Although, it is also named tungsten, the IUPAC name and the symbol, W, remember the Elhuyars' priority.

In 17-36, Antonio de Ulloa, a Spanish mathematician and naval officer, observed an unworkable metal *platina* (which in Spanish means little silver), in the gold mines of what is now Colombia. Returning home in 1745 his ship was attacked by pirates and finally captured by a British navy. He was brought to London and his papers confiscated, but was fortunately befriended by members of the Royal Society and was indeed elected to that body in 17-64 when his papers were returned and his report published in 17-48. Another Spanish chemist, Andrés Manuel del Rio, then working in Mexico, discovered vanadium in 18-0-1 (he called it erythronium) but his discovery was lost and the element was rediscovered by N. G. Sefström in 18-30.

Therefore, three elements wolfram (74), platinum (78) and vanadium (23) are associated with Spanish scientists, but this "golden" period of our science was a long time ago (17-50 to 1800).

However, the most universal Spanish scientist is Santiago Ramón y Cajal, who, for all of us, is the example to be followed, in personal life and in science. He was born in 18-52 and died in 19-34 (the year I was born) and he was awarded the Nobel Prize in 19-0-6, which he shared with Camilo Golgi. His was the sixth Nobel Prize in Medicine, before him, only Behring, Ross, Finsen, Ivan Petrovich Pavlov and Robert Koch had obtained this Nobel Prize. He received it to acknowledge his outstanding contribution to the structure of the nervous system.

We may recall that in 1900, Cajal obtained the Moscow Prize of the International Society of Medicine and in 19-14 he was elected honorary member of the Imperial University of Saint Petersburg. Thus, our most illustrious scientist and your city are closely related.

I started my Ph. D. Thesis in Montpellier (France) in 19-58. My thesis director, Professor Robert Jacquier, gave me as research topic the chemistry of pyrazolines and pyrazoles. At that time, the literature on that subject was mainly the work of Karl von Auwers, a great German scientist deceased in 19-39 (his most famous student is Karl Ziegler), and of two eminent Russian scientists, Academician Aleksei Nikoleavich Kost and Professor Igor Grandberg, working at the Lomonosov University of Moscow.

In 19-66 they published in English a review called "Progress in Pyrazole Chemistry" which is still excellent and provided the people, like me, who are unable to read Russian, with the possibility to discover the enormous wealth of Russian chemistry. For many years, I collected all their publications, first as reprints they sent to me in Russian (fortunately, chemical formulas are universal) and afterwards as cover-to-cover English translations, which appeared some months later.

I met Professor Kost several times in Western Europe: he spoke fluent English and traveled often abroad. Sadly, he passed away in December 19-79 before I had the possibility to visit him. Therefore, when we traveled to Moscow in 19-91, I asked our host, the Academy of Sciences, to meet Professor Grandberg then in the Timiryazev Agricultural Academy in the outskirts of Moscow.

They tried to discourage us by saying that there were other more interesting places but I wanted to meet personally Professor Grandberg to express him the deep admiration I felt for his work. Finally, we succeeded. We discovered that the laboratories were of the nineteenth century, with cork stoppers and almost no reagents. Unfortunately, he did not speak English but very good

German. A young lady, Elena Komarova, translated our conversation. The Timiryazev Academy has a splendid museum about horses and was a very interesting place to visit. But we left very sad, thinking on the working conditions of a very great heterocyclic chemist. When departing, he picked out the only valuable object he had, a pair of Zeiss binoculars from the Second World War, and gave them to us. They are always in front of me, to remember him.

I spent twenty years in France and then I came back to Spain in 19-80. For a short period of time (19-83 to 19-84) I held the responsibility of heading our Research Council, which is somewhat equivalent to your Academy of Sciences. At that time, I met several Russian scientists. One that I remember particularly well was Academician Yuri Anatolievich Ovchinnikov, then Vice-President of the Academy. He was also born in 19-34, but very sadly he died soon after his visit to Spain.

During all these years, I have exchanged an abundant correspondence (this was before e-mail changed our way-of-life) with many Russian chemists. My field of research, heterocyclic chemistry, is (or, at least, was) one of the most developed in Russia. Had it not been for the obstinate use of Russian in almost all their publications, Russia would have been recognized as the leading country in this field. Nevertheless, for the well informed, the research carried out in your Institutes and Academies was impressive.

If you allow me a small criticism, I think it was an error to use almost exclusively Russian for scientific exchange. There are over 300 millions persons speaking Spanish and we only use our native tongue within the space of Spanish speaking countries. Russian uses another alphabet and its grammar is much more difficult than ours is. An equilibrium has to be reached between the vitality of a language and the diffusion of the science results. The first one requires that the language evolves incorporating neologisms. The second one requires the use of English.

Searching in my files, I have discovered letters from Professors and Drs. Nikolai Zefirov (from Moscow State University), B. V. Ioffe (then at Leningrad University), V. A. Lopyrev (Irkutsk Institute of Organic Chemistry). Others are now in other republics like our friend Mikail Kornilov (now in Ukraine). And from this city, people like Professors Boris Ershov, Kirill Zelenin and Gleb Denisov as well as Dr. Nikolai Golubev. Moreover, I have been referee for many Soros grants and I have tried, in general without success, to obtain INTAS projects with our Russian colleagues.

I want to use this opportunity to say a few words about the late Professor Mark Solomonovich Pevzner. Although I never met him, I followed for years his remarkable work on azoles, especially nitro and halogen derivatives, subject of some authoritative reviews I have in my office and often use. I know his wife and his son are working in this Institute, I would like to express them my sympathy and the admiration I feel for Professor Pevzner.

In 19-91 we visited Rostov-on-Don, both the University, Professor Alexander Fedorovich Pozharskii, and the Institute of Physical and Organic Chemistry, Professors Vladimir Minkin, Alexander Garnovskii and Sergei Bulgarevich. This was one of the most interesting and pleasant experiences of our professional life. We discussed chemistry, heterocyclic and physics, we cruised down the Don River visiting Cossack churches, eating salted fish and trying not to drink vodka, and we made friends that will remain forever.

With several of these authors we have published joint papers:

A paper in the *Journal of the Chemical Society* with Minkin.

A paper in the *Journal of the Chemical Society* with Pozharskii.

A paper in the *Journal of Molecular Structure* with Bulgarevich.

A paper in the *Journal of Physical Chemistry* with Denisov.

And a paper in the *Journal of the Chemical Society* with Golubev.

We have met Professor Ostrovskii several times in meetings of the Heterocyclic Chemistry Society. Therefore, when he asked about the possibility to receive Rostislav Trifonov in our Institute, I gladly accepted. Always an enthusiastic person, Vladimir Ostrovski prepared a research program that correspond to several years of work. In any case, Rostislav spent here several months working with Dr. Ibon Alkorta in computational chemistry. Two papers resulted from this collaboration, both in the Japanese journal, *Heterocycles*, one in 19-98 and the other this year. Others, I hope, will follow.

Both publications are related to the chemistry of triazoles and tetrazoles, the subject of many careful studies in this Institute. I must confess that our contribution was a minor one but it gave us the opportunity to learn more about these interesting compounds. Probably the accent in Saint Petersburg was too much on their use as explosives, which limited their diffusion, and less on their biological properties. Anyway, the chemistry is the same, only their applications differ. May be a public research center is not the best place to carry out applied chemistry: we lack the ambition to become rich that industrialists possess. Most scientists would like to dedicate their lives to the pursuit of the truth and to forget about material problems like subsistence.

This summarizes my memories of personal relationship with Russian chemists.

Before ending this talk, I would like to comment about the situation of chemistry, and more generally, of science in Spain and in Russia.

Spain is a medium-size country (about 500,000 km²) whereas Russia is the largest country in the world (over 17,000,000 km²). Spain has less than 40 millions of inhabitants, Russia near 100 hundred and 50. In a situation, that we chemists call of steady-state equilibrium, science and, in particular, chemistry would be proportional to these national indicators. It is true that chemistry flourishes in small countries like Switzerland or Holland, but science in Spain was in a very bad shape twenty years ago. And now it has attained a level that is in consonance with its size, its population and its wealth.

What has been the origin of this "miracle"? In my opinion there have been three main causes:

First, a large part of our scientists have spent several years working in other countries, mainly the US, but also Germany, the United Kingdom, France, and so on. Today, they often write back to say that their facilities abroad were not so good as those they had in Spain. But it was, and still is, very important to know how other people work, think and live. You become more broad-minded and, at the same time, more exigent.

Second, a large amount of money was injected in research, expensive instruments, reagents, money for travel and, well paid salaries for university professors and research scientists. Bion of Phlossa, a Greek poet of the second century BC, called money the nerve of the war. I must confess that we are still far behind other developed countries both in percentage of our national income and in percentage of scientists over the total population.

The first two factors are well known because they can be quantified and described by statistics. The third one is subtler. As a consequence of the change between a military dictatorship and democracy, most people felt an enthusiasm for freedom and for research that made them work non-stop for years on. I don't know if this level of commitment will be maintained much more time. In any case, it has contributed decisively to the success of Spanish science.

Your situation is very different: you are a great scientific country. It is only a problem of time for recovering your natural place in the world. Nevertheless, if you don't find me too pretentious, the example of Spain could be of some interest for your academic authorities and your national and local governments.

To conclude, I want all of you, and particularly our good friend Professor Vladimir Ostrovskii, Professor Igor Tselinskii, Vice-Rector, and Professor Anatoly Dudyrev, Rector of Saint Petersburg State Institute of Technology, to know that I will always be very proud of being a member of the college of Doctors of this Institute.

Thank you very much for your attention.