Jeremy Orosco

jrorosco@ucsd.edu
www.jeremyorosco.info

CITIZENSHIP   U.S. Citizen

EDUCATION /   **University of California San Diego**
ACADEMIA   *Postdoctoral Scholar*   July 2019–July 2022
PI: James Friend
  - UC President's Postdoctoral Fellowship (2020–2022)
  - W. M. Keck Foundation Grant (2019–2020)
  - Research areas:

    - macroscopic theory of micro-scale, ultrasonic (MHz+) atomization

    - capillary wave turbulence

    - nozzle-free micro-scale droplet generation and control

    - large amplitude acoustically-driven internal and boundary flows

    - ultrasonic modulation of *in vivo* cell signaling

University of California San Diego
Ph.D. Mechanical Engineering   2019
  - UC President's Dissertation Year Fellowship (2018–2019)
  - San Diego Fellowship (2014–2018)
  - Graduate Student of the Year
  - Interests and expertise:

    - applied math, control and stability, identification and estimation, nonlinear/nonconvex optimization, fluid mechanical systems, condensed matter systems, radiative mechanics

    - generalized differential models for anomalous spectroscopic dispersion

    - generalized frequency-domain analysis for emergent nonlocal dynamics in many-body systems

    - predictive analytics with machine learning models / feature engineering

University of California San Diego
M.S. Mechanical Engineering   2016
  - San Diego Fellowship (2014–2018)
  - Courses (GPA: **3.88**):

    - MAE 280 A/B: Linear Systems and Control

    - MAE 288 A: Optimal Control

    - MAE 283 A: Open-loop System Identification

    - MAE 283 B: Closed-loop System Identification and Approximate Control

    - MAE 284: Robust and Multivariable Control

    - MATH 271 A/B/C: Nonlinear Optimization (UC/EQC/IEQC)

    - MAE 210 A/B/C: Fluid Mechanics and Hydrodynamic Stability

    - MAE 208: Engineering Mathematics

University of California San Diego

B.S. Mechanical Engineering 2014
  - Provost Honors, Warren College Honor Society
  - Selected Courses:

    - MAE 143 A/B/C: Signals, CT/DT Control Systems

    - MAE 144: Embedded Control and Robotics

    - MATH 120 A: Complex Analysis

MiraCosta Community College

A.A. Pre-Engineering 2011
  - Medal of Honor Scholarship
  - President's List, President's Permanent Honor Roll
  - President, Phi Theta Kappa Honor Society
  - All California Academic Team

EMPLOYMENT **Researcher / Project Lead** July 2019–Present

Medically Advanced Devices Laboratory, University of California San Diego
  - Led the atomization research and development subgroup
  - Managed timelines/deliverables for various project grants
  - Primary theoretician: advised group members on problems of theory and modeling
  - Researcher: designed experiments, designed and fabricated devices, conducted experiments, performed detailed analysis and modeling using experimental data, authored journal papers

Engineering Instructor July 2022–Present

Mechanical and Aerospace Engineering Department, University of California San Diego
  - Instructor of record for undergraduate engineering courses:
    - MAE 40: Linear Circuits
    - MAE 150: Computational Methods for [Engineering] Design

Researcher July 2014–July 2019

Coimbra Energy Group, University of California San Diego
  - Developed radiative mechanics models for industrial applications
  - Developed/implemented machine learning models and novel feature sets for solar power forecasting
  - Designed and built portable solar-powered weather sensing station
  - First-authored eight journal articles

Controls Engineer (intern) June 2016–December 2016

Cymer / ASML
  - Individually undertaken project to research, design, and implement automation upgrades to existing experimental apparatus.
  - Machine vision driven feedback loop based on observation of a modulated hydrodynamic instability and multi-stage actuation of an imaging assembly.
  - Applied technical skillsets based on project deliverables:
    - mechanical design (5%)
    - software/hardware high- and low-level interfacing (15%)
    - hydrodynamics and hydrodynamic instabilities (15%)
    - control theory (25%)
    - machine vision (40%)

PUBLICATIONS **Orosco, J.**, Connacher, W., Nguyen, K. and Friend, J.: Microscopic Rogue Waves. (in preparation)

Orosco, J., Connacher W., and Friend, J.: Identification of weakly- to strongly-turbulent three-wave processes in a micro-scale system. Chaos, Solitons & Fractals (2023) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Finite memory nonlocal features for solar power forecasting. (in preparation)

Orosco, J. and Friend, J.: Unveiling the Burgers-Riccati physics of fast acoustic streaming. (submitted, preprint) **arXiv** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Generalization of Varshni's relation for direct estimation of the Bloch-Grüneisen intrinsic parametric resistivity. (under review)

Orosco, J. and Zhang, S. and Friend, J.: Closed-form solution for ultrasonically-driven bulk jet streaming. (in preparation)

Zhang S., **Orosco, J.**, and Friend, J.: Onset of visible capillary waves from high-frequency acoustic excitation. Langmuir (2023) **doi** - **arXiv**

Orosco, J. and Friend, J.: Modeling fast acoustic streaming: steady state and transient flow solutions. Physical Review E (2022) **doi** - **pdf**

Vasan, A., **Orosco, J.**, *et al.*: Ultrasound mediated cellular deflection results in cellular depolarization. Advanced Science (2021) **doi** - **pdf**

Connacher, W., **Orosco, J.**, and Friend, J.: Droplet ejection at controlled angles via acoustofluidic jetting. Physical Review Letters (2020) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Temperature-dependent infrared optical and radiative properties of platinum. International Journal of Heat and Mass Transfer (2019) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Temperature-dependent carrier transport: Low-complexity model for the infrared optical and radiative properties of nickel. Journal of Applied Physics (2019) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Anomalous carrier transport model for broadband infrared absorption in metals. Physical Review B (2018) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Variable order modeling of nonlocal emergence in many-body systems: Application to radiative dispersion. Physical Review E (2018) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: On a causal dispersion model for the optical properties of metals. Applied Optics (2018) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: Optical response of thin amorphous films to infrared radiation. Physical Review B (2018) **doi** - **pdf**

Orosco, J. and Coimbra, C. F. M.: On the control and stability of variable-order mechanical systems. Nonlinear Dynamics (2016) **doi** - **pdf**

CONFERENCES Orosco, J., Connacher, W., Nguyen, K., and Friend, J.: Microscopic rogue waves in strongly nonlinear capillary wave turbulence. 183rd Meeting of the Acoustical Society of America (2022) **doi**

Orosco, J., Connacher, W., Nguyen, K., and Friend, J.: Strong microscopic capillary wave turbulence: Lévy flights and rogue waves. 75th Meeting of the APS Division of Fluid Dynamics (2022) **site**

Orosco, J. and Friend, J.: Scale-partitioned differential modeling of large-amplitude acoustic streaming. 181st Meeting of the Acoustical Society of America (2021) **doi**

Orosco, J. and Friend, J.: Observation of variable-order Lévy statistics in atomizing microscale capillary wave dynamics. Virtual presentation. 181st Meeting of the Acoustical Society of America (2021) **doi**

Orosco, J. and Friend, J.: Multiscale differential analysis and modeling of one-dimensional fast acoustic streaming. Virtual presentation. APS March Meeting (2021)

Orosco, J. and Friend, J.: Spatiotemporal differential partitioning for one-dimensional fast acoustic streaming. Presentation. 179th Meeting of the Acoustical Society of America (2020) **doi**

Orosco, J. and Coimbra, C. F. M.: Thermophysical model for the infrared emissivity of metals. Paper and presentation. AIAA SciTech Forum (2019) **doi - pdf**

Orosco, J. and Coimbra, C. F. M.: Causal Models for Gauss-Lorentz Response of Solid Media to Radiative Excitation. Poster session. ASME MEED Conference (2018) **pdf**

MANUSCRIPT REVIEW	**Elsevier's Energy**	2014–Present
	Springer's Nonlinear Dynamics	2016–Present
	Elsevier's Chaos, Solitons & Fractals	2016–Present
	Springer's Journal of Scientific Computing	2016–Present
	AIP's Physics of Fluids	2017–Present
	Elsevier's Solar Energy	2018–Present
	Optica's Applied Optics	2018–Present
	Elsevier's International Journal of Non-Linear Mechanics	2018–Present
	Optica's Journal of the Optical Society of America A	2020–Present
	Optica's Optics Letters	2020–Present
	Elsevier's Communications in Nonlinear Science and Numerical Simulation	2020–Present
	Elsevier's Sensors and Actuators A: Physical	2021–Present
	Optica's Optics Express	2021–Present
	AIP's The Journal of the Acoustical Society of America	2021–Present
	AIP's Applied Physics Letters	2021–Present

PROFESSIONAL MEMBERSHIPS	**The American Institute of Aeronautics and Astronautics (AIAA)**	2018–Present
	American Society of Mechanical Engineers (ASME)	2017–Present
	Optica (formerly OSA)	2018–Present
	Society of Industrial and Applied Mathematics (SIAM)	2017–Present
	American Physical Society (APS)	2020–Present
	Acoustical Society of America (ASA)	2020–Present

SELECTED PROJECTS

Solar Power Variability Management (CEC grant EPC-14-008)
- California Valley Solar Ranch (250MW, PV)
    - State of the art machine learning models for power output forecasts
    - Novel memory-based feature sets engineered using cutting-edge mathematics
- Ivanpah Solar Electric Generating System (392MW, CSP)
    - MISO identification-based model of large-scale solar power plant dynamics
    - Determination of spurious plant operation behaviors based on pre- and post-modeling analysis

Self-balancing Robot - MIP
- Individual capstone controls project
- Digital implementation of continuous time modeling and control design

Fly Righting Response Experimentation Device - Fly2R
  - Team capstone mechanical design project
  - Developed for UCSD's Pharmacology Department for use with experimentation
  - Received Departmental Best Project Award

Portable Solar Powered Sensing Station - get(Sol)
  - Individual research-based design project
  - Self-sustaining/monitoring sensing station, internal web/data management
  - 6+ month uninterrupted runtime (unplugged, zero maintenance)

AWARDS AND DISTINCTIONS	**UC President's Postdoctoral Fellowship**	2020–2022

UC President's Postdoctoral Fellowship — 2020–2022
  - 2-Year scholarship: tuition, stipend, and tenure track UC hiring incentive

UC President's Dissertation Year Fellowship — 2018–2019
  - 1-Year scholarship: tuition and stipend

San Diego Fellowship — 2014–2018
  - 4-Year scholarship: tuition and stipend

MAE Department Graduate Student of the Year — Spring 2019

MAE Department Best Project: Fly2R — Spring 2014

UCSD Alumni Leadership Scholar — July 2012

Coca-Cola Scholar — March 2010

MiraCosta College Medal of Honor Scholar — Apr 2010

MiraCosta College Foundation Scholar — June 2010

MENTORSHIP

Kha Nguyen, MADLab
  - Ph.D. student in Mechanical Engineering at UCSD
  - coauthoring forthcoming publication

William Connacher, MADLab
  - Ph.D. completed in Materials Science at UCSD
  - coauthored multiple publications

Shuai Zhang, MADLab
  - Ph.D. completed in Mechanical Engineering at UCSD
  - coauthoring forthcoming publication

Anthony Nguyen, MAP
  - high school outreach research project, Summer 2018
  - accepted to and enrolled in UCSD's aerospace engineering major
  - current contributing member of Coimbra Research Group

Jamiree Harrison, UC LEADS
  - undergraduate research project, Summer 2017
  - Ph.D. student at UCSB

Marcel Louis, STARS
  - undergraduate research project, Summer 2015
  - Ph.D. student

Mackenzie Cottle
  - high school outreach research project, Summer 2014
  - currently enrolled in UCSD's mechanical engineering major

TECHNICAL SKILLSETS

Programming
  - Syntax: Python, Matlab, R, Mathematica, C/C++, Git/SVN, LaTeX, Bibtex
  - Environment: *nix, Windows
  - Frameworks: XGBoost, SKLearn, Pandas, CVXPY, FEniCS, Dedalus

Cleanroom Fabrication
 - Photolithography
 - Deposition
 - Wafer cleaning, spincoating, etc.

Experimental Equipment and Methods
 - Laser Doppler vibrometer
 - Test equipment (scopes, amps, generators)
 - Digital holographic microscope
 - Particle image velocimetry

Data Science
 - Data quality assessment
 - Feature engineering
 - Learned regressive models
 - Time series analysis

Design and Simulation
 - Eagle PCB, Inventor and Autocad, SolidWorks

Circuits and Electronics
 - PCB (SMD) prototyping and design, SMD hand-soldering
 - Signal conditioning, sensing, actuation
 - μC: BeagleBone, Arduino, Raspberry Pi

Rapid Prototyping
 - Machining, lasercamm

Graphical Design
 - Adobe Photoshop and Illustrator