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Spanish Science: A Conversation with José Elguero.
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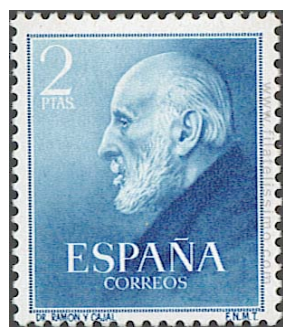
José Elguero (b. 1934) is Senior Research Scientist at the Institute of Medicinal Chemistry of the Spanish Research Council (CSIC) in Madrid. He has published about 800 papers and several books on heterocyclic chemistry, physical organic chemistry, and NMR spectroscopy. He is former Head of CSIC and has been awarded the Schutzenberg Prize of the French Chemical Society, the Gold Medal of the Spanish Royal Society of Chemistry, the Solvay Prize, and the Ramón y Cajal Prize. We recorded our conversation on June 11, 1996, in Madrid. The stamps illustrating Spanish science were kindly supplied by Professor Elguero.

ISTVÁN HARGITTAI (IH): Let's start with your background, education, and career.

JOSÉ ELGUERO (JE): The Spanish Civil War broke out two years after I was born. My parents were Republicans and had to flee from Madrid to Barcelona when Madrid was conquered by Franco. Then we moved to France, where my father was put in a concentration camp by the French. His main participation in the Republican efforts was that he accompanied the trucks carrying the paintings of the Prado from Madrid to Valencia. We returned to Spain, to Madrid, in 1939. Eventually, I became a chemistry student at the University of Madrid, which is called today, Universidad Complutense. I graduated in 1956.

I chose chemistry because my friends and I had been playing with chemistry. When I was about 15, we built a small lab at our home. Another reason was that it was easier to get into chemistry at that time than into architecture, which I would have liked very much.

After graduation I did some brief military service and then went to Grasse, France, where my father had a friend in the perfume industry, and he offered me a job. Grasse is a famous place in southern France where all the French perfume industry is concentrated. There I was trying to learn the smell of about 200 compounds. You had to immerse a small strip of paper into the perfume and then smell it and, by learning the smells, you were supposed to recognize the origin of various lavenders, from which place and altitude they come from and so on. For some people this is very easy, but I wasn't one of them. Today we have gas chromatography, but at that time it was the human nose only.



Santiago Ramón y Cajal



The Elhuyar brothers; Juan José and Fausto

After six months I quit, and on my way home I visited a girl in Montpellier. There, at the University of Montpellier a Professor of Chemistry offered me a stipend to become his Ph.D.

student. I accepted this, and even before I got my Ph.D. there, I was offered a permanent position in France at the CNRS.

My Ph.D. director, Professor Robert Jacquier, was interested in cyclopropanes and their Δ^2 -pyrazoline precursors; when I came to work with him in 1958, he proposed that I study the relationships between Δ^1 - and Δ^2 -pyrazolines, and this led me eventually to study pyrazoles, a subject in which I am still involved. We had the opportunity to receive one of the first NMR spectrometers, a 56.4-MHz instrument, and this splendid technique has also become part of my life.

I married the girl I'd come to visit, and we have two grown-up sons who live in France, and she lives there too because eventually I divorced her. Now I have a Spanish wife, and we have two younger children here in Madrid.

When I was offered the stipend in Montpellier, it was about the time of de Gaulle's return to power in 1958, and that was the beginning of making France great again, and they started a very vigorous program of supporting science. Many of my fellow graduate students are now professors in France.

I stayed in France until 1979. At that point I had to decide whether to become French and stay there forever or return home. In the meantime, important political changes were taking place in Spain. Franco died in 1975, and a transition government was in office between 1975 and 1980. I was called home and offered a position at the Spanish Research Council, Consejo Superior de Investigaciones Científicas (CSIC). This is a public organization under the jurisdiction of the Ministry of Education, with about 6000 employees. It is similar to the Max Planck Gesellschaft in Germany and the French CNRS. Eventually, I rose to be the Head of the CSIC in 1983/84.

One of the lessons I learned in the Administration is that when I now hear people in the lab criticizing their superiors, I can see things from the other side as well. I now understand why things are not always clear and perfect. The Administration must always make compromises: compromises between finances and goals, between researchers and technicians, between regions like Madrid and Barcelona, and so on. These problems stay with the CSIC regardless of the political changes in the government. Your maneuvering possibilities are rather narrow.

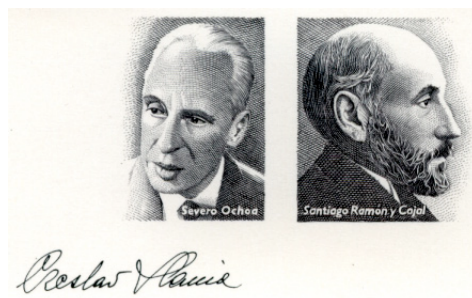
IH: When you returned to Spain, you were 45. Did you build up a new lab and a new research group then?

JE: It was difficult because the financial resources were not in place. There were no positions, no fellowships, no instrumentation. I tried to survive by building up an extensive system of cooperation with different places in Spain, in France, and in other countries. I tried to do inexpensive but interesting chemistry. This is one of the reasons why I developed a project on the solid-state properties of heteroaromatic compounds. They are stable, cheap, and friendly, are easy to prepare, and are crystalline, not volatile.

Our conditions have since improved considerably. However, during my involvement with the Administration of the CSIC, I could not apply for support. It would have been a conflict of interest. Then when I returned to research again, it was too late to build up a group. So I have continued my research between organic chemistry and physical chemistry, involving a lot of collaboration. Some people say I must be very happy because I don't have to worry about co-workers getting promotions and positions, but this was not my decision. I would prefer to have my own group with all the worries that go with it and to have a mainline of research and not depend on so many collaborations.



Miguel Catalán



Severo Ochoa (with Ramón y Cajal)

I must admit I find it a little difficult to render so personal an account of myself. Like most of my colleagues, I have learned to express myself in a cold and detached style.

People wonder why most of us work so hard and for so many years. The usual answers are "ambition" and "vanity," on the one hand, and "curiosity" and "humanity," on the other. I often wonder if early difficulties -family or personal, or both- could also provide a powerful drive. Life was not easy in Spain in the forties.

IH: Where does Spain rank in science among European countries?

JE: We have very little science in our history. We're trying very hard to identify some roots of scientific research. It's very difficult. Proust was a professor in Spain for many years. The beginning of Spanish scientific history is about the 1920s. There was a group of people who decided to create an organization outside the University. There was a group of outstanding scientists, among them Santiago Ramón y Cajal, who shared the Nobel Prize in physiology or medicine in 1906 with Camillo Golgi, in recognition of their work on the structure of the nervous system. There were also geologists and mathematicians who made an effort to change the intellectual life in Spain. The reasons for the situation are complex, and the explanations are very controversial. Some people say that it was the Catholic church and the fight against the Protestants that was the main barrier to science and research. The fact is that, except for isolated cases, there was no science in Spain.

The Elhúyar brothers (Juan José and Fausto) discovered wolfram, also called tungsten, in 1783. There is a controversy about this discovery. The Swedish chemist C.W. Scheele described its oxide in 1781 and called it tungsten, and the Spanish brothers showed in 1783 that the same oxide was a constituent of the mineral wolframite and reduced it to the metal wolfram. The latter is the name recommended by IUPAC. Apart from the Elhúyars, very few names are worth mentioning among Spanish scientists in the eighteenth and nineteenth centuries: Mateo Orfila (toxicology), Augustín de Bethencourt (civil engineering), José Celestino Mutis (botany). The twentieth century is better represented: the spectroscopist Miguel Catalán (a crater on the moon is named after him) and the Nobel laureate in physiology or medicine of 1959, Severo Ochoa. Ochoa was awarded the Prize jointly with Arthur Kornberg for their discovery of the mechanism of the biological synthesis of ribonucleic acid and deoxyribonucleic acid.

However, in the nineteenth century, which was so important for science, you find practically no contribution to science in Spain. The reasons may go back to our history. Spain used to be the fighter for the Catholic church all over the place. The Spanish King used to be the main warrior. The Jews were expelled from Spain in 1492, and this was an important factor because part of the culture was in the Jewish community. I don't know why, but it's certainly true that we have nobody to compare with Galileo, Newton, Gauss, or Leibnitz.

There are some leitmotifs that one often repeats. In my case, in speaking about my country and our science, one of these is my deep and inconsolable regret that our past is forever lost. When I

write to Jean-Marie Lehn, I cannot suppress a heartfelt sorrow, thinking not about Spain having no Nobel Prize in chemistry but of his address, "Institut Le Bel, Université Louis Pasteur, Rue Blaise Pascal"! Or that the British chemical journals are called *Perkin*, *Dalton*, and *Faraday*. This we have lost, and we will never be able to recover. The Spanish Civil War and the 50 years of dictatorship have done damage that there is no hope to repair. It is too late for Spain. The world in the year 2000 offers no opportunity for a small country in Western Europe to have its Le Bel, Pasteur, Pascal, Perkin, Dalton, and Faraday, despite the effort and enthusiasm its scientists may put into research.

IH: How about Spanish culture and science outside Spain?

JE: Argentina has developed a sort of renaissance of Spanish culture and science, and they even had a Nobel prize winner in chemistry, Luis Federico Leloir in 1970, who received the Prize for his discovery of sugar nucleotides and their role in the biosynthesis of carbohydrates. I think the Latin American contribution to science is more impressive than the contribution in Spain. The Spanish Government has put a lot of money into science during the last 10 years. I think the results have been very good. Many young people came back from other countries. Thousands of young postdocs had been sent to America, Britain, Germany, and France, and they came back and they received support. The results are good, but I'm afraid that we still suffer from the lack of roots. It takes a long time to develop them. The Spanish tree of science grows well upward, but the roots are not deep. If support gets depleted, the results may soon disappear. We lack the traditions; science is not built into our culture.

Spanish industry is also very weak. The Spanish industries are subsidiaries of French, German, British, and American companies. There is very little Spanish pharmaceutical industry, for example. The Spanish chemical industry fails to provide sufficient stimulus for chemical research in Spain. They prefer to buy patents.

IH: How about the benefits from the European Community?

JE: Sometimes I ask my German and French friends, what about our science, our industry? They say, let the science and industry be in Germany, you are a different part of Europe. In Germany we do the industry and we go to Spain for holidays. So I ask, what about our chemists and physicists, and the answer is, they can come to Germany to work. In a way we have the same attitude in Spain. Spanish science and industry concentrate in Madrid and Barcelona. Then we discuss Spanish science and industry, and some people say it's all right, we can't have everything the same everywhere. If this is the reality of the European Community, it worries me very much. At this level I'm still not European, I'm still rather Spanish, and I don't like the idea of a country where people can only retire, where they need nurses but not scientists.