

# Matea Santiago

---

## CONTACT INFORMATION

Department of Mathematics  
The University of Arizona  
617 N. Santa Rita Ave.  
Tucson, AZ 85721

Web: [www.mateasantiago.com](http://www.mateasantiago.com)  
Email: [mateasantaigo@math.arizona.edu](mailto:mateasantaigo@math.arizona.edu)

## ACADEMIC POSITIONS

**The University of Arizona**, Tucson, AZ  
Postdoctoral Research Associate

Sept 2021 – present

**University of California**, Merced, CA  
Graduate Student Researcher

Aug 2015 – Aug 2021

## EDUCATION

**Ph.D. in Applied Mathematics**  
University of California, Merced, CA

July 2021

**B.S. in Applied Mathematics**  
Sonoma State University, Rohnert Park, CA

May 2015

## TEACHING EXPERIENCE

**The University of Arizona**, Tucson, AZ  
*Instructor of Record*

- Math 119A: Mathematics of Biological Systems: a calculus-based approach
- Math 499: Directed Independent Study
- Math 129: Calculus II

Fall 2022

Spring 2022

Spring 2022

*Assisted Instructor of Record*

- Math 481: Mathematical Modeling of Fluid Flow through and around Organs and Organisms

Fall 2022 & 2021

**University of California**, Merced, CA  
*Instructor of Record*

- Math 21: Calculus I for Physical Sciences and Engineering

Fall 2019

*Teaching Assistant*

- Math 125: Intermediate Differential Equations
- Math 24: Linear Algebra and Differential Equations
- Math 23: Vector Calculus

Fall 2017

Fall 2016 & 2015

Spring 2016

## TEACHING DEVELOPMENT

**The University of Arizona**  
*Participant*

The Center for the Integration of Research, Teaching, and Learning  
Postdoctoral Pathways Program

Fall 2022

- Eight-week online course “An Introduction to Evidence-Based Undergraduate STEM Teaching”
- Co-teaching with a teaching mentor Spring 2023 semester

	<p><i>Instructor</i> Project Adelante - Calculus II</p> <ul style="list-style-type: none"> <li>• A week-long workshop for underrepresented students in STEM</li> <li>• Focus on anti-deficit teaching and inquiry-based learning</li> </ul>	Summer 2022
	<p><b>University of California, Merced</b> <i>Participant</i> Evidence-based Teaching Practices Workshop. Sponsored by the Center for Engaged Teaching and Learning.</p>	Spring 2021
RESEARCH INTERESTS	My research interests are in the area of mathematical modeling and theoretical biology. My work uses computational fluid dynamics and fluid-structure interactions to investigate biological dynamics at the organismal scale.	
RESEARCH EXPERIENCE	<p><b>University of Arizona, Tucson</b> <i>Postdoctoral Research Associate</i> Supervisor: Dr. Laura Miller</p> <ul style="list-style-type: none"> <li>• Utilized and added to open-source academic software IBAMR to run fully three-dimensional numerical simulations of pulsing soft corals and jellyfish swimming.</li> <li>• Developed muscle models to drive organism motion.</li> <li>• Created biologically complex 3D models and finite element meshes for organisms.</li> <li>• Created numerical simulations of airflow past leaves and cacti using academic and industry standard software.</li> <li>• Developed methods to improve experimental flow dye visualization.</li> </ul> <p><b>University of California, Merced</b> <i>Graduate Student Researcher</i> Supervisor: Dr. Shilpa Khatri</p> <ul style="list-style-type: none"> <li>• Extended original immersed boundary code written in MATLAB to model a two-dimensional pulsing soft coral.</li> <li>• Developed novel numerical methods to solve partial differential equations on moving boundaries to model symbiotic photosynthesis.</li> <li>• Extended a dynamical systems approach to quantify fluid mixing.</li> <li>• Added methodology to open-source software IB2d.</li> </ul> <p><b>Lawrence Berkeley National Laboratory</b> <i>Summer Researcher Intern</i> Supervisor: Dr. Johannes Blaschke</p> <ul style="list-style-type: none"> <li>• Worked in CCSE group on the open-source software AMReX.</li> <li>• Contributed numerical method for chemical reaction occurring on fluid-structure interface.</li> </ul>	Sept 2021 – present
		2015 – 2021
		May – July 2019 & 2018

	<p><b>Sonoma State University</b>  <i>McNair Scholar</i>  Supervisor: Dr. Martha Shott</p> <ul style="list-style-type: none"> <li>Created a compartmental ordinary differential equation to model the effect of low-dose Cyclophosphamide on the immune system.</li> </ul>	Jan – May 2015
STUDENTS SUPERVISED	<p><b>The University of Arizona</b>  <i>Undergraduate Research Project</i>  Supervising undergraduate student research project: “Simulating muscle-driven modeling of pulsing corals”</p> <p><i>Undergraduate Research Project</i>  Co-supervising undergraduate student research project: “Kinematics of blue blubber jellyfish swimming”</p> <p><i>Undergraduate Research Project</i>  Supervising undergraduate student research project: “Simulating realistic Cassiopea oral arms in IBFE” Continuation from RTG REU</p> <p><i>Undergraduate Research Project</i>  Mentor for Data-Driven Discovery RTG-REU Summer 2022: Co-supervised two undergraduate research projects</p> <ul style="list-style-type: none"> <li>“Flow Fields Generated by Cassiopea Contractions: The Effect of Oral Arms on Flow Velocimetry”</li> <li>“Using computational fluid dynamics to investigate how changes in cerebrospinal fluid flow in Chiari’s Malformation may lead to hydrocephalus and syringomyelia”</li> </ul> <p><i>Undergraduate Research Project</i>  Supervised undergraduate research project through independent study: “Computational and Experimental Study of Airflow Past Prickly Pears”</p> <p><i>Graduate Student Research Project</i>  Mentored graduate student research: “3D Mixing Around Simulated Pulsing Soft Corals”</p>	<p>Fall 2022</p> <p>Fall 2022</p> <p>Fall 2022</p> <p>Summer 2022</p> <p>Spring 2022</p> <p>Fall 2021 – present</p>
PEER-REVIEWED PUBLICATIONS	<p><b>M. Santiago</b>, K. A. Mitchell, and S. Khatri, “Numerical method for modeling photosynthesis of symbiotic algae on pulsing soft corals.” <i>Phys. Rev. Fluids</i>. 7(3). 2022. Editor’s suggestion.</p> <p><b>M. Santiago</b>, N. Battista, L. A. Miller, S. Khatri, “Passive concentration dynamics incorporated into the library IB2d, a two-dimensional implementation of the immersed boundary method.” <i>Bioinspir. Biomim.</i> 17(3). 2022.</p>	

## PRESENTATIONS

Poster: *3D Simulations of Chemical Concentrations Around Pulsing Soft Corals*. Microscale Ocean Biophysics 6.0, Mallorca, Spain. May 23, 2022.

Talk: *Simulations of Chemical Concentration around Pulsing Soft Corals*. Fifth International Cassiopea Workshop, Key Largo, Florida. May 2, 2022.

Invited speaker: *Fluid flow and photosynthesis modeling to quantify mixing around pulsing soft corals*. SIAM Minisymposium on Advances in Mathematical Biology, Joint Mathematics Meeting, Virtual. April 7, 2022.

Talk: *Using IB2d to simulate chemical concentrations and heat transfer around marine organisms*. Ocean Sciences Meeting, Virtual. March 3, 2022.

Talk: *Numerical Simulations of Pulsing Soft Corals and the Photosynthesis of their Symbiotic Algae*. APS Division of Fluid Dynamics. Phoenix, Arizona. Nov 21, 2021.

Poster: *Pulsing and Photosynthesis: Numerical Simulations of Soft Corals*. 2021 SIAM Annual Meeting. Virtual. July 19, 2021.

Talk: *Soft Corals: Pulsing, Mixing, and Photosynthesis*. 2021 Society of Mathematical Biology Annual Meeting. Virtual. June 15, 2021.

Talk: *Quantifying Mixing Around Pulsing Soft Corals*. 73rd Annual APS Division of Fluid Dynamics Meeting. Virtual. Nov 24, 2020.

Talk: *Chemical Interactions around Pulsing Soft Corals*. 72nd Annual APS Division of Fluid Dynamics Meeting. Seattle, Washington. Nov 24, 2019.

Poster: *Modeling the Chemistry and Hydrodynamics of Micro-Swimmers*. SIAM CSE 2019. Spokane, Washington. Partial funding through the Broader Engagement Program through the Sustainable Horizons Institute. Feb 27, 2019.

Poster: *Modeling Chemical Concentrations Around Pulsing Soft Corals*. Microscale Ocean Biophysics. Whistler, Canada. Jan 12, 2019.

Poster: *Numerical Simulations of Pulsing Soft Corals*. Yosemite Fluids Meeting. Yosemite National Park. Sept 15, 2018.

Talk: *Simulations of Pulsing Soft Corals*. Sonoma State Math Colloquium. Sonoma State University. Rohnert Park, California. April 18, 2017.

LEADERSHIP,  
SERVICE, AND  
TRAINING**The University of Arizona***Vice President*

Aug 2022 – present

Departmental Postdoctoral Governance

*Social Coordinator*

Sept 2021 – present

Departmental Postdoctoral Governance

*Session Chair and Panelist*

Jan 2020

Nebraska Conference for Undergraduate Women in Mathematics

	<b>University of California, Merced</b> <i>Graduate Peer Mentor</i>	Sept 2017 – May 2021
	Provided support and mentorship to first-year Ph.D. students in the Applied Mathematics department.	
HONORS AND AWARDS	Association for Women in Mathematics-SIAM Poster Prize	July 2021
	Graduate Dean's Dissertation Fellowship	May – Aug 2021
	NSF Research and Training Grant Graduate Student Award	Aug 2020 – May 2021
	McNair Scholar	Jan – May 2015
PROFESSIONAL AFFILIATIONS	Society for Industrial and Applied Mathematics (SIAM) <i>Member</i>	2019 – Present
	American Physical Society (APS) <i>Member</i>	2018 – Present
	Women in STEM (W-STEM), University of California, Merced Chapter (SIAM) <i>Treasurer &amp; Member</i>	2018
SKILLS	<b>Programming:</b> MATLAB, C++, FORTRAN, Python, R <b>Software:</b> NSYS, Autodesk Fusion 360, Meshmixer, Coreform Cubit, Autodesk Recap, Linux, Vim, Git, L <sup>A</sup> T <sub>E</sub> X, VisIt <b>Experimental:</b> Photogrammetry, 3D printing, Dye-visualization	