



2016 – 2017 Annual Report

I. Introduction

The Council on Science and Technology serves the University by catalyzing and supporting intellectual exchange, interdisciplinary research, excellent courses, and multidisciplinary collaboration that broaden participation in and appreciation of science, technology, engineering and mathematics (STEM). By seeking to **broaden** and **deepen** participation in STEM, the CST aims to provide unique experiences for undergraduate and graduate students, as well as to support faculty in their course development and research.

The CST is guided by the following overarching goals to

- Collaborate with university colleagues to **educate** a STEM-literate society.
- Engage in and support interdisciplinary **research**.
- Cultivate **synergies** that invite a broad and diverse community to engage with STEM and to explore intersections of STEM with the arts, humanities, and social sciences.

Throughout the 2016-2017 academic year, the CST partnered with colleagues in engineering, the natural sciences, the arts, the humanities, and the social sciences to bring together diverse perspectives to explore the intersections and shared creativity across disciplines. Members of the CST Administration and Executive Committee are listed in Appendix A. The following sections provide an overview of the Council's key projects aligned with our commitment to *education*, *research*, and *synergistic activities*. More information about the CST and our activities is available on our website: <http://cst.princeton.edu>.

II. Educate

In 2010, the Council proposed the Science and Engineering Education Initiative (SEEI), which was passed by faculty vote. The Initiative aims to inspire and prepare all undergraduates, irrespective of their majors, to become scientifically and technologically literate citizens and decision-makers. The primary recommendation of the Initiative was to change the undergraduate general education requirement for the Science and Technology (ST) designate. As a result, undergraduates are required to complete at least two ST-designated courses: at least one with a lab (STL) and a second that may be taken without a lab (STN).

To provide a rich variety of ST offerings, the Council supports faculty in revising and developing courses that emphasize the role of science and engineering in society. The Council offers financial resources to faculty developing new and enhancing existing ST-designated courses. In addition to financial resources, the CST has developed a set of guiding course goals and members of the CST administration are available to assist faculty with the enhancement of existing, and the development of new, ST-designated courses. During the 2016-2017 academic year, Princeton University offered 41 ST-designated courses that did not carry a substantial prerequisite and aligned with the spirit and intent of the Science and Engineering Education Initiative. The following subsection offers a few examples of the courses that align with the SEEI. A full list of these courses and examples of our collaborations with faculty is available in Appendix B.

a. Course Highlights

i. STC/EGR/MUS 209 Transformations in Engineering and the Arts

STC/EGR/MUS 209: *Transformations in Engineering and the Arts* explores the parallels and intersections of design/composition in engineering and the arts, emphasizing a merging of artistry and systematic thinking. Students use what they learned to create as engineer-artists and artist-engineers. Offered for the second time during the Spring 2017 semester, and held in the StudioLab, the course is organized around four modules: A) Visuals, B) Sound, C) Structure and 4) Movement, led by faculty from COS, MUS, CEE, MAE, CST with the participation of faculty from the Lewis Center for the Arts. The modules are unified through “transformations” that engage the disciplines of engineering and the arts and allow the course to serve as an introductory experience for students of varying academic backgrounds. The course culminates in an open-ended final project or performance that explores the theme of transformation in engineering and the arts. In Spring 2017, a follow-up course STC 309: *Independent Design in Engineering and the Arts* was launched, allowing graduates of STC 209 to continue to create works at this intersection. More information about STC209 is available at <https://cst.princeton.edu/courses/stcegrmus-209-transformations-engineering-and-arts>

ii. STC/ENV 349 Writing about Science

STC/ENV 349: *Writing about Science* teaches students how to write about research in STEM fields with clarity and a bit of flair. Through readings, class discussion, encounters with professional writers and journalists of all sorts, across several different media, students learn to convey technical topics to non-experts in a compelling, enjoyable way while staying true to the underlying facts, context and concepts. Most important of all, students practice what they learn in frequent writing assignments that are critiqued extensively by an experienced science journalist and a scientist.

iii. GEO/ENV 102 Climate: Past, Present, and Future

GEO/ENV 102: *Climate: Past, Present, and Future* is an introduction to the processes that control Earth's climate. The course presents an overview of past climates from the distant past to the period of human history. Students engage in an investigation of ongoing climate changes and those predicted for the future, including the capacity of human activities to alter climate and the impacts of climate change on environment and society.

iv. ENV 200 The Environmental Nexus

ENV200: *The Environmental Nexus* looks at the intersections of four major environmental challenges facing the world: climate change, water scarcity, food needs for a growing population, and biodiversity threats. The course is interdisciplinary, with a teaching team consisting of a scientist, economist, environmental humanist, and ethicist, and with six different sections satisfying different distribution requirements (STN, STL, LA, SA, QR, and EM). Students explore how the causes of and solutions to the environmental challenges are linked, and how they go beyond a single academic perspective.

III. **Research**

The Council conducts educational research and supports faculty research that crosses academic disciplinary boundaries. The Council's educational research agenda focuses on understanding the STEM educational experience of undergraduate students at Princeton University. The CST also funds research that bridges STEM with the arts, humanities, or social sciences. The following subsections provide examples of facilitated and supported research.

a. The Creative Art of Structural and Civil Engineering (CASCE)

The CASCE project is funded by the National Science Foundation (NSF DUE 14-32426, 14-31717, and 14-31609; PI M. Garlock, Co-PI E. Laffey; \$498,814.00). CASCE is an example of the CST's educational research agenda and support of undergraduate courses that align with the SEEI. Recent reports from the Office of the President of the United States and the National Academy of Engineering urge the nation to increase student retention in science, technology, engineering and mathematics, and to educate a STEM-literate populace. Uninspiring introductory courses, poor teaching, and lack of effective dissemination of best practices are major obstacles that stand in the way of achieving these goals. Faculty members from Princeton University, Virginia Tech and the University of Massachusetts Amherst are partnering on a project, *Advancing the Dissemination of the Creative Art of Structural/Civil Engineering (CASCE)*, with the aim of overcoming these obstacles through supporting the dissemination and implementation of an introductory civil engineering course that is to be enhanced with research-based pedagogy. The main objectives of the project are to: (1) transform an introductory engineering course to dramatically improve interactivity and accessibility for non-STEM students; (2) ensure that the course takes a form that can be readily adopted into the engineering and general education curricula of many types of institutions of higher education; and (3) facilitate dissemination, adoption, and continuous improvement of the courses beyond the audience already being reached. Members of the CST serve as Co-PI and on the management team. Their main responsibilities include leading project evaluation, supporting the infusion of evidenced-based teaching practices into the targeted courses, and disseminating the findings and work of the grant. The CASCE project aligns with the Council's commitment to providing excellent STEM educational opportunities and contributing to the growing body of knowledge on STEM education.

b. CST-Funded Research

The CST provides funding to support research that cross disciplinary boundaries; courses that provide research opportunities for students; workshops or conferences that showcase or advance research; or a combination of research, course development, and opportunities for intellectual exchange. The following subsections provide two examples of funded proposals. More information about funded proposals is available [HERE](#).

i. Forensic Anthropology (Janet Monge, Jeffery Himpele, and Carolyn Rouse; ANT)

Members of the Anthropology Department are preparing to engage in a large-scale research project that advances the field of forensic and cultural anthropology. Forensic anthropology deals with medico-legal cases where human remains are recovered that have lost 'personhood'. That is, where the remains cannot be identified as an individual because of decomposition or destruction of the unique features of a person (skeletal, mummified, partially decomposed, burned, co-mingled human remains). The CST funded one component of the large-scale research project, engaging undergraduate students in a new Forensic Anthropology and Epigenetics course (ANT 309/STC 310). The course provides students with the unique opportunity to work with a substantial collection of medical and socio-economic data. The students will learn to critically assess the resources, methods and application of forensic anthropology.

- ii. Development and use of new electronic instruments for PLOrk (Jeffery Snyder and Daniel Trueman; MUS).

Under the mentorship and apprenticeship of faculty in Music, students assisted with the development of new electronic instruments for the Princeton Laptop Orchestra (PLOrk). CST provided funding to support the students working on the development of the new instruments and to purchase materials for prototyping the electronic instruments.

IV. Synergies

The Council offers and supports synergistic activities that attend to the fundamentals of STEM, explore the societal impact of STEM, and investigate the connections across the natural sciences, engineering, arts, humanities, and social sciences. Activities include courses, workshops, seminars, projects, informal learning opportunities, and events for faculty, post-doctoral fellows, graduate and undergraduate students, and community members. The following subsections describe the Council's 2016-2017 synergistic activities.

a. Evinin Lectures

The Evinin Lectures were established with a gift from Anthony B. Evinin to promote a better understanding of the critical roles of science and technology in all aspects of human endeavor. Since 1991, the Council on Science and Technology has invited luminaries in the fields of science, math, engineering and technology to explore topics of interest to a broad audience. These lectures are free and open to the public. The Council hosted the following Evinin Lecture:

- On April 18, 2017, **Norah Zuniga Shaw**, an artist, facilitator and creative director focusing on choreographic ideas as the locus for interdisciplinary and intercultural discovery delivered the annual Evinin Lecture. Her lecture, *What else might Physical Thinking look like?*, engaged the audience in *exploring her work and vision for fostering better futures through innovation driven by creative motion and choreographic thinking*. Norah is known for her award-winning digital projects integrating art and science research. She tours her work internationally and since 2004, has been based at The Ohio State University.

b. Co-Curricular and Informal Learning Experiences

The CST offered the following co-curricular, extra-curricular or informal learning opportunities:

- The CST welcomed the Class of 2019 by hosting the annual Women in STEM Panel and participating in the Academic Expo during Freshmen Orientation. The Women in STEM Panel was moderated by the Council Associate Director, Evelyn Laffey. Panel participants included: Nozomi Ando (Chemistry), Naomi Leonard (Mechanical and Aerospace Engineering), Katharine Holmes (Class of 2017), and Tigist Menkir (Class of 2019). During the Academic Expo, members of the Council staff greeted approximately 150 students, shared information, and answered questions.
- During the Fall 2016 semester, GEO102B students continued the class exercise of discussing paleoclimatology concepts using the Art Museum collections. Students from the class then worked with Dr. Riihimaki and Dr. White to create an installation in the Works on Paper study room of climate-related art, documented on the website <http://artmuseum.princeton.edu/object-package/art-and-climate-making-invisible-visible/96500>. In 2017-2018, CST will be working with the Art Museum to offer a Freshman Seminar on the intersections between art and science, and to co-sponsor another interdisciplinary panel discussion, this time on the use of seashells in artwork of the ancient Americas.
- The CST is dedicated to creating extra-curricular opportunities in which undergraduate and graduate students may take on leadership roles. This past year we enhanced the CST *Ambassador Program*. Students were invited to apply and become involved in three leading roles: StudioLab *Super User*, *STEM Education and Outreach Coordinator*, *Communications Ambassador*.
 - A total of 10 undergraduate and graduate students are our core group of ambassadors and are involved in furthering the mission of the CST. They are responsible for our StudioLab Cafes, which are weekly open hours and workshop times. The ambassadors create a welcoming environment and engage a diverse community in exploring the intersection of STEM, the arts, humanities, and social sciences.
- Mass Incarceration Design Challenge. The goal was to challenge participants to think critically about mass incarceration, to learn, research and design methodologies to assist them in addressing the issues, long-term implications and solutions and create works that challenge our perception of mass incarceration. We partnered with Mass Story Lab, a participatory storytelling project whose workshops include the stories of people directly impacted by mass incarceration. They become the transformative lens through which communities imagine a world beyond prisons.
- Princeton Public Library. Sharon De La Cruz and Kelsey R. Ockert, the Technology Librarian at Princeton Public Library, held a “Halloween light up cards” workshop, where participants explored the basics of circuit making and paper crafts. This is the first of a series of collaborative workshops between Princeton Public library and CST.
- During the 2016-2017 academic year, the CST partnered with the Writing Center to create the STEM and Writing Ambassadors program. Five undergraduates worked with staff members from the CST and the Writing Center to plan and implement two workshops designed to help students with writing in their STEM courses.

- CST awarded over \$5000 to undergraduate and graduate students via the Student Activities Funding Engine (SAFE). Funding supported individual projects, student organizations, and activities open to the public.
- Dr. Riihimaki contributed to the Geoscience Education community in several projects. She joined the [Traveling Workshop Program](#), which sends experts like Dr. Riihimaki to geoscience and environmental science programs across the country to strengthen their vision, curriculum structure, and administration. She continued working with the [Classroom Observation Project](#) by serving as a classroom observer, documenting the teaching styles, techniques, and content in various lecture settings. Finally, she served as a member of the planning team for the [Earth Educators Rendezvous](#), an annual meeting aimed at bringing together educators who teach about the Earth in K12 to higher education settings.
- During July 2017, CST (Sharon De La Cruz, Aatish Bhatia, Paul Durst) organized and facilitated an online book club in collaboration with the p5.js programming community, as part of their Diversity with Code + Art series (<http://diversity.p5js.org/>). The virtual book club discussed Seymour Papert's *Mindstorms*, a classic book about radical approaches to computer science pedagogy. The discussion involved a diverse, international group of collaborators including programmers, mathematicians, artists, community organizers, educators, graduate and undergraduate students, and more. Participants met weekly for 5 weeks to discuss readings and share reading responses in the form of discussion posts, articles, and web programs. Graduate student and CST Ambassador Lian Zhu created a blog archive for the discussion at <http://mindstormsread.blogspot.com/>
- On June 17th, Sharon De La Cruz, Aatish Bhatia, Evelyn Laffey and two CST ambassadors (graduate student Bernat Guillen Pegueroles and undergraduate Alice Tang) engaged a group of middle school and high school students in a workshop on *Making Circuits with Everyday Things*. The students learned about the pentatonic scale and the basics of electricity and circuits. They used conductive paint, paper and an Arduino to build and tune their own functional paper pianos. The event was part of the TED-Ed outreach weekend that welcomed students from around the world to the TED offices in New York City.
- CST members Aatish Bhatia and Kathy Galvin partnered with graduate students Stevie Bergman and Brian Kraus (co-hosts of WPRB's science radio show) and the Princeton Laptop Orchestra (led by Jeff Snyder and Mike Mulshine) to develop a Live Radio Event. *The Science of Memory* was held on February 24 during Alumni Weekend and engaged a standing room only audience at Taplin Auditorium in a show that featured Mike Lemonick, author of *The Perpetual Now: A Story of Amnesia, Memory and Love* and Princeton neuroscientist Sabine Kastner in a discussion on how our minds remember and forget. The discussion led by Brian and Stevie was interspersed with performances by the Princeton Laptop Orchestra, including a piece commissioned for the show with sounds based on mathematical models of neuron firing (developed by Jeff Snyder and Aatish Bhatia), with a visualization developed by undergraduate student Drew Wallace (who also designed the poster for the event). A writeup of the event by undergraduate David Exumé is available at <http://nassauweekly.com/cosmic-vibes-forgotten-lives/>

- In the last year, CST sponsored the WPRB science radio talk show *These Vibes are Too Cosmic*, hosted by physics graduate students Stevie Bergman and Brian Kraus. The show features an eclectic mix of music, interviews with scientists and researchers engaged in STEM including policy makers and public health professional, as well as news about recent science findings and science themed events in the surrounding area. CST worked to enable the show to develop a podcast of their back-catalog of episodes, and has also providing funding for an undergraduate intern David Exumé, who has been editing the weekly show for the podcast, now available on iTunes or any podcasting app.
- On May 5th, CST members Sharon De La Cruz, Aatish Bhatia, Evelyn Laffey, Mike Galvin, and CST Ambassador Bernat Guillen Pegueroles engaged 75 high school students attending the W.E.B. DuBois Scholars Institute in a workshop on *Paper Piano: Making Circuits With Everyday Things*. The students learned about the pentatonic scale and the basics of electricity and circuits, and worked with conductive ink and Arduinos to collect data and ‘tune’ their paper pianos.

c. Conferences, Presentations, Publications & Committees

Members of the CST attended relevant national and regional conferences. These conferences offered excellent professional development and learning opportunities, as well as venues to share the work of the CST. A few examples of conference attendance and presentations are as follows:

- In December 2016, Aatish Bhatia gave a talk and participated in a cross-disciplinary panel discussion at The Parsons School of Design, The New School as part of a symposium on *Observational Practices and the Everyday: Talking about Seeing*. The discussion focused on the role of observation across different disciplinary lenses, and is archived at <http://www.observationalpractices.org/symposium-2/>
- In December 2016, Aatish Bhatia gave a talk at the Rutgers University Physics Department Colloquium on *The Physics Of Everyday Life*. Slides are available at <http://www.princeton.edu/~aatishb/talks/rutgers2016/assets/player/KeynoteDHTMLPlayer.html#0>
- Dr. Riihimaki co-led the 3-day workshop *Preparing for an Academic Career* at the 2017 Earth Educators Rendezvous (http://serc.carleton.edu/earth_rendezvous/2017/program/morning_workshops/w1/index.html). This session provided mentoring to 30 graduate students and postdoctoral fellows who are interested in working in academic settings for their careers. She also developed and led the 3-hour workshop *What is Implicit Bias and How to Counteract It* (http://serc.carleton.edu/earth_rendezvous/2017/program/afternoon_workshops/w14.html), which attracted 25 participants and got very strong reviews.
- Dr. Riihimaki co-developed and co-led a session *The Art of the Elevator Pitch* for 20 high school students at the Youth Climate Summit, Ballston Spa, NY, May 23-24.
- Dr. Riihimaki co-developed and co-led three course development workshops in collaboration with the McGraw Center for Teaching and Learning. The May 24-25 and July 27 workshops were aimed at any faculty revising or developing courses, especially those receiving funding from the

250th Fund for Innovation. The December 2, offered in collaboration with members of the Service and Civic Engagement Task Force, was targeted at faculty interested in creating a course focused on service and civic engagement.

- Dr. Riihimaki presented the talk “Enhancing Science Literacy and Art History Engagement at Princeton Through Collaboration Between the University Art Museum and the Council on Science and Technology” at the American Geophysical Union, Fall National Meeting. The talk was co-authored by Veronica White from the Princeton University Art Museum.
- Sharon Lee De La Cruz presented on diversity and STEM accessibility at the Processing Community Day in Oct 2017.

The Council participated in university-wide and strategic planning committees. The committees included: Committee on Classrooms and the Schedule, Committee on the Course of Study, Academic and Administrative Management Group, and the School of Engineering and Applied Sciences Taskforce on the Undergraduate Curriculum. Committees outside of the University include the New Jersey Higher Education Partnership for Sustainability and the AAU STEM Education Initiative Network.

V. Summary and Looking Ahead

CST continues to serve the University by catalyzing and supporting intellectual exchange, interdisciplinary research, excellent courses, and multidisciplinary collaboration that broaden participation in and appreciation of science, technology, engineering and mathematics (STEM). As originally mandated, CST engages a broad audience in meaningful STEM experiences. Currently, CST aims to understand the dynamic nature of STEM in the 21st Century and provide diverse opportunities to engage members of the Princeton University community.

As we look to the future of the CST, we will continue to advance undergraduate STEM education. Additionally, we will continue to define and advance the *Living at the Intersections* initiative, which aims to bridge the gap between STEM and the arts, humanities and social sciences. CST initiatives will continue to inform practice: new courses will emerge from supported research; multidisciplinary discussions will inform new research agendas and courses; rigorous evaluation on cognition and affect will inform educational practice.

Appendix A – 2016-2017 CST Administration and Executive Committee

Visit us online: <http://cst.princeton.edu>

Administration

Dr. Aatish Bhatia, Associate Director, Engineering Education

Dr. Bhatia supports science and engineering education initiatives at the Council. He has disciplinary expertise in the fields of physics, bioinformatics, physics and engineering education, and science communication. His Ph.D. research focused on numerical methods to detect signatures of natural selection using genetic data. Aatish is actively engaged in science communication, and his popular science writing has been published online by WIRED and Nautilus Magazine, and in print in The Best Online Science Writing 2012 (Scientific American Books).

Mr. Joseph Capizzi, Program Coordinator

Mr. Capizzi assists the Senior Associate Director with the daily operations of the Council. His main areas include budget management, course administration providing opportunities for undergraduate and graduate students to engage with the CST activities.

Ms. Sharon Lee De La Cruz, Assistant Director, StudioLab Initiatives

Sharon is responsible for advancing CST initiatives and activities by developing, implementing, and supporting relevant programming that build capacity of the StudioLab. She also engages in areas of teaching, as well as with ongoing creative and technical work. Sharon works with students and faculty to develop new or enhance existing courses/projects that align with the CST mission.

Mrs. Katherine Galvin, Event and Office Coordinator

Katherine is responsible for the coordination of all CST events. She facilitates the development and distribution of the CST newsletter. Katherine is responsible for all CST marketing and promotions.

Dr. Evelyn H. Laffey; Senior Associate Director

Dr. Laffey serves as the administrative head of the Council. She is responsible for the daily operations, as well as long term and strategic planning in partnership with the Director. To advance the CST initiatives, Evelyn cultivates relationships with academic and administrative units to develop synergistic collaborations across campus. She remains active in educational research activities as she continues to study the intersection of cognition, affect, and identity within STEM education.

Prof. Naomi E. Leonard, Director, Council on Science and Technology; Edwin S. Wilsey Professor of Mechanical and Aerospace Engineering

Dr. Leonard is the Edwin S. Wilsey Professor of Mechanical & Aerospace Engineering. She serves as the Faculty Director of the Council, overseeing the overall direction of the Council and future initiatives. In addition to her responsibilities at the Council, she is Associated Faculty with the Program in Applied & Computational Mathematics and Affiliated Faculty with the Princeton Neuroscience Institute and Quantitative and Computational Biology.

Dr. Catherine Riihimaki, Associate Director, Science Education

Dr. Riihimaki supports science education initiatives at the Council. Her disciplinary expertise rests in the fields of environmental science, geoscience, and geographic information systems. Catherine has worked primarily in the US Rocky Mountains, with ongoing projects on Holocene environmental records from lake sediment in Glacier National Park, Montana, and coal-based evidence of river erosion in the Powder River basin, Wyoming and Montana. She continues to collaborate with colleagues across disciplinary boundaries by serving as the project expert in GIS.

Mrs. Laura Sarubbi, Program Coordinator (appointment concluded January 2017)

Mrs. Sarubbi is responsible for coordinating the daily operations of the Council. In addition to budgetary and program management, she coordinates student efforts and the creation of the Council's new StudioLab. Laura is responsible for developing, enhancing, and sustaining the new CST Student Ambassador program, which provides an opportunity for undergraduate and graduate students to engage with the CST activities.

Dr. Jaclyn Schwalm, Associate Director, Science Education (appointment concluded September 2016)

Dr. Schwalm consults with and is a lecturer in the Molecular Biology Department. She also serves as an Academic Advisor in Butler College. As part of the Science & Engineering Education Initiative (SEEI), Jaclyn worked with the faculty teaching Molecular Biology courses to incorporate research-based teaching practices, including greater levels of in-class interaction, the use of student-response systems, and increased formative assessment. More recently, her research has been focused on education. One of her current research projects focuses on better understanding the experiences of students who take part in the FSI, and how the FSI impacts these students' first few years at Princeton.

CST Executive Committee

The CST Executive Committee consists of several faculty members from diverse academic disciplines. The Committee members engage with the CST to advance STEM literacy, cultivate programming and courses that align with the mission, oversee the ST-designation, and allocate funding via the CST annual call for proposals. During the 2015-2016 academic year, the Executive Committee members were:

Rebecca Burdine, Associate Professor of Molecular Biology

Thomas Funkhouser, David M. Siegel '83 Professor in Computer Science

Maria Garlock, Professor of Civil and Environmental Engineering; Co-Director, Program in Architecture and Engineering

Adele Goldberg, Professor of Psychology

Michael Gordin, Rosengarten Professor of Modern and Contemporary History. Professor of History. Director, Society of Fellows in the Liberal Arts.

Naomi Leonard, Director, Council on Science and Technology; Edwin S. Wilsey Professor of Mechanical and Aerospace Engineering

Daniel Marlow, Evans Crawford 1911 Professor of Physics

Daniel Trueman, Professor of Music

**Appendix B – ST-Designated Courses that Aligned with the
Science and Engineering Education Initiative with Examples of our Work with Faculty**

Summer 2016

STL Courses – Science and Technology with Lab

EGR/STC 150	Foundations of Engineering
*MOL 152	Laboratory Research in the Life Sciences

Fall 2016

STL Courses – Science and Technology with Lab

ANT 215	Human Adaptation
CEE 102B	Engineering in the Modern World
EEB 211	The Biology of Organisms
EEB 417B	Ecosystems and Global Change
FRS 133	Materials World
*GEO 102B	Climate: Past, Present, and Future
GEO 201	Measuring Climate Change: Methods in Data Analysis and Scientific Writing
PHY 101	Introductory Physics I
PHY 115B	Future Physics
PSY 101	Introduction to Psychology
VIS 418	Extraordinary Processes

STN Courses – Science and Technology without Lab

AST 205	Planets in the Universe
FRS 147	The Science of Mythbusters
*GEO 102A	Climate: Past, Present, and Future
MAE 228	Energy Solutions for the Next Century
NEU 201	Fundamentals of Neuroscience
PHY 115A	Future Physics
STC 349	Writing about Science

Spring 2017

STL Courses – Science and Technology with Lab

*CEE 262B	Structures and the Urban Environment
ELE 201	Information and Signals
ENV 200B	The Environmental Nexus
FRS 106	Art and Science of Motorcycle Design
FRS 124	State of the Earth: Shifts and Cycles (in France and Spain)
GEO 103	Natural Disasters
GEO 202	Ocean, Atmosphere, and Climate
PHY 240	Galactic Exploration with Invisible Light
PSY 101	Introduction to Psychology

STC 209B Transformations in Engineering and the Arts

STN Courses – Science and Technology without Lab

AST 204	Topics in Modern Astronomy
EEB 311A	Animal Behavior
ENE 202	Designing Sustainable Systems: Demonstrating the potential of sustainable design thinking
ENV 200F	The Environmental Nexus
FRS 146	What Makes a Great Experiment?
FRS 152	Drug Discovery: From Snake Venoms to medicines
FRS 156	Transformative Questions in Biology
GEO 299	StudioLab: El Nino, Global Climate Change and the Earth's Habitability
MAE 328	Energy for a Greenhouse-Constrained World
MOL 101A	From DNA to Human Complexity
*WWS 350	The Environment: Science and Policy

*Description of the CST collaboration with faculty teaching the course provided below.

MOL/STC152: CST Associate Director Jaclyn Schwalm collaborated with faculty in the Molecular Biology Department and the *Freshman Scholars Institute* (FSI) program to design and teach a laboratory course that engaged undergraduate students in original scientific research. The course introduces students to hands-on, discovery-based research in the life sciences at the very beginning of the Freshman Scholar's college education. Students, by experiencing the excitement of working on their own research project and prototypes, will develop a more realistic and more inspirational impression of what it will mean to be a STEM major. Furthermore, they will enhance their biology content knowledge and laboratory skills.

GEO102B and GEO201A: In this course, CST Associate Director Catherine Riihimaki worked with instructor Dr. Danny Sigman (GEO) and lead lab instructor and course coordinator Danielle Schmitt (GEO) to completely redesign the course in Fall 2015. It previously had been co-taught as a smaller seminar of ~30 students. In Fall 2015, the course had ~120 students. The CST supported the design of active learning activities during lecture, new lab activities to highlight climate research questions and methods, formative assessment opportunities throughout the semester, and exams as capstone experiences for the students. The course received strong student evaluations and will likely have over 200 students in Fall 2016.

CEE 262: In this course, CST Associate Director Aatish Bhatia consulted with the teaching staff to improve educational outcomes, and helped design, implement, document, and assess interactive lecture demonstrations and activities. Aatish is part of a NSF funded project on furthering the *Creative Art of Structural & Civil Engineering* (CASCE), in collaboration with course instructor Dr. Maria Garlock and CST Senior Associate Director Dr. Evelyn Laffey, and has contributed to research in this area presented at the annual ASEE conference, helped organize annual conferences (held in 2016 at UMass Amherst, and in

2015 and 2017 at Princeton University), and helped disseminate course materials as well as our pedagogical approach to teaching civil engineering.

WWS350: In this course, CST Associate Director Catherine Riihimaki worked with co-instructors Dr. David Wilcove (EEB and WWS) and Dr. Jin Sato (visiting professor in EAS) to re-envision a course that previous had been taught by two scientists, to instead incorporate social science concepts consistent with Dr. Sato's background. Dr. Riihimaki participated in course development before the semester and met with the teaching team throughout the semester. She also oversaw mentoring of the AI team to ensure consistency and quality across the nine precept sections. The precepts were particularly valued by students in their end-of-semester evaluations.