

# Rakesh Mogul

- Astrobiology
- Planetary Protection
- Planetary Science
- Chemical Biology
- Science Education

California State Polytechnic University, Pomona  
Chemistry & Biochemistry Department  
3801 W. Temple Ave.  
Pomona, CA 91768  
909.869.4309 (office)  
909.869.4344 (fax)

- [rmogul@cpp.edu](mailto:rmogul@cpp.edu)
- <https://www.cpp.edu/faculty/rmogul>
- <https://www.spacewardbound.org>

## Profile Pages :

- California State University Student Success
  - <https://www.calstate.edu/csu-system/faculty-staff/employee-profile/Student-Success/Pages/rakesh-mogul.aspx>
- Cal Poly Pomona Faculty Page
  - <https://www.cpp.edu/~rmogul/home.html>

## Selected Media :

- Countdown to Mars, *NASA Astrobiology Program*  
<https://astrobiology.nasa.gov/countdown-to-mars/>
- Venus sounds like the last place for life, but...could photosynthesis happen in its clouds?  
*SyFy.com*, October 5, 2021  
<https://www.syfy.com/syfywire/could-photosynthesis-happen-in-venus-clouds>
- *Life on Venus? The Picture Gets Cloudier*, *The New York Times*, February 8, 2021  
<https://www.nytimes.com/2021/02/08/science/venus-life-phosphine.html>

## Current & Past Research Interests:

- Venus astrobiology: Considerations for past, present, and future habitability.
- Developing molecular and enzymatic assays for microbial ecology.
- Survival properties of spacecraft and cleanroom-associated microorganisms.
- Proteomics and metabolomics of spacecraft-associated microorganisms.
- Policy development for planetary protection.
- Detection of biometabolites using lanthanide complexes.
- Structure/function relationships of human and plant lipoxygenases.
- Fabrication of inorganic arrays and materials using biological templates.
- Interaction of plasmas and radiation with biological matter.
- Development of chemical probes for structural biology.
- Small molecule synthesis and antibody chemistry.

## Current Institution :

- Cal Poly Pomona (CPP) is a sister campus in the California State University system.
- CPP is a primarily undergraduate institution with a MS program.
- CPP is a Hispanic-Serving Institution.
- CPP has a strong history of hands-on learning.

## Education & Training :

- **Research Fellow :**  
NASA Astrobiology Program, Mountain View, CA (06/16-09/16)  
Project: Metabolomics of permafrost along an age gradient and formation of an astrobiology science network in the CSU.  
Supervisor: M. Kirven-Brooks
- **Policy Sabbatical :**  
NASA Headquarters, Washington D.C. (08/11-08/12)  
Project: Development and implementation of NASA planetary protection policy.  
Supervisors: C. A. Conley, P. Stabekis
- **Research Fellow :**  
NASA Astrobiology Institute & Jet Propulsion Laboratory, Pasadena CA (06/09-09/09)  
Project: Proteomic characterization of spacecraft-associated *Acinetobacter* strains.  
Supervisor: K. J. Venkateswaran
- **Research Sabbatical :**  
The Scripps Research Institute, La Jolla, CA (05/04-07/04)  
Project: Synthesis of epothilone fragments.  
Supervisor: K. C. Nicolaou
- **Postdoctoral Research :**  
University of California, Santa Cruz, CA (01/99-08/00)  
Projects: Kinetic and spectroscopic studies of plant and human lipoxygenases.  
Advisor: T. R. Holman
- **Ph.D. :**  
Chemistry (Organic Chemistry), University of California, Davis, CA (08/93-08/98)  
Thesis: Isotopic substitution with unstable nuclei to study protein binding sites.
- **B.S. :**  
Chemistry, University of Redlands, Redlands, CA (08/88-05/92)  
Thesis: Kinetics and purification of glucose-6-phosphate dehydrogenase.

## Work Experience :

**Guest Topic Editor**                      08/19-Present    Frontiers in Microbiology

- Guest Editor at Frontiers in Microbiology for topic entitled “Microbiology of Extreme and Human-Made Confined Environments (Spacecraft, Space Stations, Cleanrooms, and Analogous Sites)”.

**Research Fellow**                      06/16-09/16    NASA Astrobiology Institute

- NASA Astrobiology -Minority Institutional Research Support Fellowship.
- Biochemical characterization of permafrost along an age gradient.

- Content Contributor** 01/15-Present John Wiley & Sons
- Authored ~250 Bioinformatics Exercises as learning resources for all Wiley Biochemistry textbooks.
- NASA Detail Assignment** 08/11-07/12 NASA Headquarters
- Policy Sabbatical; NASA Office of Planetary Protection.
  - Analysis and promulgation of Planetary Protection policy for robotic exploration.
- Communications Consultant** 08/11-12/18 SETI Institute
- NASA Detail Assignment; NASA Office of Planetary Protection (08/2011-07/2012).
  - Remote Communications Consultant (08/2012-12/2018)
  - Analysis and promulgation of policy, content development, and web manager for office website.
- Campus Director** 05/09-07/11 California State Polytechnic Univ.; Pomona, CA
- NASA grant entitled NASA LIFTOFF.
  - Professional Development Program for Science Teacher Leaders.
- Research Fellow** 06/09-09/09 Jet Propulsion Laboratory, Pasadena, CA
- NASA Astrobiology Institute-Minority Institutional Research Support Fellowship.
  - Growth and preparation of *Acinetobacter* and *Vibrio* strains.
- System Director** 09/08-Present California State University System
- System wide Director for NASA/CSU Spaceward Bound within the California State University.
  - Field research and expedition experiences in astrobiology for pre-service teachers.
  - Expeditions were 3-5 days with 20-30 participants; included teacher training and field research.
  - Expeditions in 2009, 2010, 2011, 2012, 2014, and 2016 at the CSU Desert Studies Center
- Full Professor** 09/05-Present California State Polytechnic Univ.; Pomona, CA
- Biochemistry (Bioorganic, Bioinorganic, and Biophysical Chemistry) for Under/Graduates.
- Assistant Professor** 08/03-07/05 Harriet L. Wilkes Honors College, Jupiter, FL
- Honors Organic Chemistry and Honors Biochemistry [Florida Atlantic University].
- Research Sabbatical** 05/04-08/04 The Scripps Research Institute, La Jolla, CA
- Synthesis of advanced eptophilone fragments, reactive thiazole derivatives, and a heterobifunctional protein cross-linker.
- Visiting Scientist** 02/03-05/03 University of California, Santa Cruz, CA
- Kinetic analysis of active site mutants of soybean 15-lipoxygenase.
- Lecturer** 03/02-06/02 University of California, Santa Cruz, CA
- Advanced Inorganic Chemistry.
- Faculty Scientist** 08/02-12/02 NASA Ames Research Center  
08/01-05/02 (Education Associates/UCSC)
- Fabrication of ordered arrays of magnetic nanoparticles using engineered protein templates.
  - Biomolecular effects of low temperature plasmas.

**NASA Faculty Fellow**                      2001/2002              NASA Ames Research Center

- NASA Faculty Fellowship (Summers 2001 & 2002).
- Biomolecular effects of low temperature plasmas.

**Lecturer (Full-Time)**                      08/00-05/01              California State University, Chico, CA

- General Chemistry, Organic Chemistry, Chemical Literature.

**Postdoctorate**                              01/99-07/00              University of California, Santa Cruz, CA

- Kinetic and spectroscopic characterization of human and plant lipoxygenases.

**Research/Teaching Assistant** 05/93-08/98              University of California, Davis, CA

- Research Subjects: Protein, Radiation, and Organic Chemistry.
- Teaching Subjects: General Chemistry and Organic Chemistry laboratories

**Lab. Technician II**                      07/92-12/92              The Scripps Research Institute, La Jolla, CA

- Synthesis of substrates for catalytic antibodies (K. D. Janda).

## **Administrative Experience :**

### **Positions**

- Chair, Organic Chemistry Search Committee (Spring 2019-Spring 2020)
- Chair, Periodic Evaluations Committee (Spring 2019)
- Facilitator/Table Guide, College of Science Strategic Initiative Project, (Fall 2019-Spring 2020)
- Chair, Organic Chemistry Search Committee (Spring 2018-Fall 2018)
- Deputy Organizer, Committee on Space Research Astrobiology Conference Panel (8/2016-8/2017)
- CSU Campus Representative, CSUPERB Faculty Consensus Group (Sum. 2017-Spring 2021)
- Chair, Periodic Evaluations Committee (Spring 2017)
- Co-Chair, Chemistry Curriculum Comparison Committee (Spring 2016-present)
- Chair, Biochemistry Search Committee (Spring 2015-Winter 2016)
- Chair, Biochemistry Curriculum Committee (Spring 2015-present)
- Deputy Organizer, Committee on Space Research Conference Panel (8/2012-8/2014)
- Communications Consultant, NASA Office of Planetary Protection (8/2011-12/2018)
- Co-Chair, NASA ROSES Planetary Protection Research Grants Panel (2013)
- Deputy Assistant, NASA Exobiology Program (9/2011-8/2012)
- Designer and Content Manager for <http://www.planetaryprotection.nasa.gov>
- Co-Chair, Chemistry Department Graduate Committee (9/2010-6/2011)
- Co-Chair, Chemistry Department Retreat Planning (2010-2011)
- Curriculum Scheduler, Chemistry Department (01/2010-06/2010)
- Campus Director, NASA LIFTOFF (05/2009-04-2012)
- System-Wide Director, NASA/CSU Spaceward Bound (09/2008-present)
- Chair, College of Science Strategic Directions Task Force Committee (2008-2011).
- Facilitator, College of Science All-College meeting (04/03/2009)
- Co-Coordinator, Biochemistry Curriculum Committee (06/2008-present)
- Advisor, Malaysian Student Association Club (2007-2011)
- Chair, Central Advising Committee (Fall 2007)
- Project leader and Co-Designer of <http://www.honorscollege.edu> (08/2004-05/2005)
- Facilitator, Fulbright Teacher Exchange Program (Fall 2003).

**Academic Committees**

- Goldstein Event Planning Committee (Fall 2020-Present)
- Assessment Committee (2020-Present; 2008-2009)
- Analytical Chemistry Search Committee (Spring 2019-Spring 2020)
- Organic Chemistry Search Committee (Spring 2019-Spring 2020)
- Organic Chemistry Search Committee (Spring 2018-Fall 2018)
- Faculty Consensus Group, California State University (Summer 2017-Spring 2021)
- Resource Management Advisory Council (Fall 2015-2017)
- Biochemistry Search Committee (Spring 2015-Spring 2016), Chair
- Department Seminar Coordinator (2014-2019), Co-Chair
- Organic Search Committee (Spring 2015-Spring 2016)
- Inorganic Chemistry Search Committee (2014-2015)
- Physical Chemistry Search Committee (2014-2015)
- Senior Capstone Project Redesign Committee (2014-2016)
- Graduate Program Committee (Spring 2015-2017, 2009-2011)
- Periodic Evaluations Committee (2012-present)
- Environmental Health & Safety Committee (2012-2014)
- Retention, Tenure, and Promotion Revision Committee (2010-2011)
- Chemistry Department Retreat Planning (2010-2011)
- Chemistry Scheduling Committee (2010-2011)
- Chemistry Department Resource Committee (2009-2011)
- College of Science Strategic Directions Task Force Committee (2009-2011)
- Chemistry Chair Search Committee (2007-2009)
- Chemistry Retreat Committee (2008-2009)
- Biochemistry Curriculum Committee (2005-present)
- Biochemistry Majors Committee (2005-present)
- Lecture and Post-Tenure Review Committee (2007-2010)
- Scholarship Committee (2005-2011)
- Organic Chemistry Search Committee (2007)
- Central Advising Committee (2005-present)
- Web Management and Design Committee (2005-2008)
- Landscape Committee (2006-2008)
- PhD Research Advisory Committee, Department of Chemistry, FAU (09/03-05/05)

**Teaching Experience :**

- A. Cal Poly Pomona (09/05-present) [~3-4 courses/semester]
- **Undergraduate:**
    - *Biochemistry I & II (1 year course for majors)*
    - *Elements of Biochemistry (1 semester survey course for non-majors)*
    - *Enzymology*
    - *Senior Seminar*
    - *General Chemistry I*
  - **Graduate:**
    - *Structure and Function of Biomolecules*

- *Bioinorganic Chemistry*
  - *Seminar in Chemistry*
- B. Harriet L. Wilkes Honors College of FAU (08/03-05/05)
- *Honors Organic Chemistry I & II (1 year course)*
  - *Honors Biochemistry (1 semester course)*
- C. UC Santa Cruz (03/02-06/02)
- *Advanced Inorganic Laboratory*
- D. CSU Chico (08/00-05/01)
- *General Chemistry II*
  - *Organic Chemistry for Allied Sciences, Chemical Literature*
- E. UC Davis (05/93-08/98)
- General Chemistry (TA)
  - Organic Chemistry (TA)

## Supervised Undergraduate and Master's Projects :

Student	Degree/Date	Major	Thesis/Project/Duty
<b><i>Biochemistry &amp; Microbiology of Cleanroom-Associated Microorganism (Cal Poly Pomona)</i></b>			
1. Morgan Sanders	B.S. (2022)	BIO	Cultivation of cleanroom <i>Acinetobacter</i> on vaporous ethanol.
2. Kevin Calles	B.S. (2023)	CHEM	Preparation of <i>Acinetobacter</i> samples for proteomics.
3. Dominic Lopez	B.S. (2023)	CHEM	Preparation of <i>Acinetobacter</i> samples for proteomics.
4. Nelyda Almeyda	B.S. (2022)	CHEM	Cultivation of cleanroom <i>Acinetobacter</i> at differing temperatures.
5. S. Hernandez	B.S. (2021)	CHEM	Sequence analysis of <i>Acinetobacter</i> genome assemblies.
6. Juan Aldaco	M.S. (2022)	CHEM	Cultivation of cleanroom bacteria on dilute defined minimal media.
7. Marshall Vogt	B.S. (2021)	BIO	Impacts of metals on the cultivation of spacecraft-associated <i>Acinetobacter</i> .
8. Amanda Ochs	B.S. (2022)	CHEM	Spectroscopic Measures of Carbon Metabolism.
9. Makayla Brzycki	B.S. (2021)	CHEM	Impacts of metals on the cultivation of spacecraft-associated <i>Acinetobacter</i> .
10. Demi Ayala	M.S. (2021)	CHEM	Spectroscopic Measures of Carbon Metabolism.
11. Daniel Jaramillo	B.S. (2020)	CHEM	Impacts of metals on the cultivation of spacecraft-associated <i>Acinetobacter</i> .
12. Juan Aldaco	B.S. (2020)	CHEM	Impacts of metals on the cultivation of spacecraft-associated <i>Acinetobacter</i> .
13. Brian Ramos	B.S. (2019)	CHEM	Impacts of Kleenol 30 on the cultivation of <i>A. radioresistens</i> 50v1.
14. Sidharth Lalla	M.S. (2019)	CHEM	Quantification of endospores in ancient permafrost using Tb luminescence.
15. Daniel Miller	M.S. (2019)	BIO	Molecular genetic interrogations of spacecraft-associated <i>Acinetobacter</i> .
16. Nicholas Cooper	M.S. (2017)	CHEM	Catalase assay development & metabolomics of cleanroom samples.
17. Nestor Aquino	A.A. (2016)	Citrus	Growth of spacecraft <i>Acinetobacter</i> under extreme conditions.
18. Omar Mercado	A.A. (2016)	Cypress	Growth of spacecraft <i>Acinetobacter</i> under extreme conditions.
19. Sidharth Lalla	B.S. (2016)	CHEM	Biodegradation of Kleenol 30 by <i>Acinetobacter radioresistens</i> 50v1.
20. Steve Madrid	B.S. (2016)	CHEM	Biodegradation of Kleenol 30 by <i>Acinetobacter radioresistens</i> 50v1.
21. Robert Wedge	B.S. (2016)	CHEM	Catalase activities of spacecraft-associated <i>Acinetobacter</i> .
22. Alexa Campos	B.S. (2016)	CHEM	Catalase activities of spacecraft-associated <i>Acinetobacter</i> .
23. Kimberly Sripong	B.S. (2016)	CHEM	Catalase activities of spacecraft-associated <i>Acinetobacter</i> .
24. Thi Nguyen	B.S. (2015)	CHEM	Viability of spacecraft-associated <i>Acinetobacter</i> on isopropanol.
25. Tynan Young	B.S. (2015)	CHEM	NMR of spacecraft-associated <i>Acinetobacter</i> .
26. Mahjabeen Ahmed	B.S. (2015)	BIOT	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.
27. Shawn Gunadi	B.S. (2015)	CHEM	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.
28. Nich. Tedjakesuma	B.S. (2015)	CHEM	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.
29. Sooji Lee	M.S. (2015)	CHEM	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.

30.	Ryan Baki	M.S. (2017)	CHEM	Dehydrogenase activities of spacecraft-associated <i>Acinetobacter</i> .
31.	Veronica Rodriguez	B.S. (2015)	CHEM	Catalase activities of spacecraft-associated <i>Acinetobacter</i> .
32.	Alex Oei	B.S. (2015)	CHEM	Survival of spacecraft <i>Acinetobacter</i> isolates on ethanol.
33.	Eun Jin Kim	B.S. (2014)	CHEM	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.
34.	Jill Walker	B.S. (2014)	BIO	Growth of spacecraft-associated <i>Acinetobacter</i> on ethanol.
35.	Hania Brasali	B.S. (2014)	CHEM	Dehydrogenase activities of spacecraft-associated <i>Acinetobacter</i> .
36.	Argelia Nava	B.S. (2014)	BIO	Construction of meta-database of spacecraft isolates.
37.	Joseph Rodriguez	B.S. (2014)	CHEM	Survival of spacecraft <i>Acinetobacter</i> isolates on ethanol.
38.	Alexa Wollen	B.S. (2014)	BIO	Survival of spacecraft isolates on alcohols.
39.	Tyfanni Nguyen	B.S. (2014)	BIO	Survival of spacecraft isolates on alcohols.
40.	Trevor Gornick	B.S. (2014)	CHEM	Survival of spacecraft isolates on alcohols.
41.	Ivonne Cepeda	B.S. (2014)	CHEM	Survival of spacecraft isolates on alcohols.
42.	Laura Keagy	B.S. (2015)	BIO	Construction of meta-database of spacecraft isolates.
43.	Farah Zerehi	B.S. (2014)	NUT.SCI	Construction of meta-database of spacecraft isolates.
44.	Chirag Jain	B.S. (2013)	BIOT	Survival of spacecraft isolates on ethanol.
45.	Vinh Bao Nguyen	B.S. (2013)	CHEM	Survival of spacecraft isolates on ethanol.
46.	Gautam Savla	B.S. (2013)	CHEM	Survival of spacecraft isolates on ethanol.
47.	Megan Schmitz	B.S. (2012)	BIO	Growth conditions for spacecraft-associated <i>Acinetobacter</i> .
48.	Nicole Hearn	B.S. (2012)	BIO	Growth conditions for spacecraft-associated <i>Acinetobacter</i> .
49.	Ruth Alvarez	B.S. (2012)	CHEM	Stability of catalase from <i>A. radioresistens</i> 50v1.
50.	Freida Dallal	M.S. (2011)	CHEM	Protein content of <i>A. radioresistens</i> 50v1.
51.	Ivy Derecho	M.S. (2011)	CHEM	Survivability of <i>A. radioresistens</i> 50v1 in oxidative conditions.
52.	Kelly McCoy	M.S. (2010)	CHEM	Purification of catalase from <i>A. radioresistens</i> 50v1.
53.	Tim Wong	B.S. (2009)	CHEM	Catalase contents of <i>A. radioresistens</i> 50v1 and two control strains.
54.	Charlie Seto	B.S. (2009)	BIOT	Measuring the catalase content of <i>A. radioresistens</i> 50v1.
55.	Ryan Moreno	B.S. (2008)	CHEM	Characterizing the organic extracts of <i>A. radioresistens</i> 50v1.
56.	Truong Huynh	B.S. (2007)	BIOT	Characterization of the <i>A. radioresistens</i> 50v1 resistances.
57.	Hoa Tran	B.S. (2007)	BIOT	Characterization of the <i>A. radioresistens</i> 50v1 resistances.
58.	Vonny Kusmawati	B.S. (2007)	BIOT	Buffer preparations for catalase purification from <i>A. rad.</i> 50v1.
59.	Jeanette Sanchez	B.S. (2007)	BIOT	Purification of catalase from <i>A. radioresistens</i> 50v1.

#### **Soil Biochemistry (Cal Poly Pomona)**

60.	Demetria Flores	B.S. (2018)	CHEM	Chlorite dismutase and amino acid assays.
61.	Jacob Cummings	B.S. (2019)	CHEM	Methods development for soil catalase assays.
62.	Nicholas Rios	B.S. (2018)	CHEM	Methods development for soil catalase assays.
63.	Scott Giatpaiboon	M.S. (2017)	CHEM	Biochemical characterization of permafrost.
64.	Michael Chabot	B.S. (2017)	CHEM	Cost-effective and field-amenable catalase measurements.
65.	Omar Snoussi	B.S. (2010)	BIOT	Colorimetric detection of metabolic activity in soils.
66.	Amit Gandhi	B.S. (2009)	BIOT	Colorimetric detection of metabolic activity in soils.
67.	Pukar Patel	B.S. (2009)	BIOT	Colorimetric detection of metabolic activity in soils.
68.	Boon Kean Shyu	B.S. (2009)	BIOT	Colorimetric detection of Life in soils.
69.	M. Subramaniam	B.S. (2009)	BIOT	Colorimetric detection of Life in soils.
70.	Fatin Muhammed	B.S. (2009)	BIOT	Colorimetric detection of Life in soils.
71.	Vinod Ganesan	B.S. (2008)	BIOT	Field-based colorimetric measurement of reduction potential.

#### **Lipoxygenase Kinetics (Cal Poly Pomona)**

72.	Lia Hodgins	B.S. (2007)	CHEM	Elaidic acid inhibition of lipoxygenase.
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#### **Bioinorganic Chemistry (Cal Poly Pomona)**

73.	Estelle Le	M.S. (2012)	CHEM	Characterization of terbium chelate complexes with phosphotyrosine.
74.	Lia Barnes	M.S. (2011)	CHEM	Effects of chelate structure on DPA ligation and <i>Bacillus</i> detection.
75.	Kota Kaneshige	B.S. (2010)	CHEM	Effects of chelate structure on DPA ligation.
76.	David Joh	B.S. (2008)	CHEM	Luminescence of fatty acid complexes with Eu(tetracycline).
77.	Mark Sabino	B.S. (2008)	BIOT	Impact of Tb concentration on DPA ultraviolet absorbance.
78.	Jerome Strong	B.S. (2007)	CHEM	Effects of chelate structure on pY•Tb complexes.
79.	Hugo Bernabe	B.S. (2007)	CHEM	Effects of chelate structure on DPA•Tb complexes.
80.	Kingsley Tan	B.S. (2007)	CHEM	Effects of chelate structure on DPA•Eu complexes.

81. Allison Koga B.S. (2007) CHEM Sensitization of Eu-tetracycline using an alkenyl peroxide.

***NASA Historical Documents Archiving (NASA Headquarters)***

82. Carolyn Pace B.A. (2013) - Hollins University, summer intern program, documents archiving

83. John Caldwell M.S. (2013) Lib.Sci. University of Maryland, summer intern program, documents archiving

***Wilkes Honors College***

84. Nkaya Williams B.A. (2006) BIO Synthesis of oleyl phosphate.

85. Tito Sempértegui B.A. (2006) BIO Synthesis of oleyl phosphate.

86. Morgan Cable B.A. (2005) CHEM Luminescence of DPA-Tb complexes.

87. Sonya Reid B.A. (2005) CHEM Effect of chelate structure on lanthanide luminescence.

88. Maria Vizcaino B.A. (2005) BIO Isolation and determination of cytotoxic compounds from...plakinidae.

89. Sarah Chaney B.A. (2005) BIO Bioassay-guided purification of an active compound...Spongosorites.

**Publications : (CPP, CSU, & WHC student co-authors are in bold)**

- **Miller, D.R.; Lalla, S.J.; Ramos, B.**; Mogul, R. Spacecraft-associated *Acinetobacter* Tolerate Kleenol-30, a Cleanroom Floor Detergent. *Front. Microbiol.*, **accepted**
- Mogul, R.; Limaye S.S.; Way, M.J. The CO<sub>2</sub> profile and Analytical Model for the Pioneer Venus Large Probe Neutral Mass Spectrometer. *Icarus* **393** (2023). (<https://doi.org/10.1016/j.icarus.2022.115374>)
- Mogul, R.; Lee, Y.J., **Pasillas, M.**; Limaye, S.S. Potential for Phototrophy in Venus' Clouds. *Astrobiology* **21** (2021). (<http://doi.org/10.1089/ast.2021.0032>)
- Kotsyurbenko, O.; Cordova, J.; Belov, A.; Cheptsov, V.; Kolbl, D.; Khrunyk, Y.; Kryuchkova, M.; Milojevic, T.; Mogul, R.; Sasaki, S.; Slowik, G.; Snytnikov, V.; Vorobyova, E. Exobiology of Venus clouds: new insights into habitability through terrestrial models and methods of detection. *Astrobiology* **21** (2021). (<http://doi.org/10.1089/ast.2020.2296>)
- Limaye, S.S.; Mogul, R.; Baines, K.H.; Bullock, M.A.; Cockell, C.; Cutts, J.A.; Gentry, D.; Grinspoon, D.; Head, J.; Jessup, K.L.; Kompanichenko, V.; Lee, Y.J.; Mathies, R.; Milojevic, T.; Pertzborn, R.A.; Rothschild, L.; Sasaki, S.; Schulze-Makuch, D.; Smith, D.J.; Way, M.J. Venus, as an Astrobiology Target. *Astrobiology* **21** (2021). (<http://doi.org/10.1089/ast.2020.2268>)
- Mogul, R.; Limaye S.S.; Way, M.J. Venus' Mass Spectra Show Signs of Disequilibria in the Middle Clouds. *Geophys. Res. Letters* **48** (2021). (<https://doi.org/10.1029/2020GL091327>)
- Limaye, S.S.; Bullock, M.A.; Baines, K.H.; Cordova, J.A.; Cutts, J.A.; Gentry, D.; Grinspoon, D.; Head, J.; Jessup, K.L.; Kompanichenko, V.; Lee, Y.J.; Mathies, R.; Milojevic, T.; Mogul, R.; Pertzborn, R.A.; Rothschild, L.; Sasaki, S.; Schulze-Makuch, D.; Seager, S.; Smith, D.J.; Way, M.J. Venus, as an Astrobiology Target (White Paper). *Bull. Am. Astron. Soc.* **53** (2021). (<https://doi.org/10.3847/25c2cfcb.32998123>)
- **Lalla, S.J.; Kaneshige, K.R.; Miller, D.R.**; Mackelprang, R.; Mogul, R. Quantification of Endospores in Ancient Permafrost using Time-Resolved Lanthanide Luminescence. *Anal. Biochem.* **612**, 113957 (2020). (<https://doi.org/10.1016/j.ab.2020.113957>)



- **Chabot, M.; Morales, E.; Cummings, J.; Rios, N.; Giatpaiboon, S.;** Mogul, R. Simple kinetics, assay, and trends for soil microbial catalases. *Anal. Biochem.* **610**, 113901 (2020). (<https://doi.org/10.1016/j.ab.2020.113901>)
- Mogul, R. Protecting planets beyond Earth. *Physics Today* **17**, 66 (2019). (<https://doi.org/10.1063/PT.3.4120>)
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## Talks, Seminars & Conferences :

- Invited Seminar: Department of Biological Sciences, Northern Illinois University, Virtual (Nov 2022).
- Talk: Mogul, R.; Limaye, S.; Way, M. DAVINCI Roundtable Discussion, Virtual (July, 28 2022)
- Talk: Mogul, R.; Miller, D.; Ramos, B.; Lalla, S. 44<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly – Venus Science and Exploration (B4.1), Athens, Greece (July 2022).
- Talk: Mogul, R.; Limaye, S.; Way, M. 44<sup>th</sup> Committee on Space Research (COSPAR) Scientific Assembly – Planetary Protection Research and Development (PPP.3), Athens, Greece (July 2022).
- Invited Speaker: Friends of DAVINCI Seminar Series, Virtual (June 2022).
- Session Co-Chair: Planetary Protection, the Limits of Life and the Moon to Mars, Astrobiology Science Conference, Atlanta, GA (May 2022).

- Talk: Mogul, R.; Planetary Protection, the Limits of Life and the Moon to Mars, Astrobiology Science Conference, Atlanta, GA (May 2022).
- Poster: Mogul, R., Limaye S.S.; Way, M.J.; Towards Resolving the Mysteries of Earth's Sister Planet, Venus, Astrobiology Science Conference, Atlanta, GA (May 2022).
- Talk: Mogul, R.; et al. Venera-D: Venus Cloud Habitability System Workshop, Virtual (Nov. 2021)
- Invited Speaker: National Academies of Science, Engineering and Medicine, Planetary Science and Astrobiology Decadal Survey 2022-2023, Panel on Venus (May 19, 2021).
- Invited Speaker: NASA Glenn Institute of Space Studies, Astrobiology – NExSS ROCKE-3D Project (March 2021).
- Invited Speaker: American Geophysical Union Fall Meeting 2020, Phosphine in the Venusian Atmosphere: Observations and Implications (December 2020).
- Invited Seminar: Brown University, Planetary Geosciences Group (November 2020).
- Invited Speaker: 18<sup>th</sup> Meeting of the Venus Exploration and Analysis Group (VEXAG) (November 2020).
- Talk: Mogul, R.; Lee, Y. J.; Limaye, S.; Venera-D Landing Sites and Cloud Layer Habitability Workshop, Moscow, Russia (October 2019).
- Talk: Mogul, R.; Barding, G.A.; Lalla, S.; Baki, R.; Lee, S.; European Astrobiology Network Association Conference, Berlin, Germany (September 2018).
- Talk: Mogul, R.; Limaye, S. 42<sup>nd</sup> Committee on Space Research (COSPAR) Scientific Assembly – Astrobiology (F3.1), Pasadena, CA (July 2018)
- Talk: Mogul, R.; Barding, G.A.; Lalla, S.; Baki, R.; Lee, S.; 42<sup>nd</sup> Committee on Space Research (COSPAR) Scientific Assembly – Planetary Protection Research and Development (PPP.3), Pasadena, CA (July 2018).
- Talk: Mogul, R.; Limaye, S. 51<sup>st</sup> ESLAB Symposium: Extreme Habitable Worlds, Noordwijk, NE (December 2017)
- Session Co-Chair: Astrobiology & Planetary Protection, Astrobiology Science Conference, Mesa, AZ (April 2017).
- Poster: Giatpaiboon, S.; Mackelprang, R.; Mogul, R.; Omics in Astrobiology, Astrobiology Science Conference, Mesa, AZ (April 2017).
- Poster: Lalla, S.; Madrid, S.; Barding, G.A.; Mogul, R.; Astrobiology & Planetary Protection, Astrobiology Science Conference, Mesa, AZ (April 2017).
- Talk: Baki, S.; Lee, S.; Campos, A.; Perkins, N.; Barding, G.A.; Mogul, R.; Astrobiology & Planetary Protection, Astrobiology Science Conference, Mesa, AZ (April 2017).

- Seminar: Insights in the survival of spacecraft-associated *Acinetobacter*, CSU Fullerton (March 16, 2017).
- Plenary Chair: Astrobiology, 2017 CSU Biotechnology Symposium, Santa Clara, CA (January 2017).
- Poster: Giatpaiboon, S.; Mackelprang, R.; Mogul, R.; Astrobiology, 2017 CSU Biotechnology Symposium, Santa Clara, CA (January 2017).
- Poster: Lalla, S.; Madrid, S.; Barding, G.A.; Mogul, R.; Astrobiology, 2017 CSU Biotechnology Symposium, Santa Clara, CA (January 2017).
- Poster: Baki, S.; Lee, S.; Campos, A.; Perkins, N.; Barding, G.A.; Mogul, R.; Astrobiology, 2017 CSU Biotechnology Symposium, Santa Clara, CA (January 2017).
- Talk: Mogul, R.; Astrobiology and the search for life on Mars, Science on Tap, Cal Poly Pomona (April 2016).
- Session Co-Chair: Planetary Protection in the Age of Exploration, Astrobiology Science Conference, Chicago, IL (June 2015).
- Session Co-Chair: Astrobiology Research and Education at Minority-Serving Institutions, Astrobiology Science Conference, Chicago, IL (June 2015).
- Talk: Payton, G.; Tharayil, S.; Mogul, R.; Schubert, K.; Vaishampayan, P, McKay, C. P.; Astrobiology Research and Education at Minority Serving Institutions Session, Astrobiology Science Conference, Chicago, IL (June 2015).
- Talk: Mogul, R.; Vaishampayan, P.; Schubert, K.; McKay, C. P.; Extreme Earth: Omics Research on Microbial Communities, their Chemistries, and What it Means for Life in the Solar System, Astrobiology Science Conference, Chicago, IL (June 2015).
- Poster: Rodriguez, V.; Nguyen, T.; Le, S.; Tedjakesuma, N.; Gunadi, S.; Ahmed, M.; Young, T.; Baki, R.; Barding, G.; Mogul, R.; Exploring the Effects of Stress on Microbial Mutation Rates and Survival Strategies Session, Astrobiology Science Conference, Chicago, IL (June 2015).
- Talk: Mogul, R.; Cepeda, I.; Brasali, H.; Gornick, T.; Jain, C.; Kim, E.J.; Nguyen, V.B.; Oei, A.; Rodriguez, J.; Rodriguez, V.; Savla, G.; Walker, J.; 40<sup>th</sup> COSPAR Assembly, Life in Extreme Environments – Model Systems for Astrobiology, Moscow, Russia (August 2014).
- Talk: Mogul, R.; Keagy, L.; Nava, A.; Zerehi, F.; 40<sup>th</sup> COSPAR Assembly, Planetary Protection Research Panel, Moscow, Russia (August 2014).
- Talk: Rodriguez, J.; Oei, A.; Jain, C.; Gornick, T.; Cepeda, I.; Brasali, H.; Wollen, A.; Mogul, R.; Southern California Conference for Undergraduate Research 2013, Whittier, CA. (November 2013).
- Talk: Nava, A.; Keagy, L.; Zerehi, F.; Mogul, R.; Southern California Conference for Undergraduate Research 2013, Whittier, CA (November 2013).

- Talk: Savla, G.; Nguyen, V.B.; Jain, C.; Mogul, R.; ACS SoCal Undergraduate Conference 2013, Claremont, CA (April 2013).
- Talk: Keagy, L.; Zerehi, F.; Mogul, R.; ACS SoCal Undergraduate Conference 2013, Claremont, CA (April 2013).
- Session Chair: Mogul, R.; Voytek, M.; Viso, M.; 39<sup>th</sup> COSPAR Assembly, Advanced Instrumentation for Astrobiology: ISS, Mars and Beyond, Mysore, India (July 2012).
- Talk: Mogul, R.; McCoy, K. B.; Dallal, F.; Derecho, I.; La Duc, M. T.; Venkateswaran, K. 39<sup>th</sup> COSPAR Assembly, Life in Extreme Environments – Model Systems for Astrobiology, Mysore, India (July 2012).
- Talk: Mogul, R.; Stabekis, P.D.; 39<sup>th</sup> COSPAR Assembly, Planetary Protection Policy and Implementation Guidelines Panel, Mysore, India (July 2012).
- Talk: Mogul, R.; Barnes, L.; Kaneshiga, K. R.; Strong, J.; Tan, K.; Von Bremen, H. American Chemical Society National Meeting: Division of Inorganic Chemistry, Coordination Chemistry: Characterizations and Applications, Anaheim, CA. (March 2011).
- Poster: Kaneshiga, K. R.; Chea, K.; Von Bremen, H.; Mogul, R. American Chemical Society National Meeting: Division of Inorganic Chemistry, Sci-Mix and Coordination Chemistry: Characterizations and Applications, Anaheim, CA. (March 2011).
- Talk: McCoy, K. B.; Derecho I.; Dallal, F.; Venkateswaran, K. J.; Mogul, R. Astrobiology Science Conference, League City, TX (4/20-4/26, 2010).
- Poster: McCoy, K. B.; Dallal, F.; Derecho, I.; La Duc, M. T.; Vaishampayan, P. Venkateswaran, K. J.; Mogul, R. Astrobiology Science Conference, League City, TX (4/20-4/26), LPI Contribution, 1538, 5578 (2010).
- Seminar: Characterizing *Acinetobacter radioresistens* 50v1, an extremophile isolated from the Mars Odyssey spacecraft. Jet Propulsion Laboratory, Planetary Protection and Biotechnology Group (06/25/09).
- Seminar: Biomolecular effects of low-temperature plasma exposure. University of Redlands, Redlands, CA. (03/03/09).
- Poster: Mogul, R.; Seto, C.; Tran, H. M.; Huynh, T. D.; La Duc, M. T.; Venkateswaran, K. Astrobiology Science Conference, Santa Clara, CA (4/08).
- Poster: Mogul, R.; Tran, H. M.; Huynh, T. D.; Sanchez, J. M.; La Duc, M. T.; Venkateswaran, K. American Society for Microbiology 107<sup>th</sup> General Meeting: Extreme Environments II, Toronto, CA. (5/07).
- Poster: Mogul, R. CSUPERB Symposium (01/06).
- Talk: Mogul, R. American Chemical Society National Meeting: Division of Chemical Education, Hot topics in organic chemistry, "Organic Chemistry and the News", San Diego, CA. (3/05).

- Poster: Kelly, J. J. G.; Mogul, R.; Cable, M. L.; Hebard, A. F. 49<sup>th</sup> Conference on Magnetism and Magnetic Materials, Jacksonville, FL. (11/04).
- Seminar/Discussion: Epothilones for antibody-directed cancer therapy. Advisory Board, Wilkes Honors College, Jupiter, FL. (11/04).
- Poster: Mogul, R. Florida Tech Transfer Conference, St. Petersburg, FL. (5/04).
- Poster: Mogul, R.; Ruddat, V.; Holman, T. R.; Chen, C.; Whitman, S. American Chemical Society National Meeting: Division of Inorganic Chemistry, Non-heme iron chemistry in biology and Sci-Mix, Anaheim, CA. (4/04).
- Poster: Mogul, R.; Cable, M. American Chemical Society National Meeting: Division of Inorganic Chemistry, Bioinorganic Chemistry, Anaheim, CA. (4/04).
- Poster: Reid, S.; Mogul, R. American Chemical Society National Meeting: Division of Chemical Education, Anaheim, CA. (4/04).
- Poster: Dalton, J. B.; Mogul, R. American Geophysical Union, San Francisco, CA. (12/02).
- Poster: Zach, M. P.; Mogul, R.; McMillan, A.; Paavola, C.; Trent, J.; Banfield, J. American Chemical Society National Meeting: Division of Inorganic Chemistry, Synthesis of Nanoparticles and Nanostructured Materials, New Orleans, LA. (3/03).
- Poster: Mogul, R, Bol'Shakov, A. A.; Chan, S. L.; Stevens, R. D.; Khare, B. N.; Meyyappan, M.; Trent, J. D. *Proceedings of the 2<sup>nd</sup> Astrobiology Science Conference*, NASA Ames Research Center, Mountain View, CA. (4/02).
- Poster: Dalton, J. B.; Kagawa, H.; Mogul, R. *Proceedings of the 2<sup>nd</sup> Astrobiology Science Conference*, NASA Ames Research Center, Mountain View, CA. (4/02).
- Seminar: Biomolecular effects of low-temperature plasma exposure. San Jose State University, San Jose, CA. (4/02).
- Seminar: No Earth bugs on Mars. NASA Ames Research Center, Mountain View, CA. (03/02).
- Poster: Mogul, R, Imanaka, H.; Chan, S. L.; Khare, B.; Meyyappan, M.; Trent, J. Mars Atmospheric and Astrobiology Workshop, Caltech, Pasadena, CA. (12/01).
- Poster: McMillan, R. A.; Kagawa, H.; Takuro, Y.; Paavola, C.; Mogul, R.; Meyyappan, M.; Trent, J. Foresight Conference on Molecular Nanotechnology, Santa Clara, CA. (11/01).
- Seminar: Allosteric inhibition of Lipxygenase. California State University, Chico, CA. (04/01).
- Poster: Mogul, R.; Johansen, E.; Holman T. R. American Chemical Society National Meeting: Sci-Mix and Division of Biological Chemistry, San Francisco, CA. (3/00).

- Poster: Mogul, R.; Meares, C. F. American Society of Biochemistry and Molecular Biology: Protein Chemistry, San Francisco, CA. (8/97).
- Poster: Mogul, R.; Greiner, D. P.; Meares, C. F. American Chemical Society National Meeting: Sci-Mix and Division of Inorganic Chemistry, San Francisco, CA. (3/97).

## Peer-Review Activities

### Management of Review Panels

- Co-Chair, NASA ROSES Planetary Protection Research Grants Panel (2013)
- Deputy Assistant to the Program Manager, NASA ROSES Exobiology Grants Panel (2012).
- Deputy Assistant to the Program Manager, NASA ROSES Exobiology Grants Panel (2011).

### Grant Reviews

- Internal Reviewer, NASA Solar System Workings Panel (2022).
- Internal Reviewer, NASA FINESST Awards Panel (2021).
- Internal Reviewer, NASA Habitable Worlds Grants Panel (2020).
- External Reviewer, Space Telescope Science Institute, Director's Discretionary request for Hubble Space Telescope observations (2018).
- Internal Reviewer, NASA ROSES Exobiology Grants Panel (2018).
- Internal Reviewer, NASA ROSES Planetary Protection Research Grants Panel (2017).
- External Reviewer, Lewis & Clark Fund in Astrobiology (2016).
- Internal Reviewer, Kellogg FuTURE Mini-Grant Program, Cal Poly Pomona (2015).
- Internal Reviewer, Kellogg Undergraduate Scholars Program, Cal Poly Pomona (2015).
- External Reviewer, NASA Moon and Mars Analog Mission Activities (2012).
- Internal Reviewer, NASA ROSES Planetary Protection Research Grants Panel (2011).

### Manuscript Reviews

- *Life*, life-1165020; AMAB-D-01221 (2021)
- *Astrobiology*, 2020-2326 (2020)
- *Astrobiology*, 2020-2267 (2020)
- *European Journal of Soil Biology*, EJSOBI\_2020\_16 (2020)
- *Astrobiology*, 2018-2019 (2019)
- *Soil Biology & Biochemistry*, SBB14710 (2019)
- *AIMS Microbiology*, Micro2018046 (2018)
- *European Journal of Soil Biology*, EJSOBI\_2018\_262 (2018)
- *Proceedings of the Indian National Science Academy*, 478 (2018)
- *Astrobiology*, AST-2017-1715 (2017)
- *47<sup>th</sup> International Conference on Environmental Systems*, ICES-2017-177 (2017).
- *Catalysis Letters*, CATLET-2015-0008 (2015).
- *Colloids Surfaces B*, COLSUB-D-13-01637R1 (2014).
- *J. Mat. Res.*; JMR-2012-0306 (2012).
- *African J. Biotechnol.*; AJB-11-3080 (2011).
- *Fed. Europe. Microbiol. Soc.*; FEMSLE-10-11-1445 (2010).
- *J. Mat. Res.*; JMR-2008-0998 (2009).
- *Chem. Mat. Reviews*, cm0629311 (2007).



- *Inorg. Chem.*; ic0602190 (2006).
- *Inorg. Chem.* (2005).
- *Inorg. Chem.* (2004).
- *Naturwis.* (2004).

### Textbook Reviews

- Chapter Reviews, Essential Biochemistry, Pratt & Cornely, 4<sup>th</sup> ed.; Wiley (2018).
- Biochemistry: Concepts and Connections, Matthews, Appling, Anthony-Cahill, Pearson (2014).
- Diary Review, Essential Biochemistry, Pratt & Cornely, 3<sup>rd</sup> ed.; Wiley (2013).
- Tools for Biochemistry, Mathews, 1<sup>st</sup> ed.; Pearson (2013)
- Biochemistry, The Molecular Basis of Life, McKee & McKee, 6<sup>th</sup> ed.; Oxford (2013).
- Essential Biochemistry, Pratt & Cornely, 3<sup>rd</sup> ed.; Wiley (2012).
- Biochemistry, The Molecular Basis of Life, McKee & McKee, 5<sup>th</sup> ed.; Oxford (2009).
- Biochemistry, The Molecular Basis of Life, McKee & McKee, 4<sup>th</sup> ed.; Oxford (2006).

### **Funded Research and Travel :**

- Reassessing the Composition of Venus' Atmosphere (2). NASA NExSS, Rocky Planet Habitability: Insights from Solar System Climate Dynamics through Time (80NSSC22K1316), PI, \$44k (05/01/22-01/31/23)
- Reassessing the Composition of Venus' Atmosphere (1). NASA NExSS, Rocky Planet Habitability: Insights from Solar System Climate Dynamics through Time (80NSSC21K1176), PI, \$35k (08/01/21-02/01/22)
- Metabolic Profiling of Cleanroom-Associated Microorganisms. NASA Research Opportunities in Space and Earth Sciences (ROSES-18), Planetary Protection Research (80NSSC20K0744), PI, \$418k (\$268k for PI at CPP; \$150k for Co-I at JPL) – (03/10/20-03/09/23), *funded*.
- Community Metabolomics Along a Permafrost Age Gradient. NASA Astrobiology-Minority Institute Research Support Fellowship, PI, \$25,000 (05/12/16), *funded*.
- Provost's Teacher-Scholar Support Program, Cal Poly Pomona, 4 Weighted Teaching Units, (AY 2016-2017), *funded*.
- Planetary Protection: Policy Development, Implementation Issues, and Societal Concerns. NASA Research Opportunities in Space and Earth Sciences (ROSES), Consultant, \$8,550 (4/12/15), *funded*.
- Faculty Professional Development Mini-Grant, Cal Poly Pomona, \$1000 (Jan. 2015), *funded*.
- NASA Spaceward Bound: Lassen Volcanic National Park, PI, \$14,950 California State University, Math and Science Teacher Initiative (2014-2015), *funded*.
- Faculty Travel Grant program, California State University Program for Education and Research in Biotechnology (CSUPERB), \$1500 (Dec. 2014), *funded*.

- Provost's Teacher-Scholar Support Program, Cal Poly Pomona, 8 Weighted Teaching Units, (AY 2014-2015), *funded*.
- Integrated bioinformatics learning modules for biochemistry. John Wiley & Sons, Inc., Contributor, \$30k (2014-2020), *funded*.
- NASA Spaceward Bound: Mojave. California State University, Math and Science Teacher Initiative, PI, \$13,200 (2013-2014), *funded*.
- NASA Spaceward Bound: Mojave, California State University, Math and Science Teacher Initiative, PI, \$15,000 (2012-2013), *funded*.
- Planetary Protection: Policy Development, Implementation Issues, and Societal Concerns, NASA Research Opportunities in Space and Earth Sciences (ROSES), Consultant, \$58,000 (10/19/12), *funded*.
- NASA Spaceward Bound: Mojave. California State University, Math and Science Teacher Initiative, PI, \$16,000 (2011-2012), *funded*.
- Planetary Protection: Policy Development, Implementation Issues, and Societal Concerns, NASA Research Opportunities in Space and Earth Sciences (ROSES), Communications Consultant, \$112,000 (06/22/11), *funded*.
- NASA Spaceward Bound: Mojave. California State University, Math and Science Teacher Initiative, PI, \$20,000 (2010-2011), *funded*.
- Characterization of *Acinetobacter radioresistens* 50v1, an extremophile isolated from the Mars Odyssey Orbiter. NASA Astrobiology Institute-Minority Institute Research Support Sabbatical Fellowship, PI, \$35,500 (04/08/09), *funded*.
- NASA LIFT OFF: NASA Learning Inspires Fundamental Transformations by Opening Future Frontiers for High School Science, Technology, Engineering and Mathematics Education, NASA K12 Grants Opportunity, Co-I & Institutional PI, \$1,409,903 (03/31/09), *funded*.
- Provost's Teacher-Scholar Award, Cal Poly Pomona, \$11,000, (03/13/09), *funded*.
- NASA Spaceward Bound: Mojave. California State University, Math and Science Teacher Initiative, PI, \$25,000 (2009-2010), *funded*.
- College of Science Travel Fund, Cal Poly Pomona, \$228 (06/2008), *funded*.
- Spaceward Bound 2008 Mojave (research field expedition, core science member), NASA Ames Research Center (05/2008), *sponsored*.
- Presidential Travel Award, Cal Poly Pomona, \$825 (02/2008), *funded*.
- Spaceward Bound 2007 Mojave (research field expedition), NASA Ames Research Center, (05/2007), *sponsored*.

- Presidential Travel Award, CSU Pomona, \$900 (01/2007), funded.
- Lanthanide chelates for phosphotyrosine detection. Faculty Seed Grant, California State University Program for Education and Research in Biotechnology (CSUPERB), PI, \$13,500 (01/2007), *funded*.
- Purification of catalase from *A. radioresistens* 50v1. Summer Contract Award, Jet Propulsion Laboratory, \$5000 (06-08/2006), *funded*.
- Faculty Travel Award, Florida Atlantic University, \$1200 (March 2005), *funded*.
- Sponsored Research Award, Amedicina LLC (FAU 2004-18), \$39,843 (11/04), *funded*.
- Summer Sabbatical Research, Wilkes Honors College, \$10,000 (Summer 2004), *funded*.
- CELT Grant, California State University, Chico, \$200, (02/2001), *funded*.

### **Awards, Activities, and Organizations :**

- Research Fellow, NASA Astrobiology Program (2016)
- Research Fellow, NASA Astrobiology Institute (2009)
- Web Manager for the NASA Office of Planetary Protection (10/2011-12/2018).
- Webmaster at the Wilkes Honors College.
- Discussion/Luncheon with Senator Ken Pruitt and FAU President Frank T. Brogan regarding launch of Biotech Leadership Consortium in Palm Beach County (12/07/04).
- "Between the Arts and Sciences", Invited Panelist, Palm Beach Institute for Contemporary Art (April 2004).
- Empire Who's Who Professional Registry (2001-2002).
- NASA Faculty Fellow (Summers 2001 and 2002).
- U.S. Patent 6,479,546 B1, Allosteric inhibitors of lipoxygenase.
- American Chemical Society (16 year member).
- Mortar Board, University of Redlands (08/91-05/92).
- University of New South Wales Science Program, Sydney, Australia (8/91-12/91).
- Chemistry Science Fellow, University of Redlands (05/91-08/91).
- Vice President/Founder, Amnesty International, University of Redlands (1988-1989).
- Bilingual-Bicultural Scholar Award, University of Redlands (08/88-05/91).

### **News Reports & Media :**

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- Countdown to Mars, *NASA Astrobiology Program*  
<https://astrobiology.nasa.gov/countdown-to-mars/>  
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- Venus sounds like the last place for life, but...could photosynthesis happen in its clouds? *SyFy.com*, October 5, 2021  
<https://www.syfy.com/syfywire/could-photosynthesis-happen-in-venus-clouds>
- Fotosynthese in de wolken van Venus: Dat lijkt helemaal niet zo'n vergezocht idee, *Scientias*, October 6, 2021  
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- Venus' Cloud Layers Could Support Earth-like Photosynthesis, Suggests New Study, *The Weather Channel*, October 10, 2021  
<https://weather.com/en-IN/india/space/news/2021-10-10-venus-cloud-layers-could-support-earth-like-photosynthesis>
- There's Enough Sunlight Getting Through Venus' Clouds to Support High-Altitude Life, *Universe Today*, October 5, 2021  
<https://www.universetoday.com/152832/theres-enough-sunlight-getting-through-venus-clouds-to-support-high-altitude-life/>
- Study Claims Photosynthesis Can Possibly Happen in Venus: Is This a Sign of Life?, *Nature World News*, October 3, 2021  
<https://www.natureworldnews.com/articles/47685/20211003/study-claims-photosynthesis-possibly-happen-venus-sign-life.htm>
- A New Paper Claims Photosynthesis Could Be Possible in The Clouds of Venus, *ScienceAlert*, October 1, 2021  
<https://www.sciencealert.com/new-study-deems-life-supporting-photosynthesis-possible-in-he-clouds-of-venus>
- Photosynthesis in Venus' clouds could support life, *Tech Explorist*, October 1, 2021  
<https://www.techexplorist.com/photosynthesis-venus-clouds-support-life/41551/>
- A New Paper Claims Photosynthesis Could Be Possible in The Clouds of Venus, *ScienceAlert*, October 1, 2021  
<https://www.sciencealert.com/new-study-deems-life-supporting-photosynthesis-possible-in-he-clouds-of-venus>
- Study Finds Photosynthesis in Venus' Clouds Could Support Life, *Astrobiology.com*, September 30, 2021  
<http://astrobiology.com/2021/09/study-finds-photosynthesis-in-venus-clouds-could-support-life.html>

- Photosynthesis is possible in the clouds of Venus, *Swords Today*, October 2, 2021  
<https://swordstoday.ie/photosynthesis-is-possible-in-the-clouds-of-venus/>
- Life in the skies over Venus? Microorganisms could thrive in planet's thick clouds by using sunlight to photosynthesize food like plants on Earth, study finds, *Daily Mail*, September 29, 2021  
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- Sunlight filtering through Venus' clouds could support Earth-like photosynthesis in the cloud layers, *Phys.org*, September 29, 2021  
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#### Media Reports in Additional Languages

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- **Indonesian:** <https://nationalgeographic.grid.id/read/132919669/fotosintesis-di-awan-venus-mungkin-mendukung-adanya-kehidupan?page=all>
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- **Spanish:** <https://www.europapress.es/ciencia/misiones-espaciales/noticia-fotosintesis-24-horas-nubes-venus-puede-sustentar-vida-20210929141345.html>
- **Turkish:** <https://www.timeturk.com/dunya/venus-te-yasam-izi-ihimalini-guclendiren-yeni-bir-kesif/haber-1703995>

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### **News & Media**

- Possible life signs in the clouds of Venus, *EarthSky*, April 13, 2021  
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- Planetary Radio, March 31, 2021  
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- NASA Mission to Venus in 1978 May Have Detected Phosphine, a Gas Related to Life, The Planetary Society, March 25, 2021  
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- The Quest for Life on Venus, *The Planetary Report*, March, 2021  
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- NASA Mission to Venus in 1978 May Have Detected Phosphine, a Gas Related to Life, *The Planetary Society*, March 25, 2021  
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- Did NASA detect a hint of life on Venus in 1978 and not realize it?, *Live Science*, September 30, 2020  
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- Prospects for life on Venus fade — but aren't dead yet, *Nature*, November 7, 2020  
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### **Videos**

- Forget Mars — There Could Be Alien Life On Venus, *Tech Insider*  
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- Clouds Of Venus May Be Harboring Microbial Life, Scientists Say, *GeoBeats News*  
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### **Interviews**

- Forget Mars, there could be life on Venus, *Business Insider*, May 24, 2018  
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- Venus' Cloud Alien Life Mystery Explained, *Sputnik News*, May 4, 2018  
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### **News Articles**

- Mystery of Interplanetary Expeditions, *Atlas Obscura*, August 24, 2018  
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- Those Cryptic Clouds of Venus Could Contain Alien Life, *Forbes*, May 22, 2018  
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- Researchers Say Venus' Atmosphere Could Support Extraterrestrial Life, *Time*, April 2, 2018  
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- Researchers Think There Could Be Alien Life Floating in the Clouds of Venus, *Vice*, April 2, 2018  
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- Venus' clouds could host extraterrestrial life, researchers say, *Fox News*, April 2, 2018  
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- Clouds of Venus could host extraterrestrial life forms, *Newsweek*, April 1, 2018  
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### **Planetary Protection**

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### **Interview**

- “Bakterien fressen Putzmittel,” German Public Radio, August 2018

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- They Came From Earth: The Attack Of The Space Germs, *Forbes*, June 26, 2018

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