Melissa J. Lucero, Ph.D.

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Education

Ph.D. Chemistry University of California Los Angeles **1998**

- *Kendall N. Houk*, advisor
- Dorothy Danforth-Compton Foundation Graduate Fellow
- Six (6) peer-reviewed articles
- Thesis: Theory and Modeling of Diasteroselective Electrophilic Additions to Cyclic Alkenes

B.S. Chemistry Texas A&M University **1993**

- *Daniel A. Singleton*, advisor
- National Chicano Council for Higher Education (NCCHE) Fellow
- One peer-reviewed article: *Tetrahedron Lett.* **31**(39), 5551-5554 (1990).

Recent Research

Postdoctoral Fellow *(August 2023-Present)*

David C. Irwin, mentor and Director of the Laboratory for Red Blood Cell Diseases and Hypoxia-Related Illnesses, University of Colorado, Anschutz Medical Campus.

- Translational physiology of iron sequestration and/or complement inhibition for the treatment of sickle cell disease pulmonary hypertension: mouse handling including: exercise tolerance, euthanasia, organ collection, histology.
- Murine, rabbit and bovine models of pulmonary hypertension
- Proteomics, metabolomics, lipidomics, RNAseq, Meta-analysis.
- Physiological response of Murine models to hypoxia in hypobaric chambers
- Six (6) peer-reviewed publications, three (3) as first author; two (2) manuscripts in preparation

Chief Scientist *(March 2014–March 2022)*

MLucero Consulting Chemistry and Materials Consulting: Expert testimony, Small molecule synthesis, proposal writing, and Density Functional Theory for electronic structure or Molecular Dynamics calculations.

- Expert Witness Testimony for Defense Attorneys in Collin County, TX
  - Review of medical history, police records, and laboratory reports
  - Preparation of reports, court testimony
- Research Consultant, Voxtel Inc., Eugene Oregon
  - DARPA proposal for electronic structure modeling of IR Quantum Dots
- Research Consultant *Targa Resources–Sajet Lab*, Houston, TX
  - Catalyst development and lab-to-pilot scale-up applicable for green alternatives to the MTO, MTG, and related processes.

Postdoctoral Scientist *(December 2009-August 2012)*

Gustavo E. Scuseria, mentor, in the Department of Chemistry, Rice University. Electronic structure of photovoltaic materials; band structure, densities of state, defects, layered materials, testing new and extant functionals for surface interactions, metals, refractories, semiconductors and insulators.
Seven (7) peer-reviewed publications.

Recognition and Honors

- Guest Speaker: PVRi *Pulmonary Hypertension Community Call* **Feb. 19, 2026**
- Ruth L. Kirschstein T32 Postdoctoral Fellowship, CU Anschutz **2022-2026**
- IOP Select Article: Highlights of 2012: *J.Phys.Condens.Matter 24 145504* **2012**
- Director's Postdoctoral Fellow, Los Alamos National Laboratory **2005-2007**
- UCLA Research Assistant/Mentorship Fellow **1996-1997**
- UCLA Departmental Award for Distinguished Teaching in Chemistry **1996**
- Mentor: UCLA Academic Advancement Program (*Dean-appointed*) **1994-1995**
- Dorothy Danforth-Compton Foundation Graduate Fellow **1993-1998**
- UCLA University Fellowship for Doctoral Students in Chemistry **1993-1997**
- UCLA University Fellow **1993**

Technical Capabilities

Multiomic Analyses

Multiomic Analyses. Lipidomic, metabolomic and proteomic analyses of murine or human models of sickle cell disease pulmonary hypertension or comparative human/rabbit effects of blood storage. Exposure to MzMine, XCMS, MS-DIAL via Profesor Jeff Xia; use of MetaboAnalyst, ExpressAnalyst, NetworkAnalyst, MicrobiomeAnalyst, OmicsNet., Enricher, GeneCards, HMDB, Reactome, and Uniprot websites. Univariate methods; multivariate statistics; dendrograms and heatmaps; meta-analysis, enrichment and pathway analysis, biomarker analysis. industrially curated pathways (KEGG, SMPDB, and Wikipathways.) Pearson and/or Spearman Correlation Analysis. Training for RNASeq, some sequence database searches.

Translational Physiology

Cardiovascular Function. Analysis of hemodynamic properties (CO, Ea, EF, SV, EDPVR, Ees, VVCR, HR); pulmonary vascular and RV function (PVR, medial thickening, Fulton Index, RV weight); statistical analyses including Pearson or Spearman correlation analyses.

Critical Speed. Exercise tolerance studies using critical speed methodology following various drug and administration regimens. Normoxic or at hypoxia.

Cardiac MRI Analysis. MRI image analysis for elucidation of pathological biomechanics resulting from ventricular overload induced through PAB and/or TAC surgeries. MRI segmentation using Segment, some Horos, Osirix, and Circle. Murine imaging, mouse or rat, and observation of human images. Strain, volume, left ventricular performance (radius of curvature, sphericity); right ventricular (RV) performance (TAPSE, FAC); some mechanical dyssynchrony analysis.

Animal Handling. *Mouse*: handling and transfer, critical speed measurement, anesthesia, aerosolized drug administration, IP and gavage dosing, organ harvesting and preservation including lung inflation, carotid ligation. *Rabbit*: handling and surgery assist. *Bovine*: securing animal and assisting during hemodynamics, exsanguination, organ harvesting, and disposal while within the CSU Hyperbaric Chamber. Colony Management using SoftMouse: multiple mouselines; genotyping and breeding, observation of non-thriving animals; assisting in animal allocation.

Statistical Analysis. Use of Prism (t-tests, ANOVA, regression, survival curves) and plotting, XMGrace and GnuPlot. Some experience with Matlab/Octave.

Molecular Structure

Spectroscopy. Sample preparation and data acquisition using MALDI-TOF. GC, GC/MS and HPLC instrumentation. ^{1}H and ^{13}C NMR, FT-IR, UV-Vis, some ESR and CD experience.

Crystallography. Some formal training in mineralogy, use of petrographic microscopes. Crystallographic tables, Bilbao and Navy databases, VESTA, Avogadro and CCSD software (Mercury, Encifier, *etc.*)

Electron Microscopy. Sample preparation for Scanning and Transmission Electron Microscopy. Also, SEM and TEM imaging. Some experience with Atomic Force Microscopy.

Theoretical & Synthetic Chemistry

Electronic Structure Code. Theory Levels: Coupled Cluster, HF, DFT (B3LYP, HISS, HSE and other hybrid functionals), LANL ECPs, semi-empirical approaches. Software: Gaussian0X, CP2K. Some experience with DALTON, GAMESS, Jaguar.

Molecular Dynamics and Modeling. RASPA, CP2K for Monte Carlo and molecular dynamics. Accelrys, Schodinger, and Tripos suites for force field calculations.

Synthesis. Physical organic and synthetic methods, organometallic, zeolites, small molecules, and non-natural biomolecules. Small and medium scale-up reactions including purification and characterization. Advanced techniques including airless methods, mustard gases, high temperature gaseous Br_2 for hydrocarbon scale-up facilities.

Coding

Programming: FORTRAN 90/95, some F77, JAVA, PErl, Python, and R.
Shell scripting: Small shell scripts for data workup: Bash, C shell, Zsh, Sed, Awk. **HTML:** Basic website creation and maintenance.

Associated Skills

Fabrication. Training in the use of AutoCAD and SolidWorks; machine/electrical shops for basic repairs, construction: etching circuits, small electronic repair, use of drill press, saws, etc., minor glassblowing techniques.

Remote Field Collection. Experienced in collection/geologic observation: California, Montana, Colorado, New Mexico, Texas, Canada, Czechia, Germany.

Graphics. Adobe: Acrobat, Illustrator, and Photoshop; The Gimp; Biorender; ray-tracing techniques (PovRay or VMD) to produce high resolution scientific images and animations. High-resolution graphics using MetaboAnalyst and related.

Data Presentation. Multimedia for live/video lectures, creation of large format documents: Beamer, MS PowerPoint, and Adobe 2026 Suite. Mastery of LaTeX (TexShop, MacTeX, TeXLive), Apple MS and Open Office Suites.

Certification and Training

Certificate. *Omics Data Science Course.* A 12-week course taught by Professor Jianguo (Jeff) Xia of XiaLab Analytics, at McGill University (Montreal, Canada).

Specialization Certificate *Grant Writing for Health Researchers* via the University of Colorado System on Coursera. Completed individual course certificates:

- Grant Proposal Plans, Sections, and Resubmission
- Biostatistics Study Design and Analysis for Grant Writing
- Scientific Writing for Research Grant Proposals

Funding

Biological and Chemical Sensor Design Using Linearly-Scaled TD-DFT Methods. Wrote a successful proposal for a Director's Fellowship (2005-2007) at the Los Alamos National Laboratory (LANL) in Los Alamos, NM.

- Funding provided by the Laboratory Directed Research and Development (LDRD) program at LANL, under the auspices of Los Alamos National Security, LLC, for the National Nuclear Security Administration of the U. S. Department of Energy under contract 12-3456-789012345.
- The annual award (ca. $120,000) covered salary, materials/equipment, travel, and a $5000 mentor stipend.
- Early research results spawned another, independent proposal, that funded a third year, also supporting four full-time LANL staff.

Additional Grant Writing Experience:

- Co-authored a renewal for ExxonMobile grant covering 2013 income. (All work performed under a non-disclosure agreement.)
- Participated in drafting proposals to the Qatar Foundation for funding of joint Rice University–Texas A&M Qatar University research.
- Assisted in writing joint NSF/European grants for photovoltaic projects at Rice University.
- Authored sections of a grant enabling hardware overhaul for the Scuseria Clusters and some shared by the Rice community
- Facilitated the writing and funding of the NSF grant that led to the overhaul of the UW Madison Chemistry Department Cluster
- Contributed to sections of proposals to NIH, NSF, and National Supercomputer Centers as a graduate student at UCLA.

Research Positions

Visiting Scientist February-November 2009
Born-Oppenheimer MD/Periodic DFT. with Dr. Štěpan Sklenak at the Heyrovsky Institute of Physical Chemistry, Prague, Czechia. Performed molecular dynamics and periodic (solid state) DFT for NMR structure studies of zeolites.

Director's Postdoctoral Fellow November 2005-September 2007
Electronic Structure of Excited States. with Dr. Anders M. N. Niklasson of the Theoretical Division at Los Alamos National Laboratory. Using HF and DFT for through-space and through-bond energy transfer, magnetic properties, algorithm development for linear-scaling RPA and polyoxometalate excited states.

Postdoctoral Scientist August 2004-August 2005
Astrophysics and Observational Cosmology. with Professor Peter T. Timbie in the University of Wisconsin, Madison Physics Department. Studied Cosmic Microwave Background (CMB) polarization anisotropies including: photonic crystal device design, feed horn characterization, design and construction microstrip transmission lines and salt antennae. NASA funded.

Visiting Scientist June 2004-August 2004
Bio-organic Synthetic Chemistry. with the late Professor Carsten Schmuck at the Universität Würzburg, Bavaria, Germany. Worked toward the design (MacroModel) and synthesis of stabilized short alanine α-helices using non-natural pyrrole-based arginine derivative to form ion pairs with glutamate and aspartate.

Research Positions, *continued*

Collaborator July 2001-September 2003
Mass Spectrometry/Biophysical Chemistry. with Dr. Martha Vestling at the University of Wisconsin, Madison Department of Chemistry and Proteomic Center. MALDI-TOF mass spectrometry to investigate H/D exchange in oligomers.

Postdoctoral scientist August 1998-August 2000†
Bio-organic and Biophysical Chemistry. with Professor Samuel H. Gellman in the University of Wisconsin, Madison Department of Chemistry. Design, synthesis, characterization and computational analysis of folded unnatural oligomers. (†Research interrupted by accident in 1999.)

Team Member, NASA-GTE ABLE-3B Mission. June 1990-August 1990
Atmospheric Chemistry. North Bay, Ontario, Canada under Professors F. Sherwood Rowland (Donald Blake) Investigating Northern hemispheric ozone depletion by CFCs, biogenic hydrocarbons and boreal terpenes; gas chromatographic analysis of trace pollutants. Aerial tropospheric sample collection.

Research Assistant March 2004-June 2004
Micropaleontology. Dr. Paula Allen at the University of Wisconsin, Madison, studying ostracod population and distribution studies: collection and sorting; characterization using SEM and EDS Microprobe X-Ray analysis.

Technical Positions

Network Administrator June 2001-May 2003
Linux, and Windows Networks. Answered to Professor Professor John Wright and Dr. Brad Spencer at the University of Wisconsin, Madison administering the Windows NT network while maintaining Red Hat Linux DNS, DHCP and email servers, and an Apache 3.1.12 web server. This position required maintenance of several campus-wide licenses for chemistry, bioinformatics and parallel computing and some network engineering tasks including cabling and switch maintenance.

Director Research Computing Center June 2001-May 2003
Research Computing. Worked with Professor Clark Landis at the University of Wisconsin, Madison Department of Chemistry, to maintain a 20-node departmental Beowulf cluster and two SGI workstations. My duties included trouble-shooting of private (group) clusters, the training of student administrators and the licensing for electronic structure and force field software. This position also required supervision of four student administrators assisting in server maintenance and help desk duties instruction for electronic structure and force field software.

Geo-Editor August 2000-December 2000
Cartography/Geo-Editing. Supervised by Ms. Barbara Gibbons-Engel at the Wisconsin Department of Transportation, creating street maps for all municipality levels in the State of Wisconsin using Arc-Serve and in-house geo-editing software.

Research Assistant June 1989-August 1989
Atmospheric Chemistry. Worked with Professors F. Sherwood Rowland (Donald Blake) in the Department of Chemistry, at the University of California, Irvine performing gas chromatographic analysis of air samples as part of several global tropospheric chlorofluorocarbon studies involving remote and urban sampling sites. This position led to the invitation to join the NASA ABLE-3B GTE Mission in North Bay Ontario the following summer.

Teaching Experience

Director, Research Computing *UW, Madison* **June 2001-May 2003**

- Formal and personal instruction for use and application of electronic structure and force field software and basic Beowulf cluster maintenance
- Training of students and faculty in administration of private clusters
- Training of students for help desk duties

Teaching Assistant *UCLA*

- Chemistry 10D *Organic & Bio-Organic Chemistry* **Spring 1996, 1997**
- Chemistry 10C *Introduction to Organic Chemistry* **Winter 1995**
- Chemistry 10B *Freshman Kinetics and Thermodynamics* **Winter 1995**
- Chemistry 10A *Freshman Structure and Bonding* **Fall 1995**
- Chemistry 132B (Reader) *Organic Chemistry* **Spring 1994**

Graduate Mentor *UCLA*

- Academic Advancement Graduate Mentor Programs **1994-1995**
- Summer Research Program for Underrepresented Undergraduates **1994**
- Mentor for a motivated high school student **Summer 1993**

Instructor: Academic Advancement Program GRE Review *UCLA*

- Quantitative Section **Fall 1994**
- Quantitative and Verbal Sections **Spring 1995**

Tutoring

Private Tutor *Houston, TX; Atlanta, GA* **August 2013-2020**

- Basic Windows 7, Vista, XP; Introduction to Mac OS
- Microsoft Office for job searches and small business applications
- Using the Internet: eBooks, Google searches, Android/Laptop interactions

Group and Private Tutor *Madison Area Technical College* **2004-2005**

- Organic Chemistry for the Health Sciences
- Freshman Chemistry

Scientific Outreach

Universe in the Park *UW-Madison Astronomy and Physics Departments:*

- Kettle Moraine State Forest **August 5, 2005**
- New Glarus Woods State Park **July 9, 2005**
- Devil's Lake State Park **July 6, 2005**

Women in Science: *UW-Madison Physics Department* **April 2005**

Wonders of Physics: *UW-Madison Physics Department* **February 2005**

Professional Activities

Committees

- **CVP-R.I.P Organization Team.** Contacted, recruited, and introduced speakers for 2025-2026 Cardiovascular and Pulmonary Research in Progress seminars, under Professor Ronald Vagnozzi, Division of Cardiology, CU Anschutz Medical Campus.
- **Founding Member.** Hispanic/Latino Employee Resource Group (HOLA) Georgia Institute of Technology.
- **Policy Committee Chair.** Served as the first Policy Committee Chair for the Los Alamos Post-Doc Association, LAPA. Assisted in drafting and ratification of the By-Laws.

Referee

- Computational Materials Science
- Journal of Chemical Theory and Computation
- Journal of Organic Chemistry
- Physical Chemistry Chemical Physics
- Physical Review B

Memberships/Affilations

- American Physiological Society
- American Heart Association
- American Thoracic Society
- American Physical Society
- American Chemical Society
- Society for Industrial and Applied Mathematics
- Microscopy Association of America

Patents and Related

M. J. Lucero* and F. A. Weinhold, "Chemical Sensors Bases Upon π-Induced Resonance Binding." *Provisional Patent*; WARF Case Number **p-03199US**, University of Wisconsin, **March 2003.**

List of Publications

https://www.ncbi.nlm.nih.gov/myncbi/melissa.lucero.2/bibliography/public/

A complete list of publications and presentations will be provided upon request

REFERENCES

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Center for Blood Oxygen Transport and Hemostasis
School of Medicine
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Professor Kurt Stenmark, M.D.
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Formerly of T-10 in the Theoretical Division Los Alamos National Lab
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Additional References Available Upon Request