# Benjamin D. Geller, Ph.D.

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## PRESENT POSITION

**Assistant Professor of Physics, Swarthmore College, Swarthmore PA**
August, 2018 – present

**Coordinator of Natural Sciences and Engineering (NSE) Educational Support Initiatives, Swarthmore College, Swarthmore PA**
August 2017 – present

**Interim Director, Swarthmore Summer Scholars (S$^3$P) Program, Swarthmore, PA**
December 2021 - present

## EDUCATION

**Ph.D. in Physics, 2014**
**University of Maryland, College Park, Maryland. Advisor: Dr. Edward F. Redish**
Dissertation title: *Explanatory coherence in the context of the second law of thermodynamics*

**Certificate of Advanced Studies in Mathematics (C.A.S.M.), Fulbright Scholar, 2004**
University of Cambridge, Cambridge, UK
Part III of the Mathematical Tripos, Department of Applied Mathematics and Theoretical Physics

**M.A., Philosophical Foundations of Physics, 2003**
Columbia University, New York, NY

**B.A., Chemistry, 2001**
Phi Beta Kappa
Swarthmore College, Swarthmore, PA

## PHYSICS EDUCATION RESEARCH & WORK EXPERIENCE

**8/17 – present: Coordinator of Natural Sciences and Engineering (NSE) Support Initiatives, Swarthmore College, Swarthmore PA**. I train and supervise undergraduate peer assistants in the NSE division. This involves leading training sessions on issues related to educational psychology, leading weekly pedagogy workshops, observing the peer assistants as they work with students, and providing feedback to the peer assistants on a regular basis. I also work with faculty who request support in making their coursework better suited for inclusive learning experiences in the peer-led help sessions.

**8/17 – 8/21: Co-PI, NSF Grant #1710875, Do connections persist? a pilot study investigating the lasting impact of a physics course designed to facilitate connections with biology.** I am co-PI on a grant to study the longitudinal effects of the Introductory Physics for Life Science (IPLS) course at Swarthmore College. We collect survey data

and long-form written work from life science students as they move into intermediate and advanced biology coursework, and conduct interviews with these students, to see what role the IPLS experience plays in their subsequent academic and research lives. We compare these data to data obtained from students who have taken traditional introductory physics.

**8/16 – 8/20: Co-PI, NSF Grant #11624017, Collaborative research: Community sourcing of Introductory Physics for the Life Sciences (IPLS).** I was co-PI on a grant to create an international online portal that gathers and disseminates materials related to Introductory Physics for Life Sciences (IPLS) courses, and foster the development of a thriving IPLS community. My colleague Catherine Crouch and I are submitting our IPLS course materials to this portal so that they can be broadly used.

**1/15 – 8/18: Visiting Assistant Professor of Physics, Swarthmore College, Swarthmore PA.** I was a Visiting Assistant Professor in the Physics & Astronomy department at Swarthmore College. Since I was also a postdoctoral researcher during this period, this is sometimes called a "teaching post-doc" position.

**1/15 – 8/17: Postdoctoral Research Associate in Physics Education, Swarthmore College, Swarthmore PA**. I was a Postdoctoral Research Associate in the Physics & Astronomy and Biology departments at Swarthmore College. I worked on the development, implementation, and assessment of a novel Introductory Physics for Life Scientists (IPLS) course, Physics 3L-4L. I also assisted the Swarthmore biology department to increase the amount of student-centered, active learning in the introductory biology courses, and to assess the Biology Scholars Program, a program supporting students who are under-prepared for the Introductory Biology Sequence. I also assessed the Swarthmore Summer Scholars Program (S3P) in its early days, an initiative to support underrepresented students in STEM at Swarthmore.

**8/11 – 12/14: Creating a Common Thermodynamics, University of Maryland, College Park MD.** I was a Research Assistant in Dr. Edward Redish's Physics Education Research Group (PERG). I completed a literature review to understand educational issues related to thermodynamics across biology, chemistry, and physics, developed curriculum to cross disciplinary boundaries, and researched student understanding of thermodynamics across biology, chemistry, and physics. This work culminated in my Ph.D. dissertation: *Explanatory coherence in the context of the second law of thermodynamics*.

**8/11 – 12/14: NEXUS/Physics, University of Maryland, College Park MD.** I was a Research Assistant in Dr. Edward Redish's Physics Education Research Group (PERG). I worked on the design and implementation of a biologically authentic physics curriculum for pre-health profession students.

**6/12 – 7/12: Interdisciplinary Research Institute in STEM Education (I-RISE) Physics Education Scholar, Seattle Pacific University, Seattle WA.** I worked with Dr. Rachel Scherr and other physics education researchers and students to observe, document, and reflect on an instructional setting in which elementary school science teachers reasoned about energy.

## BIOPHYSICS RESEARCH EXPERIENCE

**1/10 – 7/11: Graduate Student Researcher, University of California, Berkeley CA**. I was a Graduate Student Researcher in Dr. Birgitta Whaley's quantum computation lab. I studied quantum effects in photosynthesis.

**1/07 – 1/09: Graudate Student Researcher, University of California, Berkeley CA.** I was a Graduate Student Researcher in Dr. Susan Marqusee's protein folding lab. I studied single-molecule protein folding through the use of optical tweezers.

## PHYSICS RESEARCH EXPERIENCE

**5/02 – 10/02: Research with Dr. Brian Greene and Dr. Mark Jackson, Columbia University, New York NY.** I did research on supersymmetry in quantum mechanics, supported by the VIGRE program.

**5/00 – 5/01: Research with Dr. Peter Collings and Dr. Robert Pasternack, Swarthmore College, Swarthmore PA.** I researched the use of resonance light scattering to investigate the self-aggregation properties of ultrathin porphyrin films.

## TEACHING EXPERIENCE

*Instructor of record for the following courses:*

**PHYS 003L (Fall 2017, Fall 2019, Fall 2020). General Physics I: Motion, Force, and Energy with Biological and Medical Applications.**
Department of Physics & Astronomy, Swarthmore College.

**PHYS 004L (Spring 2015, Spring 2016, Spring 2017, Spring 2018, Spring 2019, Spring 2020, Spring 2021). General Physics II: Electricity, Magnetism, and Optics with Biochemical and Biomedical Applications.**
Department of Physics & Astronomy, Swarthmore College.

**PHYS 005 (Fall 2021). Spacetime and Quanta.**
Department of Physics & Astronomy, Swarthmore College

**PHYS 008S (Spring 2019, Spring 2020). Electricity, Magnetism, and Waves: Intensive.**
Department of Physics & Astronomy, Swarthmore College

**PHYS 095/EDUC 075 (Fall 2015, Fall 2016). Introduction to Science Pedagogy: Theory and Practice.**
Departments of Physics & Astronomy and Educational Studies, Swarthmore College.

**PHYSICS 299L (Spring 2014). Special Problems in Physics: Quantitative Biology and Biophysics.**
Department of Physics, University of Maryland, College Park.

**PHYSICS S1202Q (Summer 2003, Summer 2004). General Physics II.**
Department of Physics, Columbia University

**PHYSICS S0065 (Summer 2004). Basic Physics.**
Department of Physics, Columbia University

*Head Graduate Student Instructor for the following courses:*

**PHYSICS 8A (Fall 2009), Introductory Physics I.**
Department of Physics, University of California, Berkeley.

**PHYSICS 8B (Spring 2010), Introductory Physics II.**
Department of Physics, University of California, Berkeley.

*Graduate Student Instructor for the following courses:*

**PHYSICS 8A and 8B (Fall 2005, Spring 2006, Fall 2006)**. Introductory Physics I and II.
Department of Physics, University of California, Berkeley.

*Other teaching experiences:*

**7/21 – 8/21: Swarthmore Summer Scholars Program (S3P).**
Mathematics instructor for underrepresented and first-generation students interested in studying sciences at Swarthmore.

**9/10 – 6/11: Volunteer Mathematics Instructor, Prison University Project at San Quentin Prison.**
Tutored inmates in mathematics in an effort to assist them in obtaining a college degree during their time in prison.

**8/09: Instructor for the Compass Project, University of California, Berkeley.**
Designed and delivered an interactive course for incoming undergraduates in the physical sciences, titled "What can Quantum Mechanics teach us about Human Vision?," as part of the Compass Project. The Compass Project promotes community within the physics department at Berkeley, to emphasize the importance of effective teaching, and to support the success of women and underrepresented minorities in the physical sciences broadly. The effort was started by graduate students during my time at Berkley and remains an active community today.

**9/06 – 9/08: Pedagogy Coordinator for the Compass Project, University of California, Berkeley.**

## RESEARCH STUDENTS MENTORED AT SWARTHMORE COLLEGE

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| **Nikhil Tignor '24** | (Summer 2021, with Catherine Crouch) |
| **Brandon Daniel-Morales '24** | (Summer 2021, with Catherine Crouch) |
| **Calvin White '24** | (Summer 2021, with Catherine Crouch) |
| **Maya Tipton '23** | (Summer 2020, with Catherine Crouch) |
| **Gwendolyn Rak '22** | (Summer 2020, with Catherine Crouch) |
| **Jack Rubien '20** | (Spring 2020 & Summer 2020, with Catherine Crouch) |
| **Aqil (Tarzan) MacMood '20** | (Summer 2019 & Summer 2020, with Catherine Crouch) |
| **Jonathan Solomon '20** | (Summer 2018, with Catherine Crouch) |
| **Katherine Lima '20** | (Summer 2018, with Catherine Crouch) |
| **Jessica Li '19** | (Summer 2017, with Catherine Crouch) |
| **Max Franklin '19** | (Summer 2016 & Summer 2017, with Catherine Crouch) |
| **Nathaniel Peters '18** | (Summer 2018 & Summer 2019, with Catherine Crouch) |
| **Haley Gerardi '17** | (Summer 2016, with Catherine Crouch, and Fall 2016) |
| **Tessa Williams '17** | (Summer 2015, with Catherine Crouch) |

## FELLOWSHIPS AND AWARDS

Nominated to be Faculty Speaker at Last Collection, Swarthmore College, 2017
PERTG Travel Grant, Winter AAPT Conference, New Orleans, LA, 2016
Best Poster Award, University of Maryland Bioscience Day, 2014
Jacob K. Goldhaber Travel Grant, University of Maryland, 2013
TRUSE Travel Award, TRUSE Conference, St. Paul, Minnesota, 2012
Interdisciplinary Research Institute in STEM Education (I-RISE) Scholar, Seattle Pacific University, 2012
Outstanding Graduate Student Instructor, University of California, Berkeley, 2006
Presidential Teaching Award (Finalist), Columbia University, 2003
Fulbright Scholarship, University of Cambridge, UK, 2003
American Chemical Society Outstanding Scholar Award, 2001, Swarthmore College
Sarah Kaighn Cooper Scholar, 2000, Swarthmore College

## PROFESSIONAL AFFILIATIONS

American Association of Physics Teachers
American Physical Society
Phi Beta Kappa

## SERVICE TO SWARTHMORE COLLEGE

Swarthmore Summer Scholars Committee Member: 2020 – present
Health Sciences Advisory Committee Member: 2019 – present
Instructor for the Teachers as Scholars Program: 2019
NSE Inclusive Excellence Faculty Working Group (informal participant): 2017 – present
Intake interviews and assessment of the Swarthmore Summer Scholars Program: 2015 – 2018

## RESEARCH GRANT ADVISORY BOARD PARTICIPATION

University of Utah (PI Lauren Barth-Cohen): *Exploring Students' Learning of Data Analysis in a Three-Dimensional Lab Environment* (NSF). 2020 - present
Seattle Pacific University (PI Amy Robertson): *Research and Curriculum Development to Leverage University Student Conceptual Resources for Understanding Physics* (NSF) 2020 – present
Western Washington University (PI Andrew Boudreaux): *Unifying Science for Students* (NSF) 2019 – present
Carleton College (PI Melissa Eblen-Zayas): *Online modules for quantitative skill building: Exploring adaptation and adoption across a consortium* (NSF). 2019 – present

## PUBLICATIONS (*INDICATES UNDERGRADUATE CO-AUTHOR)

***Peer-Reviewed Journal Articles:***

**Geller, B.D.,** Tipton, M.*,Daniel-Morales, B.*, Tignor, N.*, White, C.*, Crouch, C.H., "Assessing the impact of introductory physics for the life sciences on students' ability to build complex models," Phys. Rev. ST-Phys. Educ. Res., under review (2022)

**Geller, B.D.,** Rubien, J.*, Hiebert Burch, S., Crouch, C. H., "Assessing the impact of introductory physics for the life sciences in a senior biology capstone course," Phys. Rev. ST-Phys. Educ. Res., under review (2022)

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V., Turpen, C., Redish, E.F., "Bridging the gaps: How students seek disciplinary coherence in introductory physics for life science," Phys. Rev. ST-Phys. Educ. Res., **15**, 020142 (2019). doi.org/10.1103/PhysRevPhysEducRes.15.020142

**Geller, B.D.,** Daane, A.R., "Making energy relevant: the role of free energy in introductory physics," Am. J. Phys., **87**, 558 (2019). https://doi.org/10.1119/1.5110698

**Geller, B.D.,** Turpen, C., Crouch, C.H. "Sources of student engagement in introductory physics for life sciences," Phys. Rev. Phys. Educ. Res. **14**, 010118 (2018). doi.org/10.1103/PhysRevPhysEducRes.14.010118

**Geller, B.D.,**[1] Dreyfus, B.W.[1], Sawtelle, V., Meltzer, D.E., "Resource letter: Teaching thermodynamics and statistical mechanics in physics, chemistry, and biology," Am. J. Phys., **83**, 5-21 (2015). [1] Authors contributed equally to this publication.

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V., Turpen, C., Redish, E.F., "Entropy and spontaneity in an introductory physics course for life science students," Am. J. Phys., **82**, 394 (2014).

Dreyfus, B.W., Gouvea, J.S., **Geller, B.D.**, Sawtelle, V., Turpen, C., Redish, E.F., "Chemical energy in an introductory physics course for the life sciences," Am. J. Phys., **82**, 403 (2014).

Dreyfus, B.W., **Geller, B.D.**, Gouvea, J., Sawtelle, V., Turpen, C., and Redish, E.F., "Ontological metaphors for negative energy in an interdisciplinary context, Phys. Rev. Phys. Educ. Res., **10**, 020108 (2014).

Redish, E.F, Bauer, C., Carleton, K.L, Cooke, T.J., Cooper, M., Crouch, C.H., Dreyfus, B.W., **Geller, B.**, Giannini, J., Gouvea, J.S., Klymkowsky, M.W., Losert, W., Moore, K., Presson, J., Sawtelle, V., Turpen, C., Thompson, K., "NEXUS/Physics: An interdisciplinary repurposing of physics for biologists," Am. J. Phys., **82**, 368 (2014).

Gouvea, J.S., Sawtelle, V., **Geller, B.D.**, Turpen, C., "A framework for analyzing interdisciplinary tasks: Implications for student learning and curricular design," Cell Biol. Educ., **12**, 187 (2013).

Conley, J., **Geller, B.**, Jackson, M.G., Pomerance, L., Shrivastava, S., "A quantum mechanical model of spherical supermembranes," JHEP, 070 (2003).

***Papers in Peer-Reviewed Conference Proceedings:***

**Geller, B.D.**, Gouvea, J.S., Sawtelle, V., and Turpen, C., "Sources of affect around interdisciplinary sense making," Proceedings of the International Conference of the Learning Sciences, 1142-1146 (2014).

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V., Turpen, C., and Redish, E.F., "Like dissolves like: Unpacking student reasoning about thermodynamic heuristics," Proceedings of the 2013 Physics Education Research Conference, 157-160 (2014).

Dreyfus, B.W., **Geller, B.D.**, Gouvea, J.S., Sawtelle, V.**,** Turpen, C., and Redish, E.F., "Negative energy: Why interdisciplinary physics requires multiple ontologies," Proceedings of the 2013 Physics Education Research Conference, 129-132 (2014).

Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., Svoboda, J., Turpen, C., Redish, E.F., "Students' Interdisciplinary Reasoning about 'High Energy Bonds' and ATP," Proceedings of the 2012 Physics Education Research Conference, AIP Press, Melville NY **1513,** 122-125 (2013).

**Geller, B.D.**, Dreyfus, B.W., Sawtelle, V., Svoboda, J., Turpen, C., and Redish, E.F., "Students' Reasoning about Interdisciplinarity," Proceedings of the 2012 Physics Education Research Conference, AIP Press, Melville NY, **1513,** 146-149 (2013).

### *Invited and Juried Talks*

**Geller, B.D.,** "The impact of IPLS in a senior biology capstone course," selected talk at the 2021 Virtual X-DBER (Discipline Based Education Research) Conference.

**Geller, B.D.,** "Do connections persist? Assessing the longitudinal impact of IPLS," invited talk at the 2018 AAPT National Meeting, Washington, D.C.

**Geller, B.D.**, "Transformative experience in a physics course designed to facilitate connections to biology," juried talk at the 2018 Physics Education Research Conference, Washington, D.C.

**Geller, B.D.**, "Bridging the gaps: The role of 'free energy' in interdisciplinary education," invited talk at the 2018 Physics Research and Education Gordon Research Conference, Smithfield, RI, June 2018.

**Geller, B.D.**, "Curricular content and affective engagement in an Introductory Physics for Life Sciences (IPLS) course," invited talk to the Drexel University Physics Department, January 2018.

**Geller, B.D.**, "Sources of student engagement in IPLS," invited talk to the PER group at Michigan State University, East Lansing, MI, October 2016.

**Geller, B.D.**, "Sources of student engagement in IPLS," invited talk to the PER group at Michigan State University, East Lansing, MI, October 2016.

**Geller, B.D.**, "Sources of student engagement in IPLS," invited talk at the 2016 Physics Education Research Conference (PERC), Sacramento, CA, July 2016.

**Geller, B.D.**, "Epistemological and methodological balancing acts in IPLS collaboration," invited talk at the Winter AAPT Meeting, New Orleans, LA, January 2016.

**Geller, B.D.**, "Sources of affect around interdisciplinary sense making," invited talk to the DBER group at George Washington University, Washington, D.C., April 2014.

**Geller, B.D.**, "Life science student and faculty perspectives on IPLS," invited talk for the Workshop on "Teaching Physics For Life Science And Pre-Health Students: Lab Activities And Strategies For Course Design," Portland State University, Portland, OR, July 2013.

**Geller, B.D.**, Moore, K., "NEXUS/Physics lab curriculum," invited presentation for the Workshop on "Teaching Physics For Life Science And Pre-Health Students: Lab Activities And Strategies For Course Design," Portland State University, Portland, OR, July 2013.

**Geller, B.D.**, Dreyfus, B.W., "Integrating different approaches to physics from different disciplines," invited talk, University of Maryland Bioscience Day, College Park, MD, November 2012.

***Contributed Presentations (Posters and Talks) at National Conferences:***

*AAPT = American Association of Physics Teachers National Conference*
*PERC = Physics Education Research Conference*

Rubien, J.*, Crouch, C.H., Hiebert Burch, S., **Geller, B.D.,** "The impact of IPLS in a senior biology capstone course," contributed talk and poster, AAPT/PERC 2020 Virtual National Meetings.

Tipton, M.*, Crouch, C.H., **Geller, B.D.,** "Does IPLS help students apply physics to biology?", contributed talk and poster, AAPT/PERC 2020 Virtual National Meetings.

Rak, G.*, **Geller, B.D.,** Crouch, C.H., "Assessing the Lasting Impact of IPLS on Student Interdisciplinary Attitudes," contributed talk and poster, AAPT/PERC 2020 Virtual National Meetings.

Peters, N.*, Turpen, C., Crouch, C.H., **Geller, B.D.**, "Assessing the lasting impact of an IPLS course in an Animal Physiology Course," contributed talk and poster, AAPT/PERC 2019 National Meetings, Provo, UT.

MacMood, A.*, Peters, N.*, Gerardi, H.*, **Geller, B.D.,** Crouch, C.H., "Exploring the impact of an IPLS course on student learning in neurobiology," contributed talk and poster, AAPT/PERC 2019 National Meetings, Provo, UT.

Gerardi, H.*, Turpen, C., Crouch, C.H., **Geller, B.D.,** "Enduring attitudes of life science students toward physics and interdisciplinary learning," contributed talk and poster, AAPT/PERC 2019 National Meetings, Provo, UT.

Crouch, C.H., **Geller, B.D.,** Hiebert Burch, S., "Two physicists and a physiologist think and teach about energy," contributed poster at the June 2018 Gordon Conference on Physics Research and Education.

Solomon, J.*, Peters, N.*, **Geller, B.D.,** Turpen, C., Crouch, C.H., "Assessing the lasting impact of an IPLS course," contributed talk and poster, AAPT/PERC 2018 National Meetings, Washington, D.C.

Lima, K.*, Turpen, C., **Geller, B.D.,** Crouch, C.H., "Transformative experience in a physics course designed to facilitate connections to biology," contributed poster, AAPT/PERC 2018 National Meetings, Washington D.C.

**Geller, B.D.**, Turpen, C., and Crouch, C.H., "Saving the best for last: Introductory physics as a capstone," contributed talk, AAPT/PERC 2017 National Meetings, Cincinnati, OH.

Franklin, M., **Geller, B.D.**, and Crouch, C.H. "The role of self-efficacy in introductory physics," AAPT/PERC, contributed talk and poster, AAPT/PERC 2017 National Meetings, Cincinnati, OH.

**Geller, B.D.**, Turpen, C., and Crouch, C.H., "The source of student engagement in IPLS," AAPT/PERC, contributed talk and poster, AAPT/PERC 2016 National Meetings, Sacramento, CA.

Gerardi, H.*, Franklin, M.*, **Geller, B.D.**, Turpen, C., and Crouch, C.H., "Traditional physics vs IPLS: Comparing student experiences," contributed talk and poster, AAPT/PERC 2016 National Meetings, Sacramento, CA.

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V., and Turpen, C., "Explanatory coherence in an introductory physics for life scientists course," contributed talk and poster, AAPT/PERC 2014 National Meeting, Minneapolis, MN.

**Geller, B.D.**, Turpen, C., Renninger, K.A., Wisittanawat, P.*, and Crouch, C.H., "Unpacking the source of student interest in an IPLS course," Contributed talk and poster, AAPT/PERC, 2015 National Meeting, College Park, MD, and Society for the Advancement of Biology Education Research (SABER), 2015 National Meeting, Minneapolis, MN.

Williams, T.E.*, **Geller, B.D.**, Turpen, C., Renninger, K.A., and Crouch, C.H., "Traditional physics versus IPLS: Comparing student interest and engagement," contributed talk and poster, AAPT/PERC, 2015 National Meeting, College Park, MD.

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V., and Turpen, C., "Explanatory coherence in an introductory physics for life scientists course," contributed talk and poster, AAPT/PERC 2014 National Meetings, Minneapolis, MN.

Sawtelle, V., Dreyfus, B.W., **Geller, B.D.**, Redish, E.F., Gouvea, J.S., and Turpen, C., "Designing and refining physics for biologists: The scaling up process," contributed poster, PERC 2014 National Meeting, Minneapolis, MN.

Gouvea, J.S., Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., and Turpen, C., "In biology we never explain…: The construction of epistemological stances in course experiences, July 2014, Society for the Advancement of Biology Education Research (SABER), contributed poster, 2014 National Meeting, Minneapolis, MN.

**Geller, B.D.**, Dreyfus, B.W., Gouvea, J.S., Sawtelle, V.**,** Turpen, C., and Redish, E.F., "Like dissolves like: Unpacking student reasoning about thermodynamic heuristics," Contributed talk and poster, AAPT/PERC, 2013 National Meeting, Portland, OR.

Daane, A.R., **Geller, B.D.**, Sawtelle, V., Scherr, R.E., Redish, E.F., "Connecting learner ideas about energy and free energy," Contributed poster, AAPT, 2013 National Meeting, Portland, OR.

Moore, K., Giannini, J., **Geller, B.D.**, Losert, W., "Research on a laboratory curriculum for NEXUS/Physics," Contributed talk and poster, AAPT, 2013 National Meeting, Portland, OR.

Dreyfus, B.W., **Geller, B.D.**, Gouvea, J.S., Sawtelle, V., Turpen, C., and Redish, E.F., "Negative energy: Why interdisciplinary physics requires multiple ontologies," Contributed talk and poster, AAPT/PERC, 2013 National Meeting, Portland, OR.

Sawtelle, V.**,** Turpen, C., Gouvea, J.S., Dreyfus, B.W., **Geller, B.D.**, "A case study in leveraging biology experiences in physics," Contributed talk and poster, AAPT/PERC, 2013 National Meeting, Portland, OR.

Gouvea, J.S., Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., Turpen, C., and Redish, E.F., "Mathematical reasoning across the sciences: The case of IPLS," Contributed poster, AAPT/PERC, 2013 National Meeting, Portland, OR.

Redish, E.F., Sawtelle, V., Turpen, C., Dreyfus, B.W., **Geller, B.D.**, "NEXUS/Physics: Rethinking physics for biology and premed students," Contributed poster, AAPT/PERC, 2013 National Meeting, Portland, OR.

**Geller, B.D.**, Daane, A.R., Sawtelle, V., "Reconciling 'energy' and 'free energy'," Contributed poster, AAPT, 2013 National Meeting, New Orleans, LA.

**Geller, B.D.**, Dreyfus, B.W., Sawtelle, V., Svoboda, J., Turpen, C., and Redish, E.F., "Students' reasoning about interdisciplinarity," Contributed poster, University of Maryland Bioscience Day, College Park, MD, November 2012.

**Geller, B.D.**, Dreyfus, B.W., Sawtelle, V., Svoboda, J., Turpen, C., and Redish, E.F., "Students' reasoning about interdisciplinarity," Contributed poster, AAPT/PERC, 2012 National Meeting, Philadelphia, PA.

**Geller, B.D.**, Giannini, J., Moore, K., Redish, E.F., Losert, W., "Laboratory development efforts in a physics for biologists course," Contributed poster, Beyond-First-Year Laboratory Conference, Philadelphia, PA.

Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., Svoboda, J., Turpen, C., Redish, E.F., "Students' interdisciplinary reasoning about 'high energy bonds' and ATP," Contributed poster, AAPT/PERC, 2012 National Meeting, Philadelphia, PA.

Redish, E.F., Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., Svoboda, J., Turpen, C., "Developing a research-based interdisciplinary physics course for biologists," Contributed poster, AAPT/PERC, 2012 National Meeting, Philadelphia, PA.

**Geller, B.D.**, Dreyfus, B.W., Sawtelle, V. Turpen, C., and Redish, E.F. "Research on students' reasoning about interdisciplinarity," Contributed poster, Transforming Undergraduate Science Education (TRUSE) Conference, St. Paul, MN, June 2012.

Dreyfus, B.W., **Geller, B.D.**, Sawtelle, V., Svoboda, J., Turpen, C. and Redish, E.F. "Students' interdisciplinary reasoning about 'high-energy bonds' and ATP," Contributed poster, Society for the Advancement of Biology Education Research (SABER) National Meeting, SABER National Meeting, Minneapolis, MN, July 2012.