

MICROSCALE CHEMISTRY IN LATIN AMERICA

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ABSTRACT

A brief account of the development of Microscale Chemistry in Latin America is here presented. The US National Microscale Chemistry Center (Merrimack College, Massachusetts) was instrumental in the initiation of several centers. Its Mexican counterpart, the Mexican Microscale Chemistry Center (CMQM), has been a key player in this process. Other participating countries include *Argentina, Bolivia, Brazil, Chile, Cuba, Guatemala, Perú and Uruguay*.

Key words: Microscale chemistry, laboratory, history of chemistry.

RESUMEN

Se ofrece un panorama del desarrollo de la química en microescala en América Latina. El Centro Nacional de Química en Microescala de los Estados Unidos de América fue clave para el inicio de varios centros. Su contraparte mexicana, el Centro Mexicano de Química en Microescala (CMQM-UIA) ha sido también una pieza clave en este proceso. Otros países que han participado incluyen a: *Argentina, Bolivia, Brasil, Chile, Cuba, Guatemala, Perú y Uruguay*.

Palabras clave: Química en microescala, historia de la química, laboratorios.

After the onset of Microscale Chemistry in the USA in the late 80's, it quickly spread into Latin America. Even before that, there were some relevant -although isolated-activities; for example, in Mexico (see reference 1), but to the best of my knowledge they were not part of a larger organization or movement.

Dr. Zvi Szafran -one of the founders of the National Microscale Chemistry Center

(NMCC), located at Merrimack College, North Andover, MA, USA; gave the first Microscale Chemistry workshop at Universidad Iberoamericana in Mexico City. Nearly 40 people from several Mexican institutions attended, and from the results of a published survey of 177 Mexican teachers (1), it is obvious that this workshop triggered the *Microscale Revolution* in this country. Visits to UIA from the other two NMCC founders, Drs. Mono Mohan Singh

and Ronald Pike, followed. They also gave workshops and presentations in San Luis Potosi, Guadalajara, Guanajuato, Cancun, and Puebla to literally hundreds of Mexican teachers and students.

Professors Singh and Szafran were instrumental in the setting up of the Mexican Microscale Chemistry Center (Centro Mexicano de Química en Microescala, CMQM from its Spanish initials), through a formal agreement between the NMCC and Universidad Iberoamericana. This center now comprises 14 chemistry teachers, and was the first of its kind in Latin America. NMCC helped other institutions as well, and as a result, over 150 teachers from UIA and other institutions have been trained at the NMCC (2).

In addition to the NMCC founders, several other well-known chemists involved in Microscale Chemistry from throughout the World have offered workshops at CMQM-UIA, where the 1st International Microscale Chemistry Symposium was organized in May, 2000 (followed by a 2nd symposium at Hong Kong Baptist University, in Dec., 2001). A third symposium is planned for May, 2005 at CMQM-UIA in honor of Profs. Szafran, Singh and Pike. The first symposium was edified by workshops and talks given by:

John Bradley (University of the Witwatersrand, South Africa, and CTC-IUPAC)

Mohan Singh (NMCC, USA)

Francisco Javier Arnaiz (Universidad de Burgos, Spain)

Erick Joling (University of Amsterdam, The Netherlands)

Christer Gruvberg (University of Halmstad, Sweden)

Touko Virkkala (Kokkola Institute of Technology)

Roque Cruz (Asseta Faculdades de Tatui, Brazil)

as well as by CMQM-UIA personnel. With grants from the Organization of American States (OEA, from its initials in Spanish), people from several Latin American institutions were able to attend either this symposium or a Microscale Photochemistry workshop offered by Dr. Michael Tausch at CMQM in July, 2003. These include:

Universidad Nacional de Litoral, Santa Fe, Argentina

Universidad de Valparaíso, Chile

Universidad Nacional de Asunción, San Lorenzo, Paraguay

Universidad de El Salvador, San Salvador

Universidad del Valle de Guatemala, Guatemala

Universidad Rafael Landivar, Guatemala

Universidad de Antioquia, Medellín, Antioquia, Colombia

Universidad Nacional de Ingeniería, Managua, Nicaragua

CAMEP, Puerto Príncipe, Petion-Ville, Haití

Pontificia Universidad Javeriana, Bogotá, Colombia

Universidad Agraria La Molina, Lima, Perú

Administración Nacional de Acueductos y Alcantarillados, San Salvador, El Salvador

Other foreign workshop leaders at CMQM-UIA have included:

Arthur Ellis (now Director of Chemistry, National Science Foundation, USA)

Viktor Obendrauf (Gratz Pedagogical Institute, Austria)

Michael Tausch (Gerhard Mercator Universität, Germany)

Bruce Mattson (Creighton University, USA)

Kenneth Doxsee (University of Oregon, USA)

Christer Gruvberg (U. of Halmstad) has offered a series of very successful workshops both at CMQM-UIA and other Mexican institutions in various years. From several sources (mainly the survey in reference 1, the records of the CMQM-UIA, and informal conversations with many colleagues), it can be safely said that in México alone, people from nearly 800 institutions of all levels have participated in microscale chemistry workshops offered mainly by CMQM - UIA, Universidad Nacional Autónoma de México (UNAM), Universidad Autónoma de San Luis Potosí (UASLP), Universidad Autónoma del Estado de México (UAEM), Universidad Autónoma de Nuevo León (UANL), Universidad Iberoamericana - Puebla (UIA-Puebla), Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO), Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Instituto Politécnico Nacional (IPN), Instituto Cultural de Occidente (ICO), Sociedad Química de México (SQM), Centro Nacional de Educación Química (CNEQ), Universidad Michoacana (UMSNH), Asociación Nacional de Química Analítica (ANQA), Universidad Autónoma de Aguascalientes (UAA), Sociedad Mexicana de Electroquímica (SME), Colegios de Bachilleres, PROVITEC, among others.

The 5th. *North American Chemistry Congress* (of the Chemical Societies of the USA, Canadá and México) was held in Cancun, Mexico in november of 1997 and included a Symposium on Microscale Chemistry, organized by Sociedad Química de México through the CMQM-UIA. It consisted of nearly 40 papers and posters. Keynote speakers were Mono M. Singh (NMCC, USA), Zvi Szafran (NMCC, USA), John Penn (West Virginia Univ., USA), David Berry (Univ. of Victoria, Canadá), Guadalupe Urizar (UASLP, México), Elsa Guadalupe Ramírez (UANL, México), Guillermina Rojas (QA-UNAM, México), Clemente Reza (IPN, México), Rosa María González (FQ-UNAM, México), Margarita Portilla (UAM, México), Miguel García Guerrero (ENP-UNAM, México), and Jorge G. Ibáñez (CMQM-UIA, México).

The *First Latin American Microscale Chemistry Symposium* was organized by Sociedad Química de México in Cancún, in September 23, 2002. The CMQM-UIA was given the overall organizational responsibility. Some 35 papers and posters were presented. The keynote speaker was Bruce Mattson, from Creighton University (Omaha, Nebraska, USA).

A brief overview of microscale chemistry activity in other Latin American countries (in the form of workshops and other events) follows. Due to the nature of an overview like this given by a single person with limited knowledge, there is undoubtedly information that I am not aware of, and thus this is only an approximation to the real scenario. I welcome feedback from readers in this regard. Nonetheless, it can give a good idea of the impetus that this revolution has gained in Latin America.

Argentina

CMQM-UIA presented several Environmental Chemistry experiments at the Reunion Anual de Educadores de Química in La Plata, in sept. 2003, and ENP-UNAM offered a workshop there.

Bolivia

CMQM-UIA offered a General Chemistry workshop at Universidad Privada de Santa Cruz de la Sierra (UPSA) in 2002. UPSA offered a High School Chemistry workshop in february, 2003. CMQM-UIA offered three workshops (Organic, Inorganic and Electro-chemistry) at the Annual Bolivian Chemical Society meeting in november, 2003, held at Universidad Autónoma Tomás Frías, in Potosí. More workshops were planned for 2004 in Potosí.

Brazil

Microscale Chemistry in Brazil has been activated by Prof. Roque Cruz, from Asseta Faculdades de Tatui and Universidade Metodista de Piracicaba.

CMQM-UIA offered a General Chemistry workshop at Faculdade de Engenharia Industrial during the Annual Meeting of ISJACHEM (Jesuit Association of Chemistry and Chemical Engineering Schools) in Jul., 2001.

Chile

The Universidad Metropolitana de Ciencias de la Educación (UMCE) invited CMQM-UIA to give a biochemistry-electrochemistry workshop in Santiago in 2001. FQUNAM offered a General Chemistry workshop at Universidad Católica de Valparaíso in 2003, and UNAM-FESC offered another one in 2003 at UMCE.

Cuba

QA-UNAM offered analytical chemistry workshops in 2001 and 2002.

Guatemala

A General Chemistry workshop at Universidad del Valle de Guatemala, supported by CMQM-UIA, was offered in Dec., 2002, as well as one at Universidad Rafael Landivar (both in Guatemala City) in mar., 2003. This same University offered a High School Chemistry workshop in october, 2003.

México

See the discussion above

Perú

The Latin American Federation of Chemical Societies (FLAQ) invited CMQM-UIA to give two workshops at their 24th Meeting in Lima in oct., 2000. Prof. Viktor Obendrauf (see above) offered an Instant Chemistry workshop in Lima, in aug., 2003.

Uruguay

QA-UNAM offered an electro analytical chemistry workshop in 2001.

Lastly, it is very important to note the creation of an institutional network named *MICRONET*, financed by the European Commission through the ALFA Program. This network, coordinated by Universidad Iberoamericana, México City, put together students and teachers from 7 European and Latin American Universities to successfully exchange students interested in Microscale Chemistry for one-semester periods during 1998-2000. The principal organizers met at UIA in may, 2000. A second stage was planned.

Journals and other publications

There are several Journals in Spanish and in Portuguese that periodically cover the field of Microscale Chemistry. Some examples include: *Chemistry Education* (México), *Journal of Science Education* (Colombia), *New Chemistry in the School* (Brazil), *Chilean Journal of Chemical Education* (Chile).

Microscale Chemistry books (all in Spanish, unless otherwise indicated) include:

CMQM-UIA

+Secondary School Microscale Chemistry
+High School Microscale Chemistry
+Microscale Environmental Chemistry (to be published in English, in 2005)
+CMQM-UIA has translated into Spanish - under UNESCO contract - the book: *Microchemistry*, by John Bradley. This should be available soon from UNESCO and/or from their publisher.

UNAM

+High School Microscale Chemistry
+Microscale General Chemistry

Asseta Faculdades de Tatui

+Several pamphlets on specific aspects of Microscale Chemistry (in Portuguese)

CONCLUSION

In conclusion, Microscale Chemistry has developed profound roots in Latin America that will make the tree grow quite high during the years to come.

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