

## Professor Jose Elguero

### A Tribute



José Elguero was born on Christmas day, 1934, in Madrid where he received his Bachelor of Science degree in chemistry from the University Complutense of Madrid in 1957. There was a very difficult economic situation throughout Spain in those days with a very poor allocation of resource to science. Therefore, José Elguero decided to move to neighboring France to be trained as a scientist, after (as he confesses sometimes) a fruitless attempt to become a perfumist in the University of Grasse. He was accepted as a PhD student by the University of Montpellier, from where he received his doctorate in 1961 working under the supervision of Professor Robert Jacquier on pyrazole chemistry. Thus, he became familiar with heterocyclic chemistry, the field in which he has worked since. In 1977 he was awarded a Doctorate of Science by the University Complutense of Madrid.

After his doctorate, he obtained his first position as “Attaché de Recherche”, being promoted to “Maître de Recherche” in the French Centre National de la Recherche Scientifique (CNRS), first in Montpellier and later on in the laboratory of Professor J. Metzger in the Faculty of Sciences and Technology of Saint Jérôme, Marseille. His work continued in Marseille until 1979, including a stay with Professor Alan R. Katritzky in England, after which he decided to return to Spain in 1980. His scientific career in France had occupied more than 20 years of his life, but his relationship with Spain was permanent, with Spanish postdocs working under his guidance in Montpellier and Marseille, and also as an active participant in the creation of the specialized group of Organic Chemistry of the former Royal Spanish Society of Physics and Chemistry.

He returned to Madrid in 1980 and took a position at the Institute of Medicinal Chemistry, a centre belonging to the Spanish Consejo Superior de Investigaciones Científicas (CSIC), where he has remained ever since first as Senior Research Scientist and later as Research Professor. He also became President of the CSIC over the period 1983-1984. From 1986 to 1990 he was

President of the Social Council of the Autonomous University of Madrid.

At the time he joined CSIC, José Elguero was already a specialist in heterocyclic chemistry, mainly in azoles, with wide experience in international publications, something not very common among the Spanish scientists of that time. For example, he had already published in 1976 one of his most important contributions to the heterocyclic chemistry: "The Tautomerism of Heterocycles", in collaboration with Claude Marzin, Alan R. Katritzky and Paolo Linda, which has been a fundamental book for investigators in heterocyclic chemistry and is widely cited in the literature. To give but one example, when José Elguero applied for the research position in CSIC, colleagues with access to his curriculum noted with astonishment the production of 222 articles, which meant that he had published more than any member of the committee in charge of his evaluation and that without speaking of the quality of the articles.

The arrival of José Elguero to Madrid (1980) was an enormous help to many who were beginning their research in the field of organic chemistry those. Spanish chemistry at that time was characterized by very poor infrastructures in the centers and in general a rather low level of research, especially with respect to international publications. In addition, organic chemistry was in the hands of a few schools that exercised strong control over the sector. In this context, José Elguero arrived as high-quality "fresh blood", without prejudices and willing to collaborate with everybody with an enormous generosity. He always encouraged to the transformation of ideas along working lines and helped to look for and establish, relevant international collaboration.

The last point deserves more attention. Having experienced difficulties in forming a consolidated and high-level group, José Elguero established from the beginning numerous collaborations with national and foreign groups, acting as a bridge between teams of researchers that previously were ignoring each other. Due to his tremendous knowledge, achieved by his avidity for reading of all types, in particular scientific, he was able to arrange contact between and thus to amalgamate groups in a variety of fields to work complementarily, with substantial optimization of the research effort. Nowadays, nobody doubts the values of interdisciplinarity, and this word is mentioned many times as something especially desirable in modern research. However, in José Elguero we found someone who really applied this concept over more than thirty years, keeping collaborations with diverse disciplines, not only concerning chemistry or medicinal chemistry, but also with physics and mathematics. Of course, this ability to connect and collaborate with different groups is based on values of scientific knowledge but also on values such as generosity, friendship and honesty.

As a result, although the career of José Elguero has always rotated around heterocyclic chemistry, he has been able to diversify enormously by developing new synthetic methodologies and the search for structure-activity relationships, that is to say, toward a less synthetic and more rational approach. Thus, José Elguero's contributions to tautomerism, hydrogen bonding and aromaticity of heterocycles are crucial. Moreover, he also has contributed to the knowledge of the aromaticity of systems such as fullerenes and aromatic propelenes. He has also made fundamental contributions to the spectroscopy and the physical chemistry, such as the study of heterocyclic systems and organometallic complexes by  $^{13}\text{C}$  and  $^{15}\text{N}$  NMR, or the application of

computational chemistry to study the structure and reactivity of heterocycles. In addition, he has performed many crystallographic studies and has been deeply involved in projects of crystal engineering.

He has also contributed to the development of new synthetic techniques, as in the fields of phase-transfer catalysis, photochemistry, flash pyrolysis of heterocycles and the optimization of processes in organic synthesis. He has also made significant contributions to solid-state or gas-phase chemistry, even performing small incursions into sonochemistry or microwave-driven chemistry. His interests have not stopped there however, since he has explored the area of new materials, with contributions to the study of "proton sponges", adamantane and cubane derivatives.

With his knowledge of heterocyclic systems, José Elguero moved into more pharmaceutical-oriented applications. Thus, he has made important use of mathematical Quantitative Structure-Activity Relationships (QSAR) methods to help the design of drugs; his hydrophobicity studies in heterocyclic systems are also of pharmaceutical interest. New antihelmintic, antiparasitary and antimicrobial agents have been obtained from these studies, as well as antiviral nucleosides, sulfonamides and anthranilic acid-derived analgesics.

The enumeration of all the scientific fruits of more than forty years of José Elguero's research cannot be described within this short tribute, but his curriculum is impressive as one of Spain's chemists with a substantial international reputation. He has published more than 1000 scientific articles, being lecturer at the universities of most fame, guest of honor of the most noted congresses, participant of scientific committees, of congresses and editorials of specialized publications. He has been rewarded with numerous accredited investigation prizes, such as the Schutzenberger Prize by the French Chemistry Society (1968), the Solvay Prize (1988), the Gold Medal of the Spanish Royal Society of Chemistry (1984) or the Santiago Ramón y Cajal Prize (1993) to mention but a few. He has been named Doctor *Honoris Causa* from the Universities of Madrid (Autonomous, 1999), Castilla-La Mancha (1999), Alcalá de Henares (2000), St. Petersburg (2000), Saragossa (2001) and Aix-Marseille (2001). In addition, José Elguero is a member of the academies of Pharmacy and "Ciencias Exactas, Físicas y Naturales", both of Madrid.

To understand the development of such a huge production of high quality work it is necessary to consider some key points in José Elguero's scientific trajectory. The orderly and systematic work, his open mind and lack of prejudice and his ability to combine different efforts to achieve a final goal were major contributors. If we combine all this qualities in a sincere, friendly and humble person, we also realize why many Spanish chemists have no doubt in calling his teaching and influence in the history of Spanish chemistry from the end of the XX century "the Elguero effect".

Among his favorite hobbies, José Elguero enjoys trekking, especially in the mountains surrounding Madrid.

**Selected Recent Publications of Professor José Elguero**

1. Crown Ethers Derived from 2,7-Dihydroxyacridine and 2,7-Dihydroxyacridan-9-one. Vichet, A.; Patellis, A.-M.; Galy, J.-P.; Galy, A.-M.; Barbe, J.; Elguero, J. *J. Org. Chem.* **1994**, *59*, 5156.
2. Imidazole and Benzimidazole Addition to Quinones. Formation of *meso* and *d,l* Isomers and Crystal Structure of the *d,l* Isomer of 2,3-Bis(benzimidazol-1'-yl)-1,4-dihydroxybenzene. Escolastico, C.; Santa Maria, M. D.; Claramunt, R. M.; Gimeno, M. L.; Alkorta, I.; Foces-Foces, C.; Hernández Cano, F.; Elguero, J. *Tetrahedron* **1994**, *50*, 12489.
3. Toward the Photostability Mechanism of Intramolecular Hydrogen Bond Systems. 3(5)-(1'-Hydroxy-2'-naphthyl)pyrazoles and 3(5)-(2'-Hydroxy-1'-naphthyl)pyrazoles. Catalán, J.; Del Valle, J. C.; Claramunt, R. M.; Santa Maria, M. D.; Bobosik, V.; Mocio, R.; Elguero, J. *J. Org. Chem.* **1995**, *60*, 3427.
4. The Colors of C60 Solutions. Catalan, J.; Saiz, J. L.; Laynez, J. L.; Jagerovic, N.; Elguero, J. *Angew. Chem. Int. Ed.* **1995**, *34*, 105.
5. Effects of Nitrogen Substitution in Poly(pyrazolyl)borato Ligands: From Orbital Energy Levels to C-H...O Hydrogen Bonding. Janiak, C.; Scharmann, T. G.; Green, J. C.; Parkin, R. P. G.; Kolm, M. J.; Riedel, E.; Mickler, W.; Elguero, J.; Claramunt, R. M.; Sanz, D. *Chem.-Eur. J.* **1996**, *2*, 992.
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7. Palladium(0)-Catalyzed Preparation of 4-Arylpyrazoles. Elguero, J.; Jaramillo, C.; Pardo, C. *Synthesis* **1997**, 563.
8. Syntheses in Superheated Aqueous Media: Preparation of Fully Deuterated Pyrazoles and Quinoxalines. Junk, T.; Catallo, W. J.; Elguero, J. *Tetrahedron Lett.* **1997**, *38*, 6309.
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10. Synthesis and Characterization of Palladium(II) Complexes with New Polydentate Nitrogen Ligands. Dynamic Behavior Involving Pd-N Bond Rupture. X-ray Molecular Structure of  $[\{Pd(\zeta^3-C_4H_7)\}_2(Me-BPzTO)](4-MeC_6H_4SO_3)$  [Me-BPzTO = 4,6-Bis(4-methylpyrazol-1-yl)-1,3,5-triazin-2-olate]. Gómez-de la Torre, F.; De la Hoz, A.; Jalón, F. A.; Manzano, B. R.; Otero, A.; Rodríguez, A. M.; Rodríguez-Pérez, M. C.; Echevarría, A.; Elguero, J. *Inorg. Chem.* **1998**, *37*, 6606.
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12. Synthesis and Molecular Structure of 3-(2-Benzyloxy-6-hydroxyphenyl)-5-styrylpyrazoles. Reaction of 2-Styrylchromones and Hydrazine Hydrate. Pinto, D. C. G. A.; Silva, A. M. S.; Cavaleiro, J. A. S.; Foces-Foces, C.; Llamas-Saiz, A. L.; Jagerovic, N.; Elguero, J.

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  22. Dynamic NMR Study of the Mechanisms of Double, Triple, and Quadruple Proton and Deuteron Transfer in Cyclic Hydrogen Bonded Solids of Pyrazole Derivatives. Klein, O.; Aguilar-Parrilla, F.; López, J. M.; Jagerovic, N.; Elguero, Jose; Limbach, H.-H. *J. Am. Chem. Soc.* **2004**, *126*, 11718.