

Arzoumanian Emmanuel
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Education

Ph.D., Chemistry and Physics. Paris 7 and Paris East Universities, 2010

Masters, Environmental Sciences and Engineering. Paris 7 Univ, 2007 - *graduated top of class*

B.S., Cellular and Molecular Biology. Saint Joseph University, Beirut, 2005

Expertise

Software: Python, R, MATLAB, LabView, OriginLab, Fortran, Lagrangian (particle dispersion) models, Eulerian (chemistry-transport) models, AWS Cloud Computing.

Instrumentation techniques: FTIR, IR/VIS/VUV-UV Spectroscopy, Cavity Ring Down Spectroscopy, GC-MS, LC-MS, HPLC, UPLC, LIDAR, Fluorometry, Optical Emission Spectrometry, EPR Spectroscopy, NMR spectroscopy, Inductively Coupled Plasma - Mass Spectrometry (ICP-MS), Raman Spectrometry, ASS Spectroscopy, Refractometry, Ion Chromatography, Laser Flash Photolysis, Instrument Design and Development, Photonics and Dye lasers, laser interferometry, Laser-Induced Fluorescence, Photochemistry, Corona Discharge, EPR-spin trapping detection, actinometry, low-noise RF electronics, nonlinear optics, cryogenics, UVH vacuum systems, CF and KF systems, vibration isolation, Synchrotron radiation, Organic Synthesis, Electrophoresis, ELISA, PCR, Cellular culture.

Languages: Fluent in English, French, Armenian, and conversational Spanish

Experience

CEA (French Atomic Energy Commission), Greater Paris, France

Research Scientist 2013 – 2019

- Engineered and built fully automated instruments using commercial NDIR sensor, humidity / temperature / pressure sensors, pump, acquisition unit. Compared the instruments to highly precise IR spectroscopy analyzers and developed correction-calibration strategies. Data analysis using MATLAB and Python. Showed the feasibility of using the engineered instruments for urban CO₂ monitoring networks after containing residual errors within the ± 1 ppm target. Results are published in *Atmos. Meas. Tech.* 2019, (12), 2665–2677
- Data analysis of Green House Gas (GHG) emissions in greater Paris area using chemistry-transport 3D models and Lagrangian particle dispersion models. Validated GHG inventories by comparing observations and models.
- Maintained and calibrated analytical instrumentation (CRDS, FTIR, HPLC, GC-MS, LC-MS, Dye Lasers, UV/VIS Spectrometers). Installed new laboratory equipment. Managed chemical and supply inventories. Selected and negotiated pricing for hardware, instruments and consumables. Prepared weekly projects updates and maintained notebooks.
- Developed and validated analytical and wet chemistry methods. Trained and provided technical guidance to associate scientists.

CEA – SUEZ partnership, Greater Paris, France

R&D Scientist 2016 - 2018

- WasteMiti Project leader: Assessed fugitive GHG emissions from a waste landfill (Butte-Bellot - Paris area).
- Developed and lead a study presenting a new concept for estimating pollutant emission rates of a site and its main facilities by using a series of atmospheric measurements across the pollutant plumes. This concept combines a tracer release method, local-scale atmospheric transport modeling and a statistical atmospheric inversion approach. Results are published in *Atmos. Meas. Tech.* 2017, (10), 5017

IMRCP (Molecular Interactions, Photochemical and Chemical Reactivity Laboratory), Toulouse, France

Post-doctoral fellow 2011 – 2013

- Studied mechanisms of photochemistry at gas-solid interfaces. Determined singlet oxygen lifetimes and quantum yields of singlet oxygen production.
- Conducted research studies on cancerous cell treatments using singlet oxygen.
- Synthesized small molecules and silica polymers combined with organic dyes (sol-gel method). Showed that the synthesized polymers can be used as microphotoreactor for O₂-mediated oxidation of volatile pollutants and cancer treatment. Results are published in ACS Applied Materials & Interfaces 2014, (1), 275-288.
- Designed and built time-resolved and steady-state optical benches using UV/VIS and Raman spectrometry, Laser induced Fluorescence, Laser Flush Photolysis.

IPSL (Institut Pierre Simon Laplace), Greater Paris, France.

Ph.D. Researcher 2007 – 2011

- Built a simulation chamber to study Titan's (Saturn's largest moon) atmosphere. Components of the chamber: FTIR and Fluorescence spectrometers, Pressure and Flow controllers, CF and KF components, UltraVacuum pumps, Cryogenic traps, Fully engineered Photochemical H₂/He lamp, YAG Laser, IR detectors.
- Implemented methane irradiations at 121.6 nm (1 photon absorption) and 248 nm (2 photons absorption). Detection techniques: FTIR, and GCMS. Data Analysis using Python and R. Interpreted results using a zero dimension chemistry model. Results are published in Planet. Space Sc., 2010, (58), 1748
- Designed and analyzed experiments on Bessy synchrotron facility. Built ultra vacuum (10E-10 mbars) chambers, installed KF and CF components, cryogenic systems.
- Measured cross sections of C₄H₂, HCN, HC₅N in the mean infrared. Designed and engineered a vacuum spectroscopy FTIR cell. Organic synthesis of C₄H₂, HCN, HC₅N. Results are published in Journal of Geophysical Research Planets, 2010, (115), 6.
- Pursued experimental and theoretical studies in the areas of plasma physics, particle acceleration, and particle beam-plasma interactions.

Saint Joseph University, Beirut, Lebanon.

Laboratory Assistant 2003-2005

- In charge of experiments for teaching purposes: PCR, Cell Culture, Western Blot, ELISA, Cell Based Assay, Flow Cytometry, DNA Sequencing, Gel assays.

Teaching Experience 2007 – 2011

- Created and taught (500 hours) analytical chemistry, IR and UV spectroscopy. Courses for undergraduate and senior students.
- Lectured Ph.D. level astrochemistry courses on Titan's atmosphere. Taught development of workflows to detect asteroids and exoplanets using virtual observatories (25 hours).

Peer Reviewed Publications

E. Arzoumanian, F. R. Vogel, A. Bastos, B. Gaynullin, O. Laurent, M. Ramonet, and P. Ciais: Characterization of a commercial lower-cost medium-precision non-dispersive infrared sensor for atmospheric CO₂ monitoring in urban areas, Atmos. Meas. Tech. 2019, (12), 2665–2677.

S. Ars, G. Broquet, C. Yver Kwok, Y. Roustan, L. Wu, **E. Arzoumanian**, and P. Bousquet: Statistical atmospheric inversion of local gas emissions by coupling the tracer release technique and local-scale transport modelling: a test case with controlled methane emissions, Atmos. Meas. Tech. 2017, (10), 5017.

E. Arzoumanian, F. Ronzani, A. Trivella, E. Oliveros, M. Sarakha, C. Richard, S. Blanc, T. Pigot and S. Lacombe. Transparent Organosilica Photocatalysts Activated by Visible Light: Photophysical and Oxidative Properties at the Gas Solid Interface. *ACS Applied Materials & Interfaces* 2014, (1), 275-288.

C. Lorente, **E. Arzoumanian**, C. Castan, E. Oliveros and A. H. Thomas. A non-singlet oxygen mediated reaction photoinduced by phenalenone, a universal reference for singlet oxygen sensitization. *Royal Society of Chemistry Adv.* 2014, (4), 10718.

A. Trivella, S. Monadjemi, D. Worrall, I. Kirkpatrick, **E. Arzoumanian**, C. Richard Perinaphthenone phototransformation in a model of leaf epicuticular waxes. *Journal of Photochemistry and Photobiology B: Biology* 2014, (130), 93–101.

F. Ronzani, **E. Arzoumanian**, S. Blanc, P. Bordat, T. Pigot, C. Cugnet, C. Richard, E. Oliveros, M. Sarakha, S. Lacombe. Efficient cyanoaromatic photosensitizers for singlet oxygen production: synthesis and characterization of the transient reactive species. *Phys. Chem. Chem. Phys.*, 2013, (15), 17219-17232.

S. Bouchama, P. de Sainte-Claire, **E. Arzoumanian**, A. Boulkamh and C. Richard. Photoreactivity of the fungicide chlorothalonil in aqueous medium. *Environ. Sci.: Processes Impacts*, 2014, (16), 839.

F. Ronzani, P. Saint-Cricq, **E. Arzoumanian**, T. Pigot, S. Blanc, M. Oelgemöller, E. Oliveros, C. Richard, S. Lacombe. Immobilized organic photosensitizers with versatile reactivity for various visible-light applications. *Photochem Photobiol.* 2014, (90), 358.

F. Ronzani, A. Trivella, **E. Arzoumanian**, S. Blanc, M. Sarakha, C. Richard, E. Oliveros and S. Lacombe. Comparison of the photophysical properties of three phenothiazine derivatives: transient detection and singlet oxygen production. *Photochem. Photobiol. Sci.*, 2013, (12), 2160-2169.

C. Romanzin, **E. Arzoumanian**, E.T. Es Sebbar, S. Perrier, M.-C. Gazeau and Y. Bénilan. Combined experimental and theoretical studies on methane photolysis at 121.6 nm and 248 nm – implications on a program of laboratory simulations of Titan's atmosphere. *Planet. Space Sc.*, 2010, (58), 1748.

N. Fray, Y. Bénilan, M.-C. Gazeau, A. Jolly, M. Schwell., **E. Arzoumanian**, T. Ferradaz, E.T. Es-Sebbar, and J.-C. Guillemin. Temperature-dependent photoabsorption cross-section of cyanodiacetylene in the vacuum UV. *Journal of Geophysical Research Planets*, 2010, (115), 6.

Selected Conference Presentations

E. Arzoumanian, B. Gaynullin, H. Martin, O. Laurent and F.R. Vogel. Developing a lower-cost medium precision urban GHG monitoring system using commercial NDIR sensors. GGMT meeting, September 2017, Zurich, Switzerland.

E. Arzoumanian, B. Gaynullin, H. Martin, O. Laurent and F.R. Vogel. An evaluation of commercial NDIR sensors for a potential use in future urban GHG monitoring systems. AGU meeting, December 2016, San Francisco USA

E. Arzoumanian, J.-D. Paris, A. Pruvost, S. Peng, S. Turquety, A. Berchet, I. Pison., M. Arshinov, and B. Belan. A comparative study of Siberian methane fluxes during the two YAK AEROSIB airborne campaigns of 2012 and 2013. PEEEX meeting, February 2015, Helsinki, Finland.

Lorente C., **Arzoumanian E.**, Castano C., Oliveros E., Thomas A. H. A non-singlet oxygen mediated reaction photoinduced by phenalenone, a universal reference for singlet oxygen sensitization. ELAFOT XII, April 2015, Sao Paulo, Brazil

E. Arzoumanian, F. Ronzani, S. Blanc, T. Pigot, S. Lacombe, E. Oliveros. Production of singlet oxygen by photosensitizers in liquid phase and at solid/gas interfaces. 22-23 November 2012, Paris.

E. Arzoumanian, C. Romanzin, M.-C. Gazeau, Et. Es Sebbar, A. Jolly, S. Perrier, Y. Benilan. Contributions to the Development of the S.E.T.U.P. (Experimental and Theoretical Simulations Useful for Planetology) Project. DPS meeting, Fajardo, 4-9 October 2009.

Arzoumanian E., Es-sebbar Et., Romanzin C., Perrier S., Gazeau M.-C., Benilan Y. Preliminary studies for the development of S.E.T.U.P. Experimental and Theoretical Simulations Useful for Planetology. Planetary Science Congress, 21-26 September 2008, Munster.