

Professor Eusebio Juaristi A Tribute



Dr. Eusebio Juaristi, professor of chemistry at the CINVESTAV (Center of Research and Advanced Study of the National Polytechnic Institute) in México City is arguably the foremost organic chemist in México. It gives me great pleasure to write this tribute as an introduction to a series of scientific articles dedicated to him on his 55th Birthday.

Eusebio Juaristi was born in Querétaro, México in 1950. After High School in Puebla, he received his undergraduate degree (“licenciatura”) in chemistry at the Technological Institute of Monterrey, México (ITESM) in 1972, having done undergraduate research with the late Professor Xorge A. Domínguez, a renowned Mexican researcher in the area of natural products chemistry and erstwhile editor of the *Revista Latinoamericana de Química*.

I first met Eusebio in a course on conformational analysis in Guadalajara in 1970. Professor N. L. Allinger and I had taught this ACS course in the U.S. (with varying third instructors) for several years in the 1960’s, and at the end of the decade we decided to export it to México. But since I was the only one of the teaching team that spoke Spanish, we persuaded Professor Domínguez and the late Professor Pedro Lehman of the Department of Pharmaceutical Chemistry of CINVESTAV to share in the presentation. Domínguez brought his student Juaristi along to partake in the course. Eusebio has told me that the subject matter and my presentation appealed to him so much that he decided to do his Ph.D. research with me. He was accepted for graduate study at the University of Notre Dame in 1972, but since I had then just moved to the University of North Carolina at Chapel Hill, he resolved to follow me there. Or, rather, he preceded me by a couple of months and, through the generosity of the then chemistry chair Richard Hiskey, was able to use the time constructively to take a course in English, which helped him greatly in his teaching and later in the writing of his dissertation.

Juaristi's thesis work was concerned largely with conformational problems in the 1,3-dithiane series including a study of the gauche and anomeric effects, a topic that engaged him for some time in his independent research later on. He was awarded the Ph. D. degree in 1977.

Realizing that theoretical interpretations of the anomeric effect required knowledge of quantum mechanics, Juaristi then spent a year working in this area with Professor Andrew Streitwieser at the University of California at Berkeley. Following this postdoctoral experience, he moved to Palo Alto, California in 1978 to work for a year in the Syntex laboratories (Diagnostics Division). In 1979 he returned to México City and joined the Chemistry Department of CINVESTAV as assistant professor. In 1983 he was promoted to titular professor and, through a sequence of further promotions, became full professor in 1991, the position he holds today. He has spent several productive sabbatical years abroad: 1985/86 and 1992/93 at the ETH (Swiss Federal Polytechnic institute) in Zurich, Switzerland and 1999/2000 at U.C. Berkeley. He also spent shorter periods at the Universities of Paris-Sud, Helsinki, Madrid (Universidad Autónoma), Barcelona, Bilbao, and Sao Paulo.

The hallmarks of Dr. Juaristi's independent research have been diversity in subject matter, diligence and thoroughness, combined with a high degree of motivation and the ability to explain his findings clearly both orally and in writing. Not surprisingly the result has been extraordinary productivity: He has nearly 220 papers to his name, including 131 original publications, almost all of them in highly renowned international journals. He has also been very conscious of the need to summarize and organize both his own work and that of others: in journal reviews (16), book chapters (21) and a large number of sole-authored, co-authored and edited books (10). (The remaining publications are pedagogic or historical in nature.) His work has been cited over 4200 times and he is both the most cited Mexican chemist author and the author of the two most cited Mexican publications in the 1990-2000 decade.

Juaristi's original publications have been largely in the area of mechanistic, physical-organic and theoretical organic chemistry. They have dealt with the conformational analysis of saturated heterocycles, including NMR, calorimetric and computational study of solvent effects, the anomeric effect, studies of chiral ligands and of stereoselective synthesis, including that of α - and β -amino acids and many other subjects. The remarkable diversity of Juaristi's work may be gleaned from the list of 25 of his most important publications, cited at the end of this tribute.

In recognition of the high importance of his research, Eusebio Juaristi was made an "Investigador Nacional" in 1984 and advanced to the highest level (III) in this group of superior Mexican scientific investigators in 1993.

The output of successful academics is seen not only in the number and quality of their publications but also in the number and professional success of the graduate students who have worked with them. In this respect, Juaristi shines once again. Of the 25 students who have earned the Ph.D. under his supervision, 23 hold academic positions in Mexican universities. One of these students, Dr. Gabriel Cuevas, now at UNAM and a co-author of Juaristi's book on the anomeric effect, is already a recipient of the Weizmann prize of the Mexican Academy of Sciences for the best doctoral dissertation in exact science of his year (1993) and has also been

awarded prizes by both UNAM and the Mexican Academy of Sciences as an outstanding young investigator; another, Dr. Barbara Gordillo, obtained the A. Rosenblueth prize for best Ph. D. dissertation. One of Juaristi's Ph.D. recipients works in Industry (BASF) a very unusual occurrence in México, since Mexican Industry hires almost exclusively chemical engineers. Of the 23 Master's students Juaristi has trained, 4 hold academic positions. I find it particularly gratifying that of his 27 former graduate student collaborators now in academe, two-thirds (18) are located outside of México City, thus counteracting the concentration of talent in the mega-universities of the capital. Surely there must be many promising students outside of México City, but with the concentration of talent and opportunities in the capital in the not so distant past, these students had the choice of either moving to the City (if they could afford to do so) or to study in institutions often of lesser level nearer home. Eusebio has clearly done his share in supplying the provincial universities with highly trained and talented young faculty who - once given the needed financial support - will contribute to improving the level of chemical science taught in those universities all over México. He has also trained 46 B.S. students in the laboratory, a number of whom went on to graduate study.

Juaristi has been a frequent guest lecturer both in México and elsewhere. He is often invited to give talks at other Mexican universities and has received many invitations to participate in symposia both in México and abroad.

Professor Juaristi has consistently been a good citizen in helping to further chemistry in a variety of ways. For example, he has served on the membership committee of the Mexican Academy of Sciences from 1992 to 1995, and from 2000 to 2002 was Secretary of the Academy. In that position and subsequently he arranged, jointly with the US-Mexican Foundation for Science and the American Chemical Society, for 3 or 4 fellowships enabling young Mexican chemical scientists to spend the summer in a US laboratory. This productive arrangement continued for several years. For 2006 Juaristi is organizing the 16th International Conference on Organic Synthesis of IUPAC in Merida, México. Preparation for this event entails a great deal of organization and coordination, including fund raising. Juaristi has also been of service to the Mexican Research Council as an evaluator of researchers and research projects, as well as to the Mexican Chemical Society. He is Director of the Latin American Chemistry Net ("ReLaQ", www.relaq.mx). In addition to teaching courses in Physical Organic Chemistry, Stereochemistry and Conformational Analysis, and Basic Principles of Molecular Orbital Theory both within and outside of CINVESTAV, he is the founder and first director of the Center of Chemical Research, a graduate center at the Universidad Autónoma del Estado de Morelos. He has been a prolific lecturer both within México (over 200 talks at universities, in industry and at national congresses) and abroad (over 100 presentations in Austria, Brazil, Canada, China, Colombia, Costa Rica, Finland, France, Germany, Italy, Japan, Poland, Portugal, Spain, Switzerland, Venezuela and the USA).

As might be expected in view of all these achievements, Juaristi has received numerous national awards. In 1984 he was elected a member of the Mexican Academy of Sciences. In 1988 he received the Exact Sciences prize of the Mexican Academy of Sciences and in 1990 he

was awarded the Manuel Noriega Morales prize of the Organization of American States. The Andrés Manuel Del Rio prize of the Mexican Chemical Society was given to him in 1995 and in 1998 the list of his awards culminated in receipt of the National Arts and Science prize in physico-mathematical and natural sciences “for his contributions to organic chemistry”, perhaps the highest award that is given to a scientist in México.

In view of all these outstanding achievements my beginning statement - that I consider Eusebio Juaristi the most outstanding chemist in México today - is presumably justified.

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List of selected publications

1. Juaristi, E. The Attractive and Repulsive Gauche Effects *J. Chem. Educ.* **1979**, *56*, 438.
2. Juaristi, E.; Valle, L.; Valenzuela, B. A.; Aguilar, M. A. S–C–P Anomeric Interactions. 4. Conformational Analysis of 2-Diphenylphosphinoyl-1,3-dithiane *J. Am. Chem. Soc.* **1986**, *108*, 2000.
3. Juaristi, E.; Martínez, R.; Méndez, R.; Toscano, R. A.; Soriano-García, M.; Eliel, E. L.; Petsom, A.; Glass, R. S. Conformational Analysis of 1,3-Dioxanes with Sulfide, Sulfoxide and Sulfone Substitution at C(5). Finding of an Eclipsed Conformation in *cis*-2-*t*-Butylsulfonyl-1,3-dioxane *J. Org. Chem.* **1987**, *52*, 3806.
4. Juaristi, E. Conformational Analysis of Six-Membered, Sulfur-Containing Saturated Heterocycles *Acc. Chem. Res.* **1989**, *22*, 357.
5. Juaristi, E. Introduction to Stereochemistry and Conformational Analysis, Wiley: New York, 1991.
6. Juaristi, E.; Cuevas, G. Recent Studies of the Anomeric Effect, *Tetrahedron Reports* **1992** *48*, 5019.
7. Juaristi, E.; Hansen, J.; Mukhopadhyay, T.; Beck, A.; Matt, T.; Simson, M.; Seebach, D. Enantioselective Aldol and Michael Additions of Achiral Enolates in the Presence of Chiral Lithium Amides and Amines, *Synthesis* (Feature Article) **1993**, 1271-1290.
8. Juaristi, E.; Quintana, D.; Escalante, J. Enantioselective Synthesis of β -Amino Acids, *Aldrichimica Acta* **1994**, *27*, 3.
9. Juaristi, E.; Cuevas, G.; Vela, A. Stereoelectronic Interpretation for the Anomalous ^1H NMR Chemical Shifts and One-Bond Coupling Constants (Perlin Effects) in 1,3-Dioxanes, 1,3-

- Oxathianes, and 1,3-Dithianes. Spectroscopic and Theoretical Observations, *J. Am. Chem. Soc.* **1994**, *116*, 5796.
10. Juaristi, E.; Cuevas, G. The Anomeric Effect, CRC Press: Boca Raton, FL., ISBN 0-8493-8941-0, 1995.
 11. Juaristi, E. Ed. Conformational Behavior of Six-Membered Rings. Analysis, Dynamics and Stereoelectronic Effects, VCH Publishers: New York, ISBN 1-56081-683-X, 1995.
 12. Juaristi, E. Ed. Enantioselective Synthesis of β -Amino Acids. Wiley-VCH: New York, ISBN 1-56081-914-6, **1997**.
 13. Juaristi, E.; Ordoñez, M. Conformational Preference of the Sulfinyl Group in Six-Membered Heterocycles, In *Organosulphur Chemistry*, P.B.C. Page, Ed., Academic Press: London, 1997.
 14. Cuevas, G.; Juaristi, E. A Density Functional Study of 2-Lithio-1,3-dithiane and 2-Lithio-2-phenyl-1,3-dithiane. Conformational Preference of the C-Li Bond and Structural Analysis, *J. Am. Chem. Soc.* **1997**, *119*, 7545.
 15. Juaristi, E. Stable Eclipsed Conformations. In *Encyclopedia of Computational Chemistry*, Schleyer, P. V. R.; Allinger, N. L. Eds; Wiley: New York, 1998; Vol. 4, pp 2688.
 16. Juaristi, E.; León-Romo, J. L.; Reyes, A.; Escalante, J. Recent Applications of α -Phenylethylamine (α -PEA) in the Preparation of Enantiopure Compounds. Part 3: α -PEA as Chiral Auxiliary. Part 4: α -PEA as Chiral Reagent in the Stereodifferentiation of Prochiral Substrates, *Tetrahedron: Asymmetry* **1999**, *10*, 2441.
 17. Ramírez-Quirós, Y.; Balderas, M.; Escalante, J.; Quintana, D.; Gallardo, I.; Madrigal, D.; Molins, E.; Juaristi, E. X-Ray Crystallographic Study of Substituted Perhydropyrimidinones. Extreme Changes in Ring Conformation, *J. Org. Chem.* **1999**, *64*, 8668-8680.
 18. Juaristi, E.; Hernández-Rodríguez, M.; López-Ruiz, H.; Aviña, J.; Muñoz-Muñiz, O.; Hayakawa, M.; Seebach, D. Synthesis of New Chiral Derivatives of DMPU and Examination of Their Impact on the Regio- and Enantioselectivity of 2-(1,3-Dithianyl)lithium Addition to 2-Cyclohexen-1-one, *Helv. Chim. Acta* **2002**, *85*, 1999.
 19. Juaristi, E. 1-Benzoyl-2(*S*)-*tert*-butyl-3-methyl-perhydropyrimidin-4-one, in *Handbook of Reagents for Organic Synthesis*. In *Chiral Reagents for Asymmetric Synthesis*, Paquette, L. A. Ed.; Wiley: Chichester, 2003; pp 53-56.
 20. Iglesias-Arteaga, M. A.; Castellanos, E.; Juaristi, E. Alternative Procedure for the Synthesis of Enantiopure 1-Benzoyl-2(*S*)-*tert*-butyl-3-methylperhydropyrimidin-4-one, a Useful Starting Material for the Enantioselective Synthesis of α -Substituted β -Amino Acids, *Tetrahedron: Asymmetry* **2003**, *14*, 577.
 21. Muñoz-Muñiz, O.; Quintanar-Audelo, M.; Juaristi, E. Reexamination of CeCl₃ and InCl₃ as Activators in the Diastereoselective Mukaiyama Aldol Reaction in Aqueous Media, *J. Org. Chem.* **2003**, *68*, 1622.

22. Castellanos, E.; Reyes-Rangel, G.; Juaristi, E. Diastereoselective Electrophilic Amination of Chiral 1-Benzoyl-2-isopropyl-3-methyl-perhydropyrimidin-4-one in the Asymmetric Synthesis of α -Substituted α,β -Diaminopropionic Acid. *Helv. Chim. Acta* **2004**, *87*, 1016.
23. Martínez-Mayorga, K.; Juaristi, E.; Cuevas, G. Manifestation of Stereoelectronic Effects on the Calculated Carbon-Hydrogen Bond Lengths and One Bond $1J_{C-H}$ NMR Coupling Constants Relative Aceptor Ability of the Carbonyl (C=O), Thiocarbonyl (C=S), and Methylenedene (C=CH₂) Groups Towards C-H Donor Bonds, *J. Org. Chem.* **2004**, *69*, 7266.
24. Juaristi, E.; Notario, R.; Roux, M. V. Calorimetric and Computational Study of Sulfur-Containing Six-Membered Rings, *Chem. Soc. Rev.* **2005**, *34*, 000-000. DOI: 10.1039/B311507K.
25. Juaristi, E.; Soloshonok, V. Eds; Enantioselective Synthesis of β -Amino Acids, 2nd Edn; Wiley: New York, ISBN: 0-471-46738-3, 2005.