

## Benjamin Young

Rhode Island College - Clarke Science 102  
600 Mount Pleasant Avenue  
Providence, RI 02908

401.456.9644  
byoung@ric.edu  
bennyyoung.com

## Preparation

Doctor of Philosophy, Physics  
Dissertation: *Electrical and Chemical Properties of Interfacial Zones*  
University of Rhode Island, Kingston RI

August 2014

Bachelors of Arts: Physics and Literature (*magna cum laude*)  
Also completed the secondary education coursework  
Slippery Rock University, Slippery Rock, PA

May 2008

## Teaching Experience

### Rhode Island College (RIC), Providence, RI

PSCI103	Physical Science (lab)
CHEM105*	General, Organic and Biological Chemistry I (lab)
PHYS101*	Physics for Science and Mathematics I (workshop)
PHYS102	Physics for Science and Mathematics II (workshop)
PHYS104	Calculus Applications in Electricity and Magnetism (lecture)
PHYS110*	Introductory Physics (workshop)
PHYS200	Mechanics (workshop)
PHYS201	Electricity & Magnetism (workshop)
PHYS311	Thermodynamics (lecture)
PHYS312	Mathematical Methods in Physics (lecture)
PHYS313	Junior Laboratory (lab)
PHYS403	Classical Mechanics (lecture)
PHYS409	Solid State Physics (lecture)
PHYS413*	Senior Laboratory (lab*)
PHYS450	Topics (lecture & lab)
PHYS491, 492, 493	Independent Study (student research 1-3 credits)

*\*experience with online course development and delivery*

### *Associate Professor of Physics:*

2019-Present

Served as chair of the College Traffic and Parking Committee. Additional service on College Academic Technology Advisory Committee (ATAC) and departmental technology committee during COVID-19 transition into/out of campus wide remote course delivery. Developed fully online courses for asynchronous and hybrid delivery, including a new computational physics course. Mentored four undergraduate student researchers, two of whom are journal co-authors and APS meeting contributed talk presenters.

### *Assistant Professor of Physics (tenure track):*

2015-2019

Added algebra-based introductory courses as well as thermodynamics, classical mechanics, and topics courses in nuclear physics at the advanced level to teaching load. Planned and led implementation of Mathematica requirements in upper-division coursework wrote extensive open-source tutorials with introductory exercises and created a computational physics lab to support that end. Service on dept. curriculum committee and as undergraduate research and honors committee

chair, as well as departmental rep. to the RIC Faculty Council and member of ATAC. Mentored nine additional undergraduate student researchers, one of whom is an APS meeting contributed talk presenter.

*Assistant Professor of Physics (one-year term):*

2014-2015

Teaching calculus-based physics and a general education lab course in workshop format at the introductory level as well as math methods, solid state (first at College), and two advanced laboratory courses at the junior/senior level. Advising, service on RIC Faculty Council, and performing original research with an undergraduate student as non-requisite responsibilities for one-year term.

### **University of Rhode Island (URI), Kingston, RI**

AST108	Introductory Astronomy: Stars & Galaxies (lecture)
AST118	Astronomy: Solar System (lecture)
PHY185	General Physics I (lab)
PHY186	General Physics II (lab)
PHY203/MTH141	Hybrid Elementary Physics I/Calculus I (recitation)
PHY273	Elementary Physics I (lab)
PHY274	Elementary Physics II (lab)
PHY275	Elementary Physics III (lab)

*Co-developer & Graduate Teaching Assistant (TA):*

2011-2014

Development and execution of a pilot program in which introductory physics and calculus courses are collaboratively designed and cooperatively taught featuring Mathematica exercises, interactive computer simulation, and clicker technology. Managed all aspects of combined recitation section for over 50 students per offering and collaborated on course design with faculty.

*Graduate Teaching Assistant*

2010-2014

Ten contact-hours per week supporting algebra and calculus-based general physics lecture and lab courses with typical class sizes of 20 students and astronomy courses with up to 150 students per section. Author revisions and new experiments for lab manuals of four general physics courses.

### **Butler Junior High School (BJHS), Butler, PA**

*Student Instructor, Honors English*

2007

Design and implement content and assessment in local high school in accordance with PA core-curriculum standards. Remediation planning for students with special needs and those identified as core curricula deficient by *No Child Left Behind*.

## **Physics Research Experience**

**URI**

2023-present

Principal Investigator (PI) of National Aeronautics & Space Administration (NASA) EPSCoR subaward to perform basic and applied studies of the allotropic transition and its reversibility in tin under space-like conditions using radioisotope Mössbauer spectroscopy (MS), X-ray photoelectron spectroscopy (XPS), low energy electron diffraction (LEED), and Auger electron spectroscopy (AES) techniques. The work is being hosted in my collaborators' labs on the URI main campus while my lab at RIC is under renovation. One RIC undergraduate student researcher as well as several URI graduate students have been involved so far.

**Advanced Photon Source (APS), Lemont, IL**

2018-2023

PI for Department of Energy (DOE)-sponsored collaboration with researchers at URI and Argonne National Laboratory (ANL) to develop time-resolved synchrotron radiation Mössbauer spectroscopy (TRSRM) as a novel experimental technique to study ultra-fast photon-stimulated processes in various materials, primarily concerned with photochemical and photo-catalytic processes. Included multiple undergraduate researchers in X-ray transient absorption (XTA) and radioisotope MS experiments at URI and in TRSRM measurements at the APS.

**National Synchrotron Light Source (NSLS-II), Upton, NY**

2018-2020

PI for hard X-ray photoelectron spectroscopy (HAXPES) experiments on Li-ion battery materials at new synchrotron on Brookhaven National Lab (BNL) campus. Continuation of previous effort at two other synchrotron facilities.

**Canadian Light Source (CLS), Saskatoon, Saskatchewan, Canada**

2015-2017

Co-lead investigator for HAXPES beamtime proposals and experiments at the CLS, a continuation of DOE battery work suspended when NSLS-I closed. Multiple undergraduate students involved in data analysis at RIC with summer support.

**RIC**

2014-Present

Develop instrument-specific curve fitting parameters for XPS analysis at URI in service to the statewide battery effort while building experimental ultrahigh vacuum (UHV) chamber in-house at RIC for surface analysis. Collaborate with staff at RI Nuclear Science Center (RINSC) to build out neutron detectors for scattering experiments. Several undergraduate researchers included in all of the above.

**URI and National Synchrotron Light Source (NSLS-I), Upton, NY**

2013-2015

Collaboration with researchers at the National Institute for Standards and Technology (NIST) and Brown University, supported by DOE. Conduct HAXPES experiments on Li-ion battery materials at NSLS-I in collaboration with URI chemistry group and NIST at BNL. Beamtime awards constantly active until NSLS closure in late 2014.

**URI**

2009-2014

Investigate electronic properties of metallic surfaces under ion bombardment using inverse photoemission spectroscopy (IPES), LEED, and work function measurements. Correlate observed changes with degree of surface damage. Write field-deployable experimental control program in LabVIEW including robust user controls, common logging procedures, and the ability to collect LEED data as CCD photos. Also wrote extensive analysis and simulation programs in Mathematica.

**Technical Skills**

- All aspects of vacuum (low through ultrahigh) system design, construction, and maintenance
- Atomically clean surface preparation
- Geiger-Muller tube and fast pulse counting circuit fabrication
- Characterization: IPES, LEED, XPS, HAXPES, XANES, NMR, FTIR, GCMS, TRSRM, AES, work function measurement, cryogenic techniques, PID temperature control, RGA mass spectroscopy.
- Machine shop: wood and metal lathe; drill press; mill; tap and die; band, chop, jig, reciprocating, mitre, and circular saws; belt and wheel sanding; stick welding; brazing

- Software: NI LabVIEW, Wolfram Mathematica, CasaXPS, MossWinn, Wavemetrics IGOR Pro, Python
- Student response and learning management: iClicker, Top Hat, Blackboard, Starfish
- Video and web editing: Elgato, iMovie, iDVD, WordPress

## Professional Memberships and Activities

Council on Undergraduate Research	2015 Present
Materials Research Society	2013 Present
American Physical Society	2007 Life

### Peer-Review

Department of Energy Grant Funding Reviewer	2020-2022
Journal of the Electrochemical Society Publication Referee	2017, 18
Materials Research Society Publication Referee	2013, 14

## Awards

NASA EPSCoR Seed Grant Award, \$25,000 2023  
 “Tin Pest Seed Investigation”: One-year PI award to support purchasing a cylindrical mirror analyzer for LEED and AES investigations of tin pest.

DOE EPSCoR PI Award, \$620,019 2018  
 “Investigating Ultrafast Dynamics in Solid-State Photocatalytic and Photovoltaic Materials Using Time-Resolved Mössbauer Spectroscopy”: Collaboration with Dr. Dugan Hayes (URI, chemistry). Three-year award to support studies at URI and ANL including several RIC students with full summer support.

DOE EPSCoR Implementation Award, \$25,000 2016  
 “HAXPES investigations of Silicon Anode Materials with Carboxylic Acid Binders for Lithium Ion Batteries”: subaward to RIC from Brown University. One-year PI award to support studies at RIC and travel to CLS, including summer support for one RIC student.

RIC Center for Research and Creative Activity Implementation Award, \$3285 2016  
 “Wolfram Mathematica as Course-Integrated Computational Physics Experience”: award as part of a larger implementation from CRCA with Dr. Medini Padmanabhan to secure access to the Wolfram Mathematica software. In concert with additional investment from Physical Sciences, I established a Computational Physics Laboratory in Clarke Science to support computational physics in our curriculum.

RIC Faculty Research Grant Awards, \$13941 total 2015-23  
 2023: “Mechanism and Reversibility of Tin Pest” - \$4000  
 2022: “TRSRM Development at Argonne National Laboratory” - \$1500  
 2017: “Temperature Programmed Desorption Instrument Development” - \$2700  
 Involved three RIC students so far, work is ongoing  
 2016: “Work Function Measurements for Li-ion Battery Materials” - \$3824  
 Involved one RIC student and helped to publish two manuscripts  
 2015: “Optimization of Novel Geiger-Muller Photon Detector Design” - \$1917  
 Involved two students and helped to publish one manuscript

Granted Time at National Laboratory Synchrotron Facilities 2013-Present  
 2019-23: APS; 105, eight-hour shifts, beamlines 3-ID, 7-ID, & 30-ID  
 2018-19: NSLS-II; 36 shifts, beamline 7-ID  
 2015-16: CLS; 48 shifts, beamline SXRMB

## Publications

- 1) Antolini, C., Spellman, C.D., Otolski, C.J., Doumy, G., March, A.M., Walko, D.A., Liu, C., Zhang, X., Young, B.T., Goodwill, J.E., Hayes, D. (2022). Photochemical and Photophysical Dynamics of the Aqueous Ferrate(VI) Ion. *J. Am. Chem. Soc.*, **144** (49), 22514-22527 (2022). DOI: 10.1021/jacs.2c08048.
- 2) Jayasekara, G., Antolini, C., Smith, M., Jacoby, D., Escolastico, J., Girard, N., Young, B.T., Hayes, D. (2021). Mechanisms of the Cu(I)-Catalyzed Intermolecular Photocycloaddition Reaction Revealed by Optical and X-ray Transient Absorption Spectroscopies. *J. Am. Chem. Soc.*, **143** (46), 19356-19364 (2021). DOI: 10.1021/jacs.1c07282.
- 3) Young, B., Nguyen, C.C., Lobach, A., Heskett, D., Woicik, J.C., Lucht, B. (2019). Role of binders in solid electrolyte interphase (SEI) formation in lithium ion batteries studied with hard X-ray photoelectron spectroscopy (HAXPES). *J. Mater. Res.*, **34** (1), 97-106. DOI: 10.1557/jmr.2018.363
- 4) Young, B.T., Heskett, D.R., Woicik, J.C., Lucht, B. (2018) X-Ray-Induced Changes to Passivation Layers of Lithium-Ion Battery Electrodes. *J. Spectrosc.*, vol. 2018, Article ID 1075902. DOI: 10.1155/2018/1075902.
- 5) Dong, Y., Young, B.T., Zhang, Y., Yoon, T., Heskett, D.R., Hu, Y., Lucht, B.L. (2017). Effect of Lithium Borate Additives on Cathode Film Formation in LiNi<sub>0.5</sub>Mn<sub>1.5</sub>O<sub>4</sub>/Li Cells. *ACS Appl. Mater. Interfaces*, **9**, 20467-20475. DOI: 10.1021/acsami.7b01481
- 6) Young, B., Warner, J., Heskett, D. (2016). Ion Bombardment Of Ni(110) Studied With Inverse Photoemission Spectroscopy And Low Energy Electron Diffraction. *Surface Science*, **644**, 64-68. DOI: 10.1016/j.susc.2015.09.020
- 7) Young, B.T., Heskett, D.R., Nguyen, C.C., Nie, M., Woicik, J.C., Lucht, B.L. (2015). Hard X-Ray Photoelectron Spectroscopy (HAXPES) Investigation of the Silicon Solid Electrolyte Interphase (SEI) in Lithium-Ion Batteries. *ACS Appl. Mater. Interfaces*, **7** (36), 20004-20011. DOI: 10.1021/acsami.5b04845
- 8) Seo, D.M., Nguyen, C.C., Young, B.T., Heskett, D.R., Woicik, J.C., Lucht, B.L., (2015). Characterizing Solid Electrolyte Interphase on Sn Anode in Lithium Ion Battery. *J. Electrochem. Soc.*, **162** (13), A7091-A7095. DOI: 10.1149/2.0121513jes
- 9) Nie, M., Demeaux, J., Young, B.T., Heskett, D.R., Chen, Y., Bose, A., Woicik, J.C., Lucht, B.L. (2015). Effect of Vinylene Carbonate and Fluoroethylene Carbonate on SEI Formation on Graphitic Anodes in Li-Ion Batteries. *J. Electrochem. Soc.*, **162** (13), A7008-A7014. DOI: 10.1149/2.0021513jes
- 10) Young, B.T. (2014). *Electronic and chemical properties of surface and interfacial zones*. Dissertations and Master's Theses (Campus Access). Paper AAI3632146. <http://digitalcommons.uri.edu/dissertations/AAI3632146>

## Published Abstracts and Professional Presentations

- 1) Escolastico, J., Girard, N., Antolini, C., Smith, M., Young, B., Hayes, D., (2021). Mössbauer Analysis of S-Doped Nickel Nitroprusside for Oxygen Evolution Reaction. Talk presented by B. Young at the American Physical Society March Meeting, March 15-19, 2021, Nashville, TN. <https://meetings.aps.org/Meeting/MAR21/Session/B61.2>
- 2) Young, B. T. (2019). Time Evolution of Li-ion Battery Electrode Passivation Layer Modification by Synchrotron Radiation. Talk presented by B. Young at the American Physical Society March Meeting, March 4-8, 2019, Boston, MA. <https://meetings.aps.org/Meeting/MAR19/Session/C47.9>
- 3) Young, B. (2018). Zen and the Art of Li-Ion Battery Failure. **Invited talk** presented at Smith College, 28 September 2018, Northampton, MA.
- 4) Lucht, B.L., Chandrasiri, D.K., Jurng, S., Parimalam, B.S., Nguyen, C.C., Young, B., Heskett, D. (2018). Surface Functionalization of Silicon Nanoparticles with Citric Acid for Enhanced Performance As Lithium Ion Battery Anodes. Poster presented by D. Chandrasiri at the 233rd Electrochemical Society Meeting, May 13, 2018, Boston, MA. <http://ma.ecsdl.org/content/MA2018-01/3/555.abstract>
- 5) Young, B., Facilitating Li-Ion Battery Advancement With Hard X-ray Photoelectron Spectroscopy. **Invited talk** presented by B. Young at the Fall meeting of the APS New England Section, October 21, 2017, Kingston, RI. <http://meetings.aps.org/Meeting/NEF17/Session/F1.1>
- 6) Young, B., Heskett, D., Nguyen, C., Woicik, J.C., Lucht, B. (2017). Toward better Li-ion batteries: hard x-ray photoelectron spectroscopy investigation of binder materials for Si-based anodes. Talk presented by B. Young at the American Physical Society March Meeting, March 15, 2017, New Orleans, LA. <http://meetings.aps.org/Meeting/MAR17/Session/L38.5>
- 7) Rivard, S., Young, B., Heskett, D., Dong, Y., Hu, Y., Lucht B. (2017). Novel borate additives for lithium-ion battery cathode passivation investigated with hard x-ray photoelectron spectroscopy. Talk presented by B. Young at the American Physical Society March Meeting, March 15, 2017, New Orleans, LA. <http://meetings.aps.org/Meeting/MAR17/Session/L38.3>
- 8) Caldera, C. and Young, B. (2015). X-Ray Photoelectron Spectroscopy Peak Deconvolution for Lithium-Ion Batteries. Poster presented by C. Caldera at Honors Program Sigma Xi Poster Session at Rhode Island College, April 27, 2015, Providence, RI.
- 9) Young, B. (2014). Li-Ion Batteries: Probing Deeper with HAXPES and the Case of the Missing Phosphorus. Invited talk presented at Washington and Jefferson College, March 9, 2014, Washington, PA
- 10) Young, B. (2014). Hard X-Ray Photoelectron Spectroscopy and Advanced Materials for Li-Ion Batteries. Invited talk presented at Randolph-Macon College, May 22, 2014, Ashland, VA
- 11) Young, B., Nguyen, C., Heskett, D., Lucht, B., Woicik, J.C. (2014). Role of Substrate Material Binders in Solid Electrolyte Interphase Development in Lithium-Ion Batteries: HAXPES Insights. Poster presented by B. Young at the NSLS/NSLS-II and CFN Joint Users' Meeting, May 19, 2014, Brookhaven National Laboratory, Upton, NY.
- 12) Young, B., Heskett, D., Nie, M., Lucht, B., Woicik, J.C. (2014). Investigation of the Silicon Solid Electrolyte Interface in Lithium Ion Batteries using the Technique of Hard X-Ray Photoelectron

Spectroscopy. Talk presented by B. Young at the American Physical Society March Meeting, March 14, 2014, Denver, CO. <http://meetings.aps.org/Meeting/MAR14/Session/F25.12>

- 13) Young, B., Heskett, D., Lucht, B., Woicik, J.C. (2013). Investigation of the Silicon Solid Electrolyte Interface in Lithium Ion Batteries Using the Technique of Hard X-Ray Photoelectron Spectroscopy. Poster presented by B. Young at Materials Research Society Fall Meeting & Exhibit, December 2, 2013, Boston, MA.
- 14) Young, B., Warner, J., Heskett, D. (2013). Ion bombardment of Ni(110) studied with inverse photoemission, LEED, and simulations. Talk presented by B. Young at the American Physical Society March Meeting. March 18, 2013, Baltimore, MD. <http://meetings.aps.org/Meeting/MAR13/Session/B40.3>
- 15) Young, B., Warner, J., Heskett, D., (2012). Inverse photoemission and LEED investigation of the ion-bombarded Ni(110) surface. Talk presented by B. Young at the American Physical Society March Meeting. March 1, 2012, Boston, MA. <http://meetings.aps.org/Meeting/MAR12/Session/V5.5>