

## Prof. Rosalinda Contreras Theurel



### A Tribute

This special issue of ARKIVOC is dedicated to Prof. Rosalinda Contreras Theurel to mark her 60<sup>th</sup> birthday and to acknowledge her contribution to Mexican Science. Her work has been fundamental in the development of main group chemistry in Mexico.

Rosalinda Contreras Theurel, descendent of French immigrants, was born in the State of Veracruz and went to Puebla to study chemistry at the State University there. After obtaining her B.Sc. both as an industrial chemist and as a pharmaceutical chemist, she went to work as a research assistant at the Syntex Research Division in Mexico City headed by Pierre Crabbé, a distinguished Belgium chemist. The introduction to research persuaded Dr. Contreras to develop a career in this field. Encouraged by Dr. Crabbé she went to the University Paul Sabatier in Toulouse, France, to join the group of Prof. Robert Wolf. There she studied optically active pentacoordinated phosphorus compounds which was the subject of her Ph.D. thesis; she was awarded the degree in 1973.

Soon after her return from France, she joined the academic staff of Cinvestav; (Centre for Research and Advanced Studies) in Mexico City which, not long before, had initiated a postgraduate program in chemistry. There, she continued to develop her interest in the chemistry of main group elements. Her first research activities were dedicated to organo boron chemistry, motivated and supported by Herbert C. Brown, who trained her in the manipulation of boron compounds. Some time later, she made an academic visit to Germany in the group of Prof. Heinrich Nöth where she began a fruitful collaboration with Dr. Bernd Wrackmeyer. It was there that Dr. Contreras extended her interest to the applications of heteronuclear magnetic resonance.

As a result of her research, Dr. Contreras has published papers on the stereochemistry of main group organic chemistry, especially with nitrogen, phosphorus, boron, and tin compounds as well as studies on coordination chemistry of transition and main group metals with molecules of biological interest, particularly optically active ligands and polycyclic aromatic phenol and phenylamines. She addressed the interesting subject of weak interactions in main group chemistry, such as Lewis adducts, hydride-proton short interactions, investigation of sulfur behavior as Lewis acid or base. In total, she has published 134 scientific papers, 5 chapters in books, and has presented her results in many international meetings. She has been advisor of 73 theses of Bachelor, Master of Science and PhD students. Of those students, thirty are now successful independent research fellows in different institutions.

Besides her research career, Rosalinda Contreras has been very active in other fields such as the promotion of science among children and young students. To this end, she has given hundreds of lectures all over the country and has been involved in children educational programs both as organizer and as participant.

At Cinvestav, she has occupied several administrative positions such as Academic Dean (1980-1981) and Chairperson of the Chemistry Department (1981-1989), Academic Chancellor (1995) and President of Cinvestav (2002-2006). She has also held several positions at the Mexican Chemical Society, President of the Mexican Academy of Inorganic Chemistry, Treasurer of the Mexican Academy of Science, member and organizer of some symposia of the American Chemical Society, member of the Technical Council of the Mexico-USA Foundation for the Science. She is member of the Imeboron Committee (IUPAC), of the International Council on Main Group Chemistry, of the Scientific Committee of the Boron Americas Workshops and Mexican Chairperson of the Science and Technology Technical Committee of the Mexico-USA Border Governors.

In recognition of her work Rosalinda Contreras has received several awards. She received a scholarship from the French Government for her PhD Studies 1970-1973. She was also awarded a research scholarship from the Humboldt Foundation (Germany) in 1979. She received the Mexican Academy Award for Young Scientist in Exact Sciences in 1986, the Boron Americas Award 2004 for distinguished achievement in the Chemistry of Boron, and Honorary Diplomas from the Puebla and Guanajuato Universities. She is Corresponding Member of the Bavarian Academy of Sciences (2001).

Apart from her many academic interests, Rosalinda Contreras likes to walk in the forest and deserts and is an avid photographer.

“To succeed is to help others to succeed.” These words could be observed on a print in her office and they very much reflect Rosalinda Contreras’ attitude through her academic career.

Some papers that cover the research of Prof. Contreras related with optically active boron compounds derived from aminoalcohols, are listed below:

1. Obtention de 3 types de dérivés du bore: Esters aminoboriques tris N-boranes, esters aminoboriques bis N-boranes et aminoalcools N-boranes a partir de la réaction d'aminoalcools-1,2 avec  $\text{BH}_3 \cdot \text{THF}$  et  $\text{BH}_3 \cdot \text{DMS}$ . Mise en évidence d'une coordination interne  $\text{B} \leftarrow \text{N}$ . Mancilla, T.; Santiesteban, F.; Contreras, R.; Klaébé, A. *Tetrahedron Lett.* **1982**, 23(15), 1561-1564.
2. Consequences stéréochimiques de la fixation de  $\text{BH}_3$  sur la paire libre de l'azote des éphedrine: Echange isotopique  $\text{NH}/\text{ND}$  stéréospécifique. Santiesteban, F.; Mancilla, T.; Klaébé, A.; Contreras, R. *Tetrahedron Lett.* **1983**, 24(8), 759-760.
3. Détermination de la configuration de l'azote dans les éphedrine N-boranes et une étude de leur assistée stéréospécifique deutération de  $\text{NH}$ . Tlahuext, H.; Santiesteban, F.; García-Báez, E.; Contreras, R. *Tetrahedron: Asymmetry* **1994**, 5(8), 1579-1588.

Some of her research related with optically active boron compounds derived from aminoalcohols, are described in the following papers:

1. The N-B coordination in hindered cyclic hexylboronic esters derived from diethanolamines. R. Contreras, C. García, T. Mancilla, B. Wrackmeyer. *J. Organometal. Chem.* **1983**, 246, 213-217.
2. Stereochemistry of ephedrine- and pseudoephedrine-derived oxazolidines and of their N-borane adducts determined by nuclear overhauser effect difference spectroscopy. F. Santiesteban, C. Grimaldo, R. Contreras, B. Wrackmeyer. *J. Chem. Soc. Chem. Commun.* **1983**, 1486-1487.
3. N-Borane adducts of oxazolidines derived from ephedrine and pseudo-ephedrine. Study of stereochemistry by NMR. R. Contreras, F. Santiesteban, A. Paz-Sandoval, B. Wrackmeyer. *Tetrahedron* **1984**, 40(19), 3829-3838.

Her research over 40 years, with the collaboration and friendship of distinguished Mexican chemists as Angelina Flores-Parra, María de Jesus Rosales, Angeles Paz-Sandoval and Norah Barba-Behrens and her talented students, has contributed to the knowledge of the stereochemistry of main group organic chemistry, especially with phosphorus, boron, and tin compounds. Some examples are:

1. Stable chiral nitrogen and boron. T. Mancilla, R. Contreras. *J. Organometal. Chem.* **1987**, 321, 191-198.
2. Syntheses and reactivity of new P-H dibenzobicyclic phosphoranes bearing hydroxy-, alkoxy-, oxo-, amido-, and dihydrido- functions at the phosphorus atom. A. Murillo, L.M. Chiquete, P. Joseph-Nathan, R. Contreras. *Phosphorus Sulfur and Silicon* **1990**, 53, 87-101.
3. Two new dibenzobicyclic penta- and hexacoordinated tin compounds. C. Camacho-Camacho, H. Tlahuext, H. Nöth, R. Contreras. *Heteroatom. Chem.* **1997**, 9, 321.

4. New hexacyclic binuclear tin complexes derived from bis(3,5-di-tert-butyl-2-phenol)oxamide. V. M. Jiménez-Pérez, C. Camacho-Camacho, M. Güizado-Rodríguez, H. Nöth, R. Contreras. *J. Organometal. Chem.* **2000**, 614/615, 283-293.
5. Synthesis of phosphanes bearing 2-imino-1,3-thiazolidine ligands. X-ray analyses and NMR spectroscopy. E. V. Bakhmutova, H. Nöth, R. Contreras, B. Wrackmeyer, *Z. Anorg. Allg. Chem.* **2001**, 627, 1846-1854.
6. The 2-imino-1,3-selenazolidine group bonded to phosphorus and silicon. A multinuclear magnetic resonance study. E. V. Bakhmutova, A. Cruz, R. Ramírez-Trejo, R. Contreras, B. Wrackmeyer. *Magnetic Reson Chem.* **2001**, 39, 739-745.
7. Optically active pentacyclic binuclear diorganotin compounds. V.M. Jiménez-Pérez, A. Ariza-Castolo, A. Flores-Parra, R. Contreras *J. Organometallic Chem.* **2006**, 691, 1584-1589.

Some summaries of her work in phosphorus and boron cyclic compounds derived from organic molecules were reported:

1. Asymmetric synthesis of new bicyclic phenylboronic esters containing configurationally diethanolamines, diphenolamines, diethylenetriamines, the game with phosphorus and boron. R. Contreras *Phosphorus Sulfur and Silicon* **1994**, 87, 49-58.
2. Boron coordination compounds derived from organic molecules of biological interest. A. Flores-Parra, R. Contreras *Coord. Chem. Rev.* **2000**, 196, 85-124.

She has also published papers about the coordination chemistry of transition metals and molecules of biological interest, particularly optically active ligands:

1. Novel coordination compounds of quinic acid. X-ray diffraction study of copper (II) complexes where the metal ion is a chiral center. N. Barba-Behrens, F. Salazar-García, A.M. Bello-Ramírez, E. García-Báez, M.J. Rosales-Hoz, R. Contreras, A. Flores-Parra *Transition Metal Chem.* **1995**, 19, 575-581.
2. Syntheses and characterization by NMR spectroscopy and x-ray diffraction of complexes derived from metals of 2 and 13 groups and bis-2-(3,5-ditert-butyl-1-hydroxyphenyl)amine ligand. C. Camacho-Camacho, G. Merino, F. J. Martínez-Martínez, H. Nöth, R. Contreras *E. J. Inorg. Chem.* **1995**, 1021-1027.
3. Synthesis, crystal structure and magnetic properties of the triangulo-tricopper(II) complex  $[\text{Cu}_3(\text{cpse})_3(\text{H}_2\text{O})_3] \cdot 8.5\text{H}_2\text{O}$ . H. López-Sandoval, R. Contreras, A. Escuer, R. Vicente, S. Bernés, H. Noth, G. J. Leigh, N. Barba-Behrens *J. Chem. Soc., Dalton Trans.* **2002**, 2648-2653.
4. Triangulo- $\text{N}_3$ -sulfido-trinickel(II) cone-shaped clusters and anion traps: structural characterization. H. López-Sandoval, A. Richaud, R. Contreras, G. Jeffery-Leigh, P. B.

Hitchcock, A. Flores-Parra, J.C. Gálvez-Ruíz, A. Cruz, H. Nöth, N. Barba-Behrens *Polyhedron* **2004**, 23, 1837-1843.

5. Coordination compounds in a pentacyclic aromatic system from 2-aminobenzothiazole derivatives and transition metals ions. F. Téllez, A. Peña-Hueso, N. Barba-Behrens, R. Contreras, A. Flores-Parra *Polyhedron* **2006**, 25, 2363-2374.

An interesting subject addressed by her are the weak interactions in the main group, as Lewis adducts, hydride-proton short interactions:

1. Azolylborane adducts. Structure and conformational analyses by X-ray diffraction and NMR. proton-hydride (C-H-H-B) and proton-fluoride (C-H-F-B) interactions. I. I. Padilla-Martínez, M. J. Rosales-Hoz, H. Tlahuext, Carlos Camacho-Camacho, R. Contreras *Chem. Ber.* **1996**, 129, 441-449.
2. BH-HC interactions in N-borane and N-chloroborane adducts from 1,3,5-heterocyclohexanes. A. Flores Parra, S. A. Sánchez-Ruíz, C. Guadarrama, H. Nöth, R. Contreras *E. J. Inorg. Chem.* **1999**, 2069-2073.
3. Multinuclear NMR spectra,  $^1\text{H-T}_1$  relaxation, conformational behavior and intramolecular  $\text{H}^{\delta-}\cdots\delta^+\text{H}$  contacts of N-borane cyclic adducts in solution. M. Güizado-Rodríguez, A. Flores-Parra, S. Sánchez-Ruíz, R. Tapia-Benavides, R. Contreras and V. I. Bakhmutov *Inorg. Chem.* **2001**, 40, 3243-3246.
4. 2-Anisyl-sulfonyldiphenylphosphine oxide, solid state structure bearing covalent homonuclear negative and positive charge-assisted hydrogen bonds. L. Marin-García, A. Peña-Hueso, A. Flores-Parra, R. Contreras *Crystal Growth Design* **2006**, 6(4), 969-973.

Recently, she has been interested in the investigation of sulfur behavior as Lewis acid or base. Some examples are:

1. Dithiocarbamates, thiocarbonic-esters, dithiocarbonimidates, guanidines, thioureas, isothioureas and tetraazathiapentalene derived from 2-amino benzothiazole. F. Téllez, A. Cruz, H. López-Sandoval, I. Ramos-García, M. Gayosso, R. Castillo-Sierra, B. Paz-Michel, H. Nöth, A. Flores-Parra, R. Contreras *Eur. J. Org. Chem.* **2004**, 4203-4214.
2. 2-Aminobenzothiazole phosphorus amides: Molecular and supramolecular structures, hydrogen bonds and sulfur donor-acceptor interactions. Z. García-Hernández, A. Flores-Parra, J.M. Grevy, A. Ramos-Organillo, R. Contreras *Polyhedron* **2006**, 25, 1662-1672.

Maria de Jesus Rosales and Angelina Flores