

Curriculum Vitae

Francisco J. Cervantes



Summary

Francisco J. Cervantes was born on February 19, 1972 in Sonora, Mexico. In 1995, he obtained the Bachelor of Science degree in Biotechnology Engineering from Technological Institute of Sonora (ITSON, Mexico) with *Magna cum Lauda*. His Master of Science degree (in Biotechnology) was granted in 1998 from Department of Biotechnology of Universidad Autónoma Metropolitana-Iztapalapa (UAM-I). He obtained the award “University Merit” from UAM-I as the best student of cohort (1995-1997). From July 1997 till the end of 1998 he was an assistant researcher of Department of Biotechnology at UAM-I. In January 2002, he obtained his **PhD in Environmental Sciences from Department of Environmental Technology at Wageningen University (The Netherlands)**. He also did a *post-doc* working in different projects for the *Lettinga Associates Foundation* (LEAF) from October 2001 to May 2002. From June 2002 until August 2006 he was Professor of Department of Water & Environmental Sciences at ITSON. Since September 2006 he assumed a position as Professor of Environmental Biotechnology at Instituto Potosino de Investigación Científica y Tecnológica (IPICYT, Mexico). He has received several grants for basic and applied research funded by different scientific institutions and private companies. He has supervised over 60 theses from different institutions (27 Bachelors, 30 Masters and 8 PhDs). He is member of the editorial board of *Reviews in Environmental Science and BioTechnology* (Springer), and Associate Editor of IWA Publishing. He is also an active referee of over 70 scientific journals, including top-ranking journals, such as *Nature Geoscience*, *Water Res.*, *Environ. Sci. Technol.*, *Appl. Environ. Microbiol.*, *Global Change Biology*, *Chemical Eng. J.*, among many others. He has authored over 100 peer-reviewed research papers, several book chapters and has given several lectures around the world. He has received around 2500 citations (without self-citations, according to Scopus) to his scientific contributions (more than 4300 according to Google Scholar) and his H-index is 34. He is consultant with more than 20 years of experience on wastewater treatment projects from different industrial sectors. There are several wastewater treatment plants, designed by Dr. Cervantes, currently in operation in different industrial sectors of Latin America. He has received several distinctions in his scientific career, including the prestigious *Lettinga Award 2007*, the National Research Award 2008 (in Engineering and Technology, Mexican Academy of Sciences), and the Marcos Moshinsky Fellow.

Teaching and Academic Experience

Dr. Cervantes has a large experience on teaching. He was lecturer of Department of Biotechnology at UAM-I in 1997-1998. The courses he offered during this period (for Biochemical Engineers) include Bioreactors Design, General Microbiology and Enzymology. During his participation as Professor of Department of Water and Environmental Sciences at ITSON, he educated in the programs of Biotechnology Engineer and Master in Science in Natural Resources. He designed and offered several courses at Bachelor and Master level. The courses include Scientific Methods, Microbial Metabolism, Treatment and Disposal of Hazardous Materials, Transport and Fate of Contaminants in the Environment, Enzymology, Biological Wastewater Treatment, Environmental Biotechnology, Thermodynamics for Environmental Sciences, among others. Moreover, he participated in the creation of new educational programs, such as the PhD program in Environmental Sciences and the career of Environmental Engineer at ITSON. He was Leader of the Academic Group of Biotechnology at ITSON, composed of 10 associate professors, who educated in the programs of Biotechnology Engineer, Chemical Engineer, Environmental Engineer, Bachelor in Food Chemistry, as well as a Master Program in Environmental Sciences. Since his incorporation at Department of Environmental Sciences of IPICYT he has lectured several courses dealing with Biological Wastewater Treatment, Bioremediation, Global Biogeochemical Cycles, Thermodynamics, among other topics. He was the Academic Coordinator of the Master and PhD programs in Environmental Sciences at IPICYT (2009-2011). Of particular importance is his recently published book "Biological treatment of wastewaters: Principles, modeling and design (Spanish edition, IWA Publishing)", which constitutes the basic literature for the educational programs of the UNESCO in developing countries. He has also been recognized for excellence in teaching by the Mexican certifying agency (PROMEP).

Supervision of Theses

During his scientific career, Dr. Cervantes has supervised the thesis of 27 Bachelors, 30 Masters and 8 PhD students. Moreover, 4 *post-docs* have participated in his research group. Currently, he is supervising the thesis of 3 PhD candidates at IPICYT. The vast majority of supervised Bachelor and Master Theses have generated at least one scientific publication in peer-reviewed journals. Moreover, PhD theses have generated at least 4 scientific publications each. Graduated students include Biotechnological Engineers, Chemical Engineers, Biochemical Engineers, Environmental Engineers, as well as Master and PhD students in Environmental Sciences and Biotechnology from different institutions (ITSON, UAM-I, IPICYT, Wageningen University, NTNU-Trondheim, among others).

Scientific and Technological Contributions

Scientific contributions

The first scientific contributions of Dr. Cervantes came after his master studies at UAM-I. He was the first demonstrating the coupling between a denitrifying process with anammox in a bioreactor (Cervantes et al 1999; 2001). Afterwards, he also reported the coupling between denitrification and anammox for achieving the removal of nitrogen and phenolic compounds from petrochemical wastewaters (González-Blanco et al. 2012; 2013). He is also pioneer of research works related with the application of electron shuttles (redox mediators) on anaerobic treatment processes for the conversion of different priority pollutants (hydrocarbons, phenolic compounds, azo dyes, poly-halogenated solvents, and pharmaceuticals) (Van der Zee and Cervantes 2009). One of his major contributions was to elucidate the role of humic substances on the redox (bio)transformation of several distinct contaminants under anaerobic conditions (for a review see Martínez et al 2013). More recently, he has published the anaerobic methane oxidation (AOM) linked to the microbial reduction of humic substances in a tropical wetland, a major methane sink mitigating the emission of 1300 Tg methane year⁻¹ from this kind of ecosystems (Valenzuela et al. 2017). He has also described the important contribution of anaerobic ammonium oxidation linked to the reduction of nitrite (anammox), sulfate (Sulfammox), Fe(III) (Feammox), and humus (NOM-dependent anammox) in marine biogeochemical cycles (Rios-Del Toro and Cervantes 2016; Rios-Del Toro et al. 2018). Another emerging topic is related to the capacity of microorganisms to reduce precious metals (Pd, Pt, Ni, etc.) to recover them as nano-catalysts from waste streams (Pat-Espadas et al. 2013; 2014; 2016; Ramírez et al. 2018). His scientific contributions have been published in over 30 different journals within the Journal Citation Reports (JCR). More than 2500 citations (without self-citations) are currently registered in Scopus to his scientific contributions (more than 4300 according to Google Scholar) and his h-index is 34 nowadays. He has published more than 100 peer-reviewed articles, 12 book chapters for international editorials and has given several lectures around the world. Several of his publications have been top-cited or have been selected as spotlight in prestigious journals, such as *Applied and Environmental Microbiology*, *Bioresource Technology*, among others. Several of his works have also been awarded as best presentations in international conferences.

Technological contributions

He received the *Lettinga Award* 2007, which is considered the most prestigious prize worldwide in anaerobic wastewater treatment developments for his project proposal “Immobilization of redox mediators in nanostructures for the anaerobic treatment of industrial wastewaters”. This project, which was financed by 3 Dutch companies (Paques Natural Solutions B.V., Royal Haskoning and Biothane Systems International) through the *Lettinga associates Foundation*, allowed Dr. Cervantes to develop an anaerobic wastewater treatment system in which redox mediators have been immobilized to accelerate the redox conversion of

recalcitrant pollutants. Such technology has derived in the international patent “Immobilized redox mediators for the treatment of contaminated waters and gas emissions” (US patent WO2010/024655).

Technological innovations for anaerobic wastewater treatment systems have also been developed by Dr. Cervantes and implemented at full-scale in several industrial sectors of Latin America. One of his innovations is an inlet distribution device applied in anaerobic digesters, which allows the proper mixing to achieve high removal efficiencies. He is currently developing a novel bioreactor configuration to recover metals from metallurgic effluents. He also developed a novel fermentative process for the *in situ* recovery of alcohols and hydrogen from bioreactors. More recently, he has also developed a new reactor configuration (up-flow anaerobic sediment trapped (UAST) reactor) for the enrichment of anammox biomass from marine sediments for the treatment of aquaculture effluents (Rios-Del Toro et al. 2017).

Association with Industry

Dr. Cervantes has directed several research projects for the development of wastewater treatment systems with different companies from distinct industrial sectors. Moreover, he has designed several wastewater treatment plants currently in operation in different places of Latin America. The wastewater treatment systems designed by Dr. Cervantes perform high efficiency, so that the quality of the treated effluent obtained fits legislation to allow water recycle for different purposes. Currently, these wastewater treatment plants achieve over 4,000,000 m³ of water recycle annually for different industrial sectors. Wastewater treatment systems designed include high-rate anaerobic treatment systems, such as UASB and biofilters, which operate at hydraulic residence times as short as 1 hour. He has also co-directed a research project focused on the development of a wastewater treatment system to be integrated in washing machines to achieve water recycle in laundries (financed by the Mexican company MABE). He also had a major consultancy project with piggery producers from the state of Sonora in Mexico. Strategies were implemented to produce biogas from piggery wastes in more than 120 farms. Currently these anaerobic bioprocesses produce electricity from biogas in rural areas of Sonora. He is currently developing a novel bioreactor configuration to recover metals from a metallurgic factory.

National and International Collaboration

The vast majority of his research projects have been conducted in association with several distinct institutions from Mexico, USA, Brazil, Portugal, Spain, The Netherlands, Germany and Norway. Particularly, he has cooperated with the following institutions:

- ITSON, IPICYT, UAM-I, UNAM, CINVESTAV, among others (Mexico)
- University of Arizona (USA)
- Wageningen University (The Netherlands)
- Federal University of Ceará (Brazil)

- State University of Western of Paraná-UNIOESTE (Brazil)
- University of Minho (Portugal)
- NTNU-Trondheim (Norway)
- University of Tübingen (Germany)
- National Institute of Carbon (Spain)
- National Museum of Natural Sciences-CSIC (Spain)

Editorial and Peer-Review Experience

Dr. Cervantes is member of the Editorial Board of *Reviews in Environmental Science & Biotechnology* (Springer) since January 2007. He has also edited three books for IWA Publishing. These books are currently used as basic literature for several academic programs around the world. Furthermore, he is an active referee of over 70 different journals of the JCR, including top-ranking journals, such as *Nature Geoscience*, *Environmental Science & Technology*, *Water Research*, *Biotechnology & Bioengineering*, *Applied & Environmental Microbiology*, *FEMS Microbiology Ecology*, among many others. He has also refereed research projects from several different organizations from Mexico (CONACYT), Chile (FONDECYT), Colombia (ColCencias), USA (*National Science Foundation*) and The Netherlands (*Council for Earth and Life Science*, ALW).

Distinctions

Along his scientific career, Dr. Cervantes has received several important distinctions. For instance, he won the National Award of Biotechnology (“Carlos Casas Campillo” Award) in 2006, the most important recognition given by the Mexican Society of Biotechnology & Bioengineering. He obtained the *Lettinga Award 2007* (*Lettinga Associates Foundation*), which is considered the most prestigious prize of the specialist group of Anaerobic Digestion (International Water Association). Moreover, Dr. Cervantes received the National Research Award 2008 in Technology and Engineering (Mexican Academy of Sciences), which is considered the most prestigious award for young scientists in Mexico. The Marcos Moshinsky Fellow was granted in 2014 in the area of Biological Sciences. More recently, he received an Honorific Mention on the Prize “Ecological Merit 2017”, the most prestigious award in Ecology in Mexico. Other distinctions include *Magna Cum Laude* for his Bachelor in Science in Biotechnology Engineering, fellowship from CONACYT for his Master and PhD studies, recognition for his excellence in teaching at ITSON, Top-Cited author in *Bioresource Technology*, among others. He is member of the Mexican Academy of Sciences, Mexican Society of Biotechnology & Bioengineering and the International Water Association. He has also been member of numerous Scientific Committees in international conferences.