Mark De La Cruz Bartolo

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Summary

- PhD Candidate in materials and biomaterials science and engineering with a focus on **nanoparticle self-assembly** in **soft matter** research and strong interests in data science tools and methodologies
- Materials research
    - Chemical synthesis,
    - electrical, spectral and electron microscopy characterization, and
    - experimental design and implementation
- Strengths in analytical and technical communication, collaboration, and teamwork to accomplish objectives

Education

2015-Present **Ph.D.**, Materials and biomaterials science and engineering, University of California Merced
GPA: 3.74

2015 **BS**, Applied Physics with Concentration in Applied Electronics, California State University San Marcos
GPA (last 60 units): 3.534

2013-Present Independent Learning through Udemy, SuperDataScience, DataCamp
- Statistics for Business Analytics and Data Science A-Z
- SQL Fundamentals, Intermediate, Joining Data
- Intermediate Python, Data Science Tools
- Machine Learning A-Z (In Progress)

Research Experience

2015-Present **Graduate student research assistant in materials science at University of California Merced**
PI: Sayantani Ghosh PhD
Explored self-assembly in soft matter, materials science, data science, and major principles of biochemistry
Research concentration: Develop applications in drug delivery, tissue engineering, material platforms for light matter interactions, and sensing

Project Management
- Oversaw project lifetime as resulted from 2 publications
- Built laser optics system for spectral data acquisition with optical equipment for 4 spectroscopic experimental setups for 5 projects
    - Photoluminescence
    - Time correlated photoluminescence

    - Scanning photoluminescence
    - Magneto-optical Kerr Effect (Polar)
- Planned and executed experimental design for a major project that fostered 3 cross functional collaborations

Information Management

- Authored and edited materials and process specifications for 5 projects
- Documented analysis, recommendations, implemented solutions, plans, and presentations reflecting status and results of projects in progress on a weekly basis providing 140+ reports
- Parsed, analyzed, and mapped data with MATLAB scripts resulting in 360 2D mapped data

Innovation

- Integrated automated data acquisition via AutoHotkey script saving 6+ hours of time
- Cultivated cross functional collaborations in surface material development for nanoparticle functionalization resulting in 1 protocol for the self-assembly of micro-shell platform
- Troubleshooted and adjusted optical experimental setups for more than 50% improved signal acquisition
- Programmed, tested, and assessed micron precisions optical translation stages and spectrometer for actuation & data acquisition using LabVIEW resulting in 100k+ points of data

Communication

- Conveyed work through presentations at 10 events and briefed course materials to 240 students
- Mentored interdisciplinary team of undergraduate and graduate students with defined procedures and processes accomplishing 4 objectives
- Demonstrated module of surface area to volume ratios co-developed in a high school development workshop to 120 students

2013-2015 **Undergraduate Student Research Assistant in physics and chemistry at California State University San Marcos**

PI: Stephen Tsui PhD

Co-PI: Eric Reinheimer PhD

Explored inorganic & organic chemical synthesis, computer science, embedded systems programming, and mathematics

Applied Research Methods

- Synthesized organic crystals based on tetrathiafulvalene and measured resistivity versus temperature
    - Used automated data acquisition with LabVIEW

- Communicated with a temperature controller and SR850 Digital Signal Processing Lock-In Amplifier
- Superconductor pellet synthesis of $YBa_2Cu_3O_{7-g}$ (YCBO)
- Basic LabView Programming

Communication and Leadership

- Mentored Office for Training, Research and Education in the Sciences (OTRES) Scholar during Summer 2014
- Conveyed work through presentations at meetings and 3 events

Embedded Systems Programming

- Interfacing with AVR microcontroller to program a omnidirectional wheel robot that avoids objects via 2 infrared sensors
- Object oriented programming in C/C++ • Read, Design, Implement, Test, and Correct programs • Data structure using linked list using pointers, recursion, stack, queue, and trees

Summer 2013 Summer Research Experience for Undergraduates (REU) program for characterization of advanced materials at Washington State University
PI: Soumik Banerjee PhD

- Computational modeling and analysis of a binary system of the photoactive layer of organic photovoltaic cells by utilizing a standard computational model via GROMACS
- Determined a suitable donor molecule for organic photovoltaic cells

Teaching Experience

- Lead undergraduate discussion & lab sections, exam proctoring, and office hours as a teaching assistant
- Physics 08: Introductory Physics I (Mechanics)
- Physics 09: Introductory Physics II (Electricity and Magnetism)
- Physics 19: Physics II – Bio Majors

Awards and Honors

2020 Spring 2020 NSF-Crest Center for Cellular and Bio-Molecular Machines (CCBM) Fellowship

2019 Fall 2019 NSF-Crest Center for Cellular and Bio-Molecular Machines (CCBM) Fellowship

2019 Summer 2019 Summer Materials and Biomaterials Science and Engineering (MBSE) Bobcat Fellowship

2017 March 2017 Merced nAnomaterials Center for Energy and Sensing (MACES) Summer Research Fellowship

2016 August NSF-Crest Center for Cellular and Bio-Molecular Machines (CCBM) Scholar

2016 April	2016 Merced Nanomaterials Center for Energy and Sensing (MACES) Summer Research Fellowship
2015 Sept	Graduate Dean's Relocation Award
2014-2015	Sigma Pi Sigma Physics Honor Society
2014-2015	Louis Stokes Alliance for Minority Participation (LSAMP) – Program for Recognition Undergraduate Distinction (PROUD) Research Award
2013-2015	Maximizing Access to Research Careers (MARC), Award recipient [T34]
2013-2015	CSUSM Dean's List, College of Sciences and Mathematics
2013-2015	Louis Stokes Alliance for Minority Participation (LSAMP) Scholar recipient

Peer Reviewed Publications

Google Scholar link

Mark Bartolo, Ryan Brisbin, James C. Fettinger, Sayantani Ghosh, Ryan Baxter, *Impact of Bis(imino)pyridine Ligands on Mesoscale Properties of CdSe/ZnS Quantum Dots.* J. Phys. Chem. C, 124, 41, 22677-22683, 2020

Mark Bartolo, Jose Amaral, Linda. S. Hirst, and Sayantani Ghosh, *Directed assembly of magnetic and semiconducting nanoparticles with tunable and synergistic functionality,* Scientific Reports, 9 15785, 2019

Dylan Kimball, Raechel Munns, Steven P. Fischer, **Mark Bartolo**, Jose Valdez, Simmon J. Teat, Stephen Tsui, Eric W. Reinheime, *Utilizing Perylene in New Organic Donor-Acceptor Materials: Highlighting the Synthesis, Structure and Physical Properties of Perylene-pDNB and Perylene-TCNP,* Journal of Chemical Crystallography, vol 45 (4) p. 169-177, 2015

S. P. Fisher, S. C. Keene, **M. Bartolo**, S. Tsui, and E. Reinheimer, *Identification and Analysis of a New Organic Donor-Acceptor Material: Synthesis, Structure, Spectroscopy and Transport Properties of the 2:1 Complex o-Me_2TTF-pDNB,* Journal of Chemical Crystallography vol. 44 (5) p. 261-268, 2014

Technical Seminars and Workshops

Mark Bartolo, Ryan Brisbin, Sayatani Ghosh, Ryan Baxter, Tuning nano-assembled shell sizes with BIP ligands, External Advisory Board Virtual Presentation, UC Merced, CA, September 2020

Mark Bartolo, Ryan Brisbin, Sayantani Ghosh, Ryan Baxter, Discovery of ligand controlled self-assembling nano-shells, Oral Presentation, CSU Stanislaus, Turlock, CA, February 2020

Mark Bartolo, Randy Espinoza, Jussi Amaral, Sayantani Ghosh, *Optimizing parameters in co-assembly of magnetic and semiconducting nanoparticles templated by iquid crystal phase transition,* Oral Presentation, American Physical Society, Los Angeles, CA, March 2018

Mark Bartolo, Randy Espinoza, Jussi Amaral, Sayantani Ghosh, *Nano-assembled synergistic magneto-optical sensors,* Oral Presentation, American Physical Society – Far West, Merced, CA, 2017

Light/matter interactions at the nano-bio interface, University of Illinois at Urbana-Champaign, Fall 2016, Workshop

Mark Bartolo, Randy Espinoza, Jussi Amaral, Sayantani Ghosh, *Tuning the synergistic functionality of semiconducting and magnetic nanoparticle co-assemblies*, Oral Presentation, American Physical Society, New Orleans, LA, March 2017

Mark Bartolo, S. Tsui, E. Reinheimer, *Synthesis and Characterization of Tetrathiafulvalene Derivatives*. Poster Presentation, American Physical Society, San Antonio, TX, March 2015

Mark Bartolo, S. Tsui, E. Reinheimer, *IR Spectrum and Electrical Transport Characterization of DMDT-TCNB.* Oral Presentation at the Symposium on Student Research, Creative Activities & Innovation CSUSM, San Marcos, CA February 2015

Mark Bartolo, S. Tsui, E. Reinheimer, *Characterization and Comparison of DMTTF-pDNB and DMTTF-TCNQ*. Oral Presentation at the Symposium on Student Research, Creative Activities & Innovation CSUSM, San Marcos, CA 2014

Mark Bartolo, S.M. Mortuza, and Soumik Banerjee, *Modeling Donor-Acceptor Copolymers Used in the Photoactive Layer of Organic Photovoltaic Cells*, Oral Presentations at the UCSD Summer Research Conference, University of California San Diego; CSUSM Frontiers of Science; Invitation by Office for Training Research and Education in the Sciences CSUSM San Marcos, CA August 2013

S. M. Mortuza, C. Cisneros, **M. Bartolo**, and S. Banerjee, *Molecular modeling of nanoparticles and conjugated polymers during synthesis of photoactive layers of organic photovoltaic solar cells*, Oral Presentation at the Proceedings of AlChE Annual Meeting, San Francisco, August CA 2013

Mark Bartolo, S.M. Mortuza, Soumik Banerjee, *Modeling Donor-Acceptor Copolymers Used in the Photoactive Layer of Organic Photovoltaic Cells*, Summer Research Poster Presentation, Washington State University, Pullman, WA August 2013

Community Involvement

2020 February oral presentation seminar for CCBM & MACES outreach at CSU Stanislaus
2019 February Student Poster presentation for MBSE graduate student visitation week
2018 October CCBM Poster Presentation at Annual open house and advisory board meeting
2018 Yosemite National Park Face Lift
2018 Volunteer at Merced County Special Olympics
2017 CCBM Outreach event for Burbank/Peterson Elementary Schools
- Escort and helium demo

2016 Buhach Colony High School Nanoscience Module with Merced nAnomaterials Center of Energy and Sensing (MACES)

- Lectured topic of surface area to volume ratios
- Led alka seltzer experiment

2016 High School Curriculum Development Workshop
- Development of classroom modules to be included in high school classrooms

2015 Peterson Elementary Kindergarteners Merced Campus Visit
- Demonstration of the difference between light and lasers

2015 Summer Research Training Program (SRTP), San Marcos, CA
- Termite wrangler
- Poster presentation moderator
- SRTP student supervisor of physics and chemistry based projects
- Senior scholar representative

2015 Super STEM Saturday Volunteer, San Marcos, CA
- Presented the amount of sugars in the common beverages that society drinks and what their effects have on adults versus children
- Demonstrated mechanical power and electromagnetism, electrostatics, and inertia

2014 Super STEM Saturday Volunteer, San Marcos, CA
- Demonstrated the autonomous activity of low level programming of microcontrollers.

2013 Annual Robotics Expo Volunteer; CSUSM Physics Department, San Marcos California
- Demonstrated robots that were programmed and interfaced at the hardware layer.

Skills/Techniques/Software

- Statistics
- Python | SQL | C/C++
- Machine Learning
- Data Analysis
- Detailed Design
- Implementation
- Illustrator & Premiere Pro
- Photoshop
- Microsoft Office 365
- Excel Pivot Tables
- HTML5 & CSS
- Image Analysis (FIJI/ImageJ)
- Optics
- Optical & electron microscopy
- AutoCAD | SolidWorks
- Electronics
- LabVIEW | MATLAB

Relevant Software Skills

MS Office Suite; C/ C++; LabVIEW; SolidWorks; AutoCAD; MasterCAM;

Relevant Hardware Skills

Analog Circuit Analysis and Troubleshooting; SR850 lock-in amplifier; Janis ST-100 cryostat

Membership of Professional Organizations

Association for Computing Machinery (ACM)
American Society of Mechanical Engineers (ASME)
American Physical Society (APS)
Society of Physics Students (SPS)

Society for Advancement of Hispanics/Chicanos and Native Americans in Science (SACNAS)
SuperDataScience | DataScienceGo
DataCamp

Relevant Course Work

Solid State Physics
Physical Chemistry
Inorganic Chemistry
Quantum Mechanics
BMSE: Nucleic Acids
Quantitative Chemistry
Computing & Modeling
Organic Chemistry I & II
Basic Discrete Mathematics
Applied Solid State Physics
Analog & Digital Electronics
Bioethics and Medical Ethics
Introductory Computer Science
Responsible Conduct in Research
Computer Interfacing and Control
Mathematical Methods for Physics
Assembly Language and Digital Circuits
Statistical Mechanics & Thermodynamics
Imaging and Spectroscopy for Interdisciplinary Biophysical Sciences, Biomaterials and Biotechnology