

**Cody A. Gonzalez**  
 cag46@psu.edu  
 Department of Materials Science and Engineering  
 Pennsylvania State University

---

### Education

Ph.D. in Mechanical Engineering, **Pennsylvania State University** **Graduating December 2021**

Ph.D. Dissertation: “*Analytical Modeling and Design Optimization of Lithium Ion Battery Smart Actuators*”

Advisors: Mary Frecker, Ph.D., Department of Mechanical Engineering, Pennsylvania State University

Chris Rahn, Ph.D., Department of Mechanical Engineering, Pennsylvania State University

Committee Members:

Donghai Wang, Ph.D., Department of Mechanical Engineering, Pennsylvania State University

George Lesieutre, Ph.D., Department of Aerospace Engineering, Pennsylvania State University

M.S. in Mechanical Engineering, **Pennsylvania State University** August 2021

B.S. in Mechanical Engineering, **University of California, Riverside** June 2016

UCR Senior Honors Thesis: “*Investigation of The Cobalt Distribution in the Room Temperature Ferromagnetic Nanocomposite TiO<sub>2</sub>-CO Thin Films*”

Advisor: Sandeep Kumar, Ph.D., Department of Mechanical Engineering, University of California, Riverside

**A.S., A.A., Riverside City College (RCC)** June 2013

A.S. Math and Science; A.A. Humanities, Arts, and Philosophy

### Research

Priya Lab (PSU) 2021-2022

Postdoctoral Scholar under Dr. Shashank Priya

- Investigating the wireless energy transfer for recharging of Unmanned Aerial Systems (UAS) to extend flight duration and enable more successful scouting missions.
- Directing a multidisciplinary team of two graduate students and two researchers in industry to investigate multi-energy harvesters composed of solar, magnetic, and piezoelectric energy harvesters for wireless energy recharging.

Engineering Design and Optimization Lab & Mechatronics Research Lab (PSU) 2017-2021

Graduate Research Assistant under Dr. Mary Frecker and Dr. Christopher Rahn

- Modeling and simulation of actuator metrics such as free deflection and actuator energy to improve design of actuators for upwards of **10-20% improved actuator energy** for less volume of actuator material.
- Modeling, designing, fabricating and testing Li-ion cells with Si composite structures for harnessing of a Si-anode base lithium ion battery as an actuator with upwards of **1,000% more theoretical capacity** than commercial graphite anodes for improved battery performance.

Rotation in Interfacial Phenomena Lab (IPHEL), Penn State 2017

PhD Student under Dr. Bladimir Ramos Alvarado

- Intermolecular Modeling of Graphite and Si (100) in LAMMPS

- Rotation in Energy Nanostructure Research Group, Penn State 2017  
PhD Student under Dr. Donghai Wang
- Fabrication and Testing of Lithium Ion Battery Coin Cells
- Rotation in Terrones Research Group, Penn State 2016  
PhD Student under Dr. Mauricio Terrones
- Synthesis of 2D material (MoS<sub>2</sub>) using Chemical Vapor Deposition
- Goddard Space Flight Center (NASA) Intern Researcher 2015  
Intern Researcher under Manuel Balvin
- Performing microfabrication of MEMS Devices for In-Situ Missions to Solar System Primitive Bodies to enable sample capture and analysis.
- Multi-Physics Laboratory, University of California, Riverside 2014-2016  
Undergraduate Researcher under Dr. Sandeep Kumar
- Investigating of the cobalt distribution in the room temperature ferromagnetic nanocomposite TiO<sub>2</sub>-Co thin films
  - NSF funded research on *In Situ* TEM Observation of the Electrochemical Lithiation of Silicon Thin Films
- UCR Environmental Particle Fate and Transport Laboratory 2013-2014  
Undergraduate Researcher under Dr. Sharon Walker
- Began under **USDA** funded Building Bridges Grant from RCC to UCR with research on *Escherichia coli* and *Salmonella pullorum* Adherence to *Spinacia oleracea* Leaves

### **Teaching**

- OL 2050: Essentials of Online Teaching for Graduate Students Fall 2021  
Attending a class to earn a certificate on effective online teaching.
- Workshop: Planning a class session 09/14/2021  
Interactive workshop presented by Chas Brea and John Elia of the Schreyer Institute for Teaching Excellence
- Workshop: Handling Hot Moments in the Classroom 09/15/2021  
Interactive workshop presented by Kris McLain and Beate Brunow of the Schreyer Institute for Teaching Excellence

### **Peer-Reviewed Publications**

- Gonzalez, C., Shan, S., Frecker, M., & Rahn, C. (2021).** Design optimization of a 2D lithium-ion battery actuator for shapeshifting biomedical device applications. *Journal of Intelligent Material Systems and Structures*. In preparation.
- Gonzalez, C., Shan, S., Frecker, M., & Rahn, C. (2021).** Generic analytical modeling of a multilayer, multimorph lithium-ion battery actuator. *Journal of Intelligent Material Systems and Structures*. Submitted.
- Gonzalez, C., Ma, J., Frecker, M., & Rahn, C. (2021).** Analytical modeling and simulation of a multifunctional segmented lithium ion battery unimorph actuator. *Smart Materials and Structures*, 30(1), 015039. <https://doi.org/10.1088/1361-665X/abc7fb>

Ma, J., **Gonzalez, C.**, Huang, Q., Farese, J., Rahn, C., Frecker, M., and Wang, D., (2020). “Multifunctional Li(Ni 0.5 Co 0.2 Mn 0.3 ) O 2 -Si Batteries with Self-Actuation and Self-Sensing,” *J. Intell. Mater. Syst. Struct.*, 31(6), pp. 860–868.

**Gonzalez, C.**, Kumar, S. (2016). Fabrication and Optical Microscopy Observation of the Electrochemical Lithiation of Polysilicon Thin Films. *UCR Undergraduate Research Journal*

### **Peer-Reviewed Conference Papers**

\*Presenting Author

**Gonzalez, C.\***, Shan, S., Frecker, M., & Rahn, C. (2021, September 15). 1D Shape Matching of a Lithium-Ion Battery Actuator. *ASME 2021 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*. Accepted.

Shan, S.\*, **Gonzalez, C.**, Frecker, M., & Rahn, C. (2021). Experimental Study of NCM-Si Batteries with Bimorph Actuation. *ASME 2021 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*. Accepted.

**Gonzalez, C.\***, Shan, S., Frecker, M., & Rahn, C. (2020, September 15). Analytical Modeling of a Segmented Bimorph Lithium Ion Battery Actuator. *ASME 2020 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*. <https://doi.org/10.1115/SMASIS2020-2328>

**Gonzalez, C.\***, Ma, J., Frecker, M., & Rahn, C. (2019). Analytical modeling and simulation of the blocked force and large deformation of multifunctional segmented Lithium ion battery unimorph actuator. In *ASME 2019 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SMASIS 2019*

**Gonzalez, C.\***, Ma, J., Frecker, M., & Rahn, C. (2018). Analytical Modeling of a Multifunctional Segmented Lithium Ion Battery Unimorph Actuator. In *ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SMASIS 2018* (Vol. 2, p. V002T06A009). <https://doi.org/10.1115/smasis2018-8123>

Ma, J.\*, **Gonzalez, C.**, Rahn, C., Frecker, M., & Wang, D. (2018). Experimental Study of Multifunctional NCM-Si Batteries with Self-Actuation. In *ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SMASIS 2018* (Vol. 1, p. V001T01A009). <https://doi.org/10.1115/smasis2018-8004>

### **Reports, Presentations, and Posters**

- Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS) Conference (2018-2021)
- College of Engineering Research Symposium (2021)
- Industry Exchange Poster PSU (2018)
- Center for Acoustics and Vibration (CAV) Spring Workshop PSU (2018)
- UCR Undergraduate Research Symposium 2015 (Perfect Score and Best Poster), 2016 (Oral Presentation)
- Statewide California Alliance of Minority Participation (CAMP) Symposium 2015 (Honorable Mention), 2016 Honorable Mention
- Investigation of the cobalt distribution in the room temperature ferromagnetic nanocomposite TiO<sub>2</sub>-Co thin films *UCR Undergraduate Honors Capstone Project* (2016)

### Invited Talks

**2021** - “Analytical Modeling of a Segmented Bimorph Lithium Ion Battery Actuator.” Future Leaders in Mechanical and Aerospace Engineering: Celebrating Diversity and Innovation. Virtual. February 10<sup>th</sup>

**2019** - “Analytical Modeling of a Segmented Unimorph Lithium Ion Battery Actuator.” Mechanical and Nuclear Engineering Graduate Research Form of Penn State. The Pennsylvania State University. September 26<sup>th</sup>

### Patents

U.S. Patent Pending 63/119,920, Goyal, N., Zacharia, B., Frecker, M., Hanks, B., Gonzalez, C., Khurana, J. Apparatus to seal the nasal, oral, and ear cavities during sinonasal, skull base, transoral, and otologic surgery (2020)

### Academic Service

#### Multicultural Engineering Graduate Association at PSU (MEGA)

President	2020-2021
Vice-President	2018-2020
Secretary	2017-2018

#### American Society of Mechanical Engineers (ASME)

Member, Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS), student organizers	2021
National Member	2014-Present
President, University of California, Riverside student chapter	2015-2016

### Outreach and Leadership

Advisory group for the Office of Graduates Equity and Educational Programs (OGEEP) (2021)  
Council of College Multicultural Leadership/Advisory Committee for Graduate Education (CCML/ACGE) (2021)

### Fellowships, Awards, and Honors

▪ Outstanding Graduate Student Leader Award	2021
▪ Harry G. Miller Fellowship in Engineering for excellence in research field	2020
▪ ASME SMASIS Best Student Paper Conference	2019
▪ Sloan Scholar, Alfred P. Sloan Foundation’s Minority Ph.D. (MPHD) Program	2019
▪ PSU Bunton-Waller Assistantship; Robert W. Graham Endowed Fellowship	2016
▪ UCR Chancellor’s Research Fellow	2015
▪ ASME John & Else Gracik Scholarship Recipient	2015
▪ Best Poster Presentation UCR Undergraduate Research Symposium	2015
▪ HSI-STEM Grant <b>US Dept. of Education (USDE)</b> ; CAMP Stipend (NSF)	F14, W15, S15
▪ Southern California Edison Sponsored HENAAC Scholarship; HENAAC Scholar	2014

**Reference Contact Information for Cody A. Gonzalez**

**Dr. Mary Frecker** (*Doctoral Research Co-Advisor*)

Head, Department of Mechanical Engineering, Pennsylvania State University

Professor of Mechanical & Biomedical Engineering

Mailing Address:

Pennsylvania State University

326 Leonhard Building

University Park, PA 16802

Phone: 814-865-1617

Email: [mx36@psu.edu](mailto:mx36@psu.edu)

**Dr. Christopher Rahn** (*Doctoral Research Co-Advisor*)

Professor, Mechanical Engineering, Pennsylvania State University

Mailing Address:

Pennsylvania State University

102N Hammond Building/229 Reber Building

University Park, PA 16802

Phone: 814-865-6237

Email: [cdr10@psu.edu](mailto:cdr10@psu.edu)