

**Carlos A. Manzano, Ph.D.**

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Date of Birth: 1985/04/06

Place of Birth: Quito, Ecuador

Country of Citizenship: Ecuador

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### **Education**

- **Oregon State University**

Corvallis, OR, USA

Ph. D. Chemistry (Analytical/Environmental), March 2013

Supervisor: Staci Simonich, Ph.D.

Thesis: "The Identification and Quantitation of Complex Polycyclic Aromatic Hydrocarbon Mixtures in Environmental Samples Using Comprehensive Two-dimensional Gas Chromatography with Time-of-flight Mass Spectrometry"

- **Universidad San Francisco de Quito**

Quito, Ecuador

B.S. Chemistry (Magna Cum Laude), June 2008

Supervisor: Cesar Zambrano, Ph.D.

Thesis: "Síntesis y Estudio Computacional de Tetra-n-butil pirogallol[4]areno". (*Synthesis and Computational study of Tetra-n-butyl pyrogallol[4]arene*)

- **Oregon State University**

Corvallis, OR

Foreign exchange student. Studies included third year college Chemistry.

September 2005 – August 2006

### **Other Training**

- **Raven Rescue Ltd.**

Burlington, Ontario, Canada

Ice Safety and Rescue Technician, February, 2014.

Training was completed as part of the snow samplings campaign for Environment Canada

### **Awards Received**

- FONDECYT Postdoctoral Fellowship, National Science and Technology Council of Chile, Government of Chile (2015-2018).
- National Science and Engineer Research Council of Canada (NSERC), Visiting Fellowship in Canadian Government Laboratories (2013-2016).
- C. Ellen Gunther Graduate Student Paper Award, American Chemical Society (ACS), Division of Environmental Chemistry (2012)
- U.S. National Scholars Honor Society (2006)
- Newton Scholarship, Universidad San Francisco de Quito, Ecuador (2003-2007).

### **Work/Research Experience**

- **San Diego State University** San Diego, CA, USA

Graduate School of Public Health, College of Health and Human Services

Adjunct Assistant Professor

Aug 2017 – Present

- **Universidad de Chile** Santiago, Chile

Center for Environmental Science, and Department of Chemistry

FONDECYT Postdoctoral Fellowship 2016

Nov 2015 – Present

Supervisor: Raúl Morales, Ph.D.

#### **Research:**

Analysis of organic vapor phase contaminants collected using silicon wristbands as personal passive sampler devices. The sample collection included different population groups in the metropolitan area of Santiago during winter and summer.

Method development for the non-targeted analysis of samples collected using two-dimensional gas chromatography coupled to time-of-flight mass spectrometer GC×GC/ToF-MS and minimal sample fractionation to ensure a comprehensive analysis of organics. This work was completed in collaboration with Eunha Hoh, Ph.D., from the Graduate School of Public Health at San Diego State University (San Diego, CA).

Explore the potential differences in organic contaminants based on different socio-economic factors, occupation and geographic location within the metropolitan region of Santiago.

Community outreach and collaboration with high school institutions in the areas under study, which included periodic seminars and presentations to students and educators, and guided visits to the Faculty of Science at the University of Chile.

Other duties and responsibilities:

Funding management, field sampling coordination, official communication of results and peer-reviewed articles.

- **Environment and Climate Change Canada** Burlington, ON, Canada

Canada Center for Inland Water

NSERC Visiting Scientist in Government Laboratories Program

May 2013 – May 2016

Supervisor: Derek Muir, PhD

Research:

Analysis of polycyclic aromatic compounds (PACs) in sediments, river water, precipitation and snow samples from the Oil Sands Region in Northern Alberta, as part of the Canada-Alberta Joint Oil Sands Monitoring Program (JOSMP).

Expand the list of PACs analyzed by Environment and Climate Change Canada, to match reported industry emissions and to identify new PACs that characterize atmospheric emissions from bitumen upgraders and dust from mining and refineries. Research includes the use of two-dimensional gas chromatography coupled to time-of-flight mass spectrometer GC×GC/ToF-MS.

Other duties and responsibilities:

Instrument acquisition, installation and maintenance. Field work activities in northern Alberta during winter 2014, official communication of results via government web portal, official government reports and peer-reviewed articles.

- **Oregon State University** Corvallis, OR  
**San Diego State University** San Diego, CA

Chemistry Department (OSU), and Graduate School of Public Health (SDSU)

September 2008 – December 2012

Supervisor: Staci Simonich, Ph.D. (OSU), and Eunha Hoh, Ph.D. (SDSU)

Research:

Thesis work was completed in collaboration with San Diego State University in San Diego, California. It focused on the development of novel analytical methods for the correct detection and quantification of complex mixture of polycyclic aromatic hydrocarbons present in environmental samples, using a two-dimensional gas chromatography coupled to time-of-flight mass spectrometry GC×GC/ToF-MS and novel gas chromatographic column combinations. The main objective was to increase the number of compounds analyzed in a single chromatographic run, improve separation of individual persistent organic pollutant isomers such as polycyclic aromatic hydrocarbons

(PAHs) as well as the resolution from matrix interferences. Several applications were also explored, and included soil and sediment samples, as well as polystyrene and other plastic samples.

- **Universidad San Francisco de Quito** Quito, Ecuador

College of Science and Engineering

August 2003 – June 2008

Advisor: Cesar Zambrano, Ph.D.

Research:

Synthesis and computational studies of calixarene molecules. Work involved organic synthesis and use of software CAChe (Computer Aided Chemistry) for computer modeling of crystalline structures.

Work/Teaching Experience

- **Universidad de Chile** Santiago, Chile

Guest Lecturer: Environmental Chemistry (QC-610, fourth year BS Chemistry), August 2017 – February 2018

Laboratory Assistant: Atmospheric Chemistry (QA-712, fourth year BS Chemistry), March 2017 – July 2017

Guest Lecturer: Introduction to Environmental Chemistry (EC-120, first year BS Environmental Sciences), March 2017 – July 2017

Guest Lecturer: Environmental Chemistry (QC-610, fourth year BS Chemistry), August 2016 – January 2017

- **Oregon State University** Corvallis, OR

Teaching Assistant: General Chemistry I (CH121), September 2008 – April 2009, June 2011 – July 2011, June 2012 – July 2012

Teaching Assistant: General Chemistry II (CH122), September 2008 – April 2009, June 2010 – July 2010

Teaching Assistant: Quantitative Chemical Analysis (CH324), April 2009 – June 2009, September 2009 – December 2009

- **Universidad San Francisco de Quito** Quito, Ecuador

Teaching Assistant: General Chemistry, September 2006 – June 2006

Laboratory Instructor: Organic Chemistry Laboratory, September 2007- June 2008

Teaching Assistant: Principles of Organic Chemistry, July 2008 – August 2008

Peer-Reviewed Publications

**Manzano, C.**, Molina, C., Leiva, M., Toro, R. (Submitted August 30, 2017). Biofuel emissions and potential effects on quality of life (QoL): A research framework for developing regions. *Environmental Science and Pollution Research*.

Rojano, R. E., Restrepo, G., **Manzano, C.**, Toro, R., Leiva, M. (Submitted August 25, 2017) Local and regional impacts of atmospheric particulate matter emitted from an open pit coal mine in northern Colombia. *Air Quality Atmosphere & Health*.

**Manzano, C.**, Marvin, C., Muir, D., Harner, T., Martin, J., Zhang, Y. (Published April 28, 2017). Heterocyclic Aromatics in Petroleum Coke, Snow, Lake Sediments, and Air Samples from the Athabasca Oil Sands Region. *Environmental Science and Technology*, **2017**, (51) 10, 5445-5453.

Molina, C., Toro A, R., Morales, R., **Manzano, C.**, Leiva-Guzman, M. (Published January 26, 2017). Particulate matter in urban areas of south-central Chile exceeds air quality standards. *Air, Quality, Atmosphere & Health*, **2017**, 10, (5), 653-667.

**Manzano, C.**, Muir, D., Kirk, J., Teixeira, C., Siu, M., Wang, X., Charland, JP., Schindler, D., Kelly, E. (Published August 31, 2016). Temporal variation in the deposition of polycyclic aromatic compounds in snow in the Athabasca Oil Sands area of Alberta. *Environmental Monitoring and Assessment*, **2016**, 188, 542.

**Manzano C.**, Muir D., Marvin, C. (Published August 17, 2016). Separation of thia-arenes and aza-arenes from polycyclic aromatics in snowpack samples from the Athabasca oil sands region by GC×GC/ToF-MS. *International Journal of Environmental Analytical Chemistry*, **2016**, 96 (10), 905-920.

Rochman, C., **Manzano, C.**, Hentschel, B., Simonich, S., Hoh, E. (Published November 20, 2013). Polystyrene Plastic: A Source and a Sink for Polycyclic Aromatic Hydrocarbons in the Marine Environment. *Environmental Science and Technology*, **2013**, 47 (24), pp 13976–13984.

**Manzano, C.**, Hoh, E., Simonich, S. (Published September 13, 2013). Quantification of Complex Polycyclic Aromatic Hydrocarbon Mixtures in Standard Reference Materials Using Comprehensive Two-Dimensional Gas Chromatography with Time-of-Flight Mass Spectrometry. *Journal of Chromatography A*, **2013**, 1307, 172-179.

**Manzano, C.**, Hoh, E., Simonich, S. (Published June 21, 2012). Improved Separation of Complex Polycyclic Aromatic Hydrocarbon Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. *Environmental Science and Technology*, **2012**, 46 (14), 7677-7684.

Zambrano, C., **Manzano, C.**, Saltos, A., Dueno, E., Zeller, M. (2010). Synthesis of 2,8,14,20-tetra-n-butylpirogallol[4]arene and computational study. *Avances en. Ciencias e Ingeniera. (Quito)*, **2010**, 2: A22-A29.

### **Non-Peer-Reviewed Publications**

Chambers P., Alexander-Trusiak A., Kirk J., **Manzano C.**, Cooke C., Hazewinkel R. Surface Water Quality of Lower Athabasca River Tributaries - A synthesis report prepared for the Canada-Alberta Joint Oil Sands Monitoring Plan. **2017**.

Kirk J., Muir D., **Manzano C.**, Cooke C., Wiklund J., Gleason A. Atmospheric Deposition to the Athabasca Oil Sands Region Using Snowpack Measurements and Dated Lake Sediment Cores – A synthesis prepared for the Canada-Alberta Joint Oil Sands Monitoring Program. **2017**.

### **Poster and Platform Presentations**

Chibwe, L., **Manzano, C.**, Muir, D., Marvin, C., Harner, T., Teixeira, C., Shang, D., Martin, J., Zhang, Y. Source identification of polycyclic aromatic compounds in snow, sediment, air and water samples from the Oil Sands Area of Alberta. 38<sup>th</sup> Annual North America SETAC meeting. Minneapolis, MN, November 2017. (Platform)

Chibwe, L., **Manzano, C.**, Muir, D., Marvin, C., Teixeira, C., Shang, D., Harner, T., Martin, J., Zhang, Y. Source Identification of Polycyclic Aromatic Compounds in Air, Snow, Water, and Sediment Samples from Oil Sands Area of Alberta. 100<sup>th</sup> Canadian Chemistry Conference and Exhibition CSC. Toronto, ON, May, 2017. (Poster)

**Manzano, C.**, Muir D., Marvin C. Further non-targeted Analysis Heterocyclic Aromatics in the Oil Sands Area of Alberta, Canada. The 8<sup>th</sup> Multidimensional Chromatography Workshop. Toronto, ON, January 2017. (Platform)

**Manzano, C.**, Muir D., Marvin C., Kirk J., Teixeira, C., Kennedy, K., Harner, T., Martin, J., Zhang, Y. Thia-arenes and Aza-arenes in Samples from the Oil Sands Area of Alberta, Canada. 37<sup>th</sup> Annual SETAC meeting. Orlando, FL, November 2016. (Platform)

**Manzano C.**, Muir D., Marvin C. Non-targeted Analysis of Snow, Air and Lake Sediment Samples from the Oil Sands Area of Alberta, Canada: Thia-arenes and Aza-arenes. The 7<sup>th</sup> Multidimensional Chromatography Workshop. Toronto, ON, January 2016. (Platform)

**Manzano C.**, Muir D., Marvin C. Non-targeted Analysis of Snow, Air and Lake Sediment Samples from the Oil Sands Area of Alberta, Canada. 36<sup>th</sup> Annual SETAC meeting. Salt Lake City, UT, November 2015. (Platform)

**Manzano C.**, Muir D., Kirk J., Siu M., Charland J.P., Chambers P., Alexander A., Sverko E. Polycyclic Aromatic Compounds in Tributaries of the Athabasca River in the Oil Sands of Alberta, Canada. 36th Annual SETAC meeting. Salt Lake City, UT, November 2015. (Poster)

Muir D., Kirk J., **Manzano C.**, Wang X., Evans M., Keating J., Kurek J., Summers J., Smol J. Profiles of Polycyclic Aromatic Hydrocarbons in Dated Sediment Cores. ContaSed 2015. Monte Verita, Ascona, Switzerland, March 2015 (Platform)

**Manzano C.**, Muir D., Kirk J., Teixeira C., Wang X., Charland J.P., Schindler D., Kelly E. Deposition of Polycyclic Aromatic Compounds in Snow in the Athabasca Oil Sands Area of Alberta, Canada. PADEMP 2015 (Peace-Athabasca Delta Environ Monitoring Program), February 2015. (Poster)

**Manzano C.**, Muir D., Marvin C. GC×GC Analysis of Polycyclic Aromatic Compounds deposited in snow in the Athabasca Oil Sands Region of Alberta, Canada. The 6<sup>th</sup> Multidimensional Chromatography Workshop. Toronto, ON, January 2015. (Platform)

Muir D., Kurek J., **Manzano C.**, Evans M., Wang X., Keating J., Smol J. Updated Spatial and Temporal Variation of Polycyclic Aromatic Compounds in the Athabasca Oil Sands Region based on Dated Lake Sediment Cores. 35th Annual SETAC meeting. Vancouver, BC, November 2014. (Poster)

**Manzano C.**, Muir D., Kirk J., Teixeira C., Wang X., Charland J.P., Schindler D., Kelly E. Deposition of Polycyclic Aromatic Compounds in Snow in the Athabasca Oil Sands Area of Alberta, Canada. 35th Annual SETAC meeting. Vancouver, BC, November 2014. (Platform)

Muir D., Kurek J., Kirk J., **Manzano C.**, Evans M., Wang X., Keating J., Smol J. Spatial and Temporal Variation of Polycyclic Aromatic Compounds in the Athabasca Oil Sands Region Reconstructed from Dated Lake Sediment Cores. 5th EuCheMS meeting. Istanbul, Turkey, September 2014. (Platform)

**Manzano C.**, Muir D., Kirk J., Teixeira C., May S., Wang X., Charland J.P. Deposition of Polycyclic Aromatic Compounds in Snow in the Athabasca Oil Sands area of Alberta, Canada. 97<sup>th</sup> Canadian Chemistry Conference and Exhibition CSC. Vancouver, BC, May, 2014. (Platform)

**Manzano C.**, Simonich S., Hoh E. Improved Separation of Complex PAH Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. The 5<sup>th</sup> Multidimensional Chromatography Workshop. Toronto, ON, January 2014. (Platform)

Naikwadi, K., Britten, A., **Manzano, C.** Novel Isomer Specific Liquid Crystal and Nano Stationary Phase Capillary Columns for GC and GC x GC applications. The 5<sup>th</sup> Multidimensional Chromatography Workshop. Toronto, ON, January 2014. (Platform)

**Manzano C.**, Muir D., Kirk J., Teixeira C., May S., Wang X., Poole G., Charland J.P., Backus S., Bradley L., Mihele C. Depositional Patterns of PACs in Snow in the Athabasca Oil Sands area of Alberta, Canada. 34th Annual SETAC meeting. Nashville, TN, November, 2013. (Poster)

**Manzano C.**, Nuñez A. Emission of Polycyclic Aromatic Hydrocarbons, Total resources Allocated for Health Care and Lung Cancer Mortality Rates in Countries Around the World: Past, Present and Future Perspectives. 9<sup>th</sup> International Health Economics Conference. Sydney, Australia, July 2013. (Platform)

**Manzano C.**, Hoh E., Simonich S. Improved Separation of Complex PAH Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. 33th Annual SETAC. Long Beach, CA, November, 2012. (Platform)

**Manzano C.**, Hoh E., Simonich S. Quantification of PAHs in Complex Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. 33th Annual SETAC. Long Beach, CA, November, 2012 (Poster)

**Manzano C.**, Hoh E., Simonich S. Improved Separation of Complex PAH Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. 244th ACS National Meeting and Exposition. Philadelphia, PA, August, 2012. (Platform)

**Manzano C.**, Hoh E., Simonich S. Improved Separation of Complex PAH Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. Connecting Research and Practice: A Dialogue between ATSDR and the NIEHS Superfund Research Program. Atlanta, GA, August, 2012. (Poster)

**Manzano C.**, Hoh E., Simonich S. Quantification of PAHs in Complex Mixtures Using Novel Column Combinations in GC×GC/ToF-MS. Connecting Research and Practice: A Dialogue between ATSDR and the NIEHS Superfund Research Program. Atlanta, GA, August, 2012. (Poster)

**Manzano C.**, Hoh E., Simonich S. Improving the Chromatographic Resolution of PAHs in GC×GC/ToF-MS. 23rd International Symposium on Polycyclic Aromatic Compounds. Muenster, Germany, September, 2011. (Platform)

**Manzano C.**, Hoh E., Simonich S. Quantification of PAH Derivatives in Standard Reference Materials Using GC×GC/ToF-MS. 23rd International Symposium on Polycyclic Aromatic Compounds Muenster, Germany, September, 2011. (Poster)

**Manzano C.,** Luo W., Synovec R., Simonich S. Compound-specific stable isotope analysis of Polycyclic Aromatic Hydrocarbons using GC×GC/ToF-MS with chemometrics. 31st Annual SETAC North America Meeting. Portland, OR, November, 2010. (Poster)

**Manzano C.,** Luo W., Synovec R., Simonich S. Compound-specific stable isotope analysis of Polycyclic Aromatic Hydrocarbons using GC×GC/ToF-MS with chemometrics. Superfund Research Program Annual Meeting. Portland, OR, November, 2010. (Poster)

**Manzano C.,** Luo W., Synovec R., Simonich S. Use of GC×GC/ToF-MS and the third order advantage for compound-specific stable isotope analysis of Polycyclic Aromatic Hydrocarbons in particulate matter. American Association of Aerosol Research Annual Conference. Portland, OR, March, 2010. (Poster)

### **Media presence**

Radio interview at the morning news show *Mañana será otro día*, Radio Concierto, September 25<sup>th</sup>, 2017. Topic: plastic pollution and waste management, comment about the recent law presented by the Chilean Government. Santiago, Chile.

### **Journal Reviewer Assignments**

Environmental Science and pollution research: 14 completed revisions

Science of the Total Environment: 1 completed revision

### **Member of**

Society of Ecotoxicology and Chemistry (SETAC)

### **References**

Staci L. Massey Simonich, Ph.D.

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Oregon State University

Department of Environmental and Molecular Toxicology and

Department of Chemistry

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