



# Facilitating a Culture of Interdisciplinary Collaboration

THE **STEAM**  
FACTORY

 THE OHIO STATE UNIVERSITY



RESEARCH



INNOVATION



COLLABORATION



DISSEMINATION



EDUCATION





# WELCOME TO THE STEAM FACTORY,

OHIO STATE'S GRASSROOTS INTERDISCIPLINARY COLLABORATION FACILITATOR IN DOWNTOWN COLUMBUS!

Founded in December of 2012 by a handful of Ohio State faculty, postdocs and staff, The STEAM Factory has organically grown to a team of over 120 members spanning more than 80 fields of study. It has become the single most diverse cross-section of the university's world-class work force and an award-winning team of academic superheroes that is:

- laying the groundwork for the next generation of interdisciplinary collaboration
- breaking the town and gown barrier
- exemplifying the land grant mission of the Ohio State University
- supporting ongoing partner efforts to cultivate a Franklinton arts and innovation hub
- supporting the local economy
- forming an important outreach model for universities across the world

At the same time, members continue to excel in their respective departmental responsibilities of research, teaching and service. The STEAM Factory's work is being voluntarily done by some of Ohio State's top employees during the early morning, late evening and weekend hours, all because our members understand the strength, impact, and importance of combining diverse resources and expertise in trying to solve humanity's greatest problems.

Creating a culture of interdisciplinary collaboration requires a bottom-up initiative with top-down support. **The STEAM Factory is the bottom-up solution to creating a culture of interdisciplinary collaboration within the University system.** We offer our members a suite of services designed to help facilitate and promote interdisciplinary collaboration:

- Our monthly themed interdisciplinary seminars known as "STEAM Exchanges" bring multiple faculty perspectives to bear on a single topic in order to help identify opportunities for cross-collaboration.
- Our "STEAM Powered" seed funding program provides our members with the initial capital necessary to launch new collaborative projects.
- Our public presentations provide outreach and engagement opportunities for our faculty, which are coupled with letters of support for research grant applications.
- Our social media and marketing campaigns highlight the work and partnership of our members.
- Our collaborative research space at 400 West Rich creates the necessary environment to connect even more researchers by creating new opportunities for information sharing and exchange across the University community.
- Finally, diverse talents and resources are shared freely among our close-knit members in order to provide the support necessary for developing successful collaborations.



Why Interdisciplinary? Why 400 West Rich, Franklinton, Downtown Columbus?

**Knowledge is our strength and diversity is our advantage.** The Ohio State University is one of the largest educational institutions in the world, in which each department has historically run the risk of operating like a city unto itself. But in this information-saturated era, there are fewer and fewer boundaries in every aspect of our culture, and that common meeting ground is where much of the world's most innovative research, design, industry, art and education is being born. The STEAM Factory cultivates and represents diversity in action in many forms:

- **Academic** - 80+ disciplines are represented within the STEAM membership, including 69 departments and 17 colleges, offices and institutes within the university
- **Underrepresented Groups** – The STEAM membership is 43% women and 23% underrepresented groups
- **Funding** - supported by seven colleges and offices within Ohio State University

Political theorist Professor Danielle Allen describes “...teams and communities that, first, emphasize bridging ties and, second, successfully learn how to communicate across their differences outperform more homogenous teams and communities with regard to the development and deployment of knowledge.”<sup>1</sup>

This speaks to the reasons The STEAM Factory chose 400 West Rich and Franklinton as our home. While this organization represents a diverse collection of academics, innovation and creativity are not confined within campus walls. Real world problems exist in the real world! With over 120 resident artists, makers, designers, consultants and entrepreneurs, the 400 West Rich address offers constant opportunities for exploration and discovery. It is one of the key anchors of a neighborhood that is quickly becoming a creative laboratory with several other young, nearby institutions committed to various design, invention, technology and art-making concepts.

Franklinton also provides a real-world classroom for Ohio State students, offering them experiences and opportunities they would not otherwise have. Several of our members have taken their classes down to Franklinton in order to provide students with an enriching educational experience and help them discover what challenges await them in the real-world. As Karl Fisch and Scott McLeod so succinctly

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<sup>1</sup> Allen, Danielle. “What We Should be Doing with Diversity on Our College Campuses.” Summer 2013. <<https://www.ias.edu/about/publications/ias-letter/articles/2013-summer/allen-bridging>>



stated, “We are currently preparing students for jobs that don’t yet exist . . . using technologies that haven’t been invented . . . in order to solve problems we don’t even know are problems yet.”<sup>2</sup>

According to an article by education writer Paul T. Corrigan titled “Preparing Students for What We Can’t Prepare Them For,” the rate of technological information alone is currently *doubling* every two years. This is what makes nourishing and developing a neutral ground where collaboration and innovation are valued so critical to students. As Corrigan says, “we *do* know at least one thing that students will need to know in the future: how to learn. We need to set students up to learn outside of college for the rest of their lives. We need to shift from facilitating *learning* to developing *learners*.”<sup>3</sup>

The STEAM Factory is constantly growing and expanding its reach. We are excited about all of the things we have yet to learn from our new colleagues, friends and partners, the innovative learning prospects for our students and the growing engagement with the public. The STEAM Factory invites you to take a deeper look at what we have accomplished over the past years as well as the ways we intend to open new avenues for interdisciplinary collaboration in the future.

Sincerely,

Roman Holowinsky,  
Associate Professor of Mathematics,  
Chair and Co-founder of The STEAM Factory

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<sup>2</sup> Fisch, Karl and McLeod, Scott. “Shift Happens - Globalization; Information Age.” n.p. Uploaded Feb 8, 2007. Web video 21 April 2015. <<https://www.youtube.com/watch?v=ljbl-363A2Q>>

<sup>3</sup> Corrigan, Paul T., “Preparing Students For What We Can’t Prepare Them For.” n.p., n.d. Web. 21 April 2015. <<http://teachingandlearninginhighered.org/2013/07/15/preparing-students-for-what-we-cant-prepare-them-for/>>



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# CHAPTER 1:

## MISSION, VISION, VALUES, AND HISTORY

### OUR MISSION

*To facilitate a culture of interdisciplinary collaboration*

Founded in December 2012 by a collection of young, energetic Ohio State faculty, postdocs and staff, The STEAM Factory is a diverse and inclusive grassroots network in the Ohio State community that facilitates creative and interdisciplinary collaboration, innovation, outreach and education.

### OUR STORY AND PURPOSE

### OUR GOALS

- ▶ Support opportunities for collaboration
- ▶ Enhance and drive innovation across all research disciplines
- ▶ Provide linkages and interdisciplinary interactions among university departments and colleges
- ▶ Increase the public awareness, understanding, and impact of Ohio State research

### OUR FUNCTION

The twin cores of STEAM Factory activity are **Collaboration** and **Dissemination**.

- ▶ **COLLABORATION:** The STEAM Factory provides a space where researchers from all disciplines can broaden their perspectives, share resources, spark creative research ideas, and form collaborations across areas of common interest.

Both formal and informal activities help members to:

- Share research skills, pedagogical resources, equipment and grant writing opportunities
- Learn about current research questions and opportunities for collaboration across all disciplines through a variety of stimulating interactions and activities



- Find support for establishing collaborations via seed funding, proposal development assistance, and links to other resources
- ▶ **DISSEMINATION:** The STEAM Factory helps to bridge the gap between Ohio State and the Columbus community through research dissemination and outreach that is accessible and approachable by combining formal and informal learning. Finding creative ways to reach and engage the Columbus community, such as the Franklinton Friday Open Houses at 400 West Rich, accomplishes the following:
  - Increases public impact of academic research by reaching a demographic typically inaccessible via traditional on-campus methods
  - Establishes connections across all disciplines
  - Encourages critical feedback on research in progress from community members and colleagues
  - Provides a channel for promoting and raising awareness of the work done by individual members, the STEAM Factory, and the greater Ohio State community





## STEAM MEMBERS 2015 - 2016

- ✂ **Alex Oliszewski**, Assistant Professor, Theatre and ACCAD
- ✂ **Alia Dietsch**, Assistant Professor, Environment and Natural Resources
- ✂ **Amul Tevar**, Staff, Ohio State-Battelle Joint Appointee
- ✂ **Amy Youngs**, Associate Professor, Art
- ✂ **Andrew Frueh**, Lecturer, Art
- ✂ **Anna Gawboy**, Assistant Professor, Music
- ✂ **Anne Co**, Assistant Professor, Chemistry and Biochemistry
- ✂ **Annie Specht**, Assistant Professor, Agricultural Communication, Education and Leadership
- ✂ **Arnab Nandi**, Assistant Professor, Computer Science Engineering
- ✂ **Arnulfo Perez**, Assistant Professor, Mathematics
- ✂ **Ayaz Hyder**, Assistant Professor, Environmental Health Sciences
- ✂ **Barbara Wyslouzil**, Professor, Chemical & Biomolecular Engineering, Chemistry and Biochemistry
- ✂ **Behrooz Omidvar-Tehrani**, Postdoctoral Researcher, Computer Science Engineering
- ✂ **Bart Snapp**, Auxiliary Assistant Professor, Mathematics
- ✂ **Ben Caplan**, Professor, Philosophy
- ✂ **Bernadette Hanlon**, Assistant Professor, City and Regional Planning
- ✂ **Charlene Brenner**, Project Coordinator, STEAM Factory
- ✂ **Christine Charyton**, Adjunct Assistant Professor and Visiting Assistant Professor, Neurology
- ✂ **Chris Orban**, Assistant Professor, Physics
- ✂ **David McKenzie**, Graduate Assistant, Graphic Design
- ✂ **David Penneys**, Assistant Professor, Mathematics
- ✂ **David Staley**, Assistant Professor, History
- ✂ **Derrick Tillman-Kelly**, University Innovation Alliance Fellow, Office of Academic Affairs
- ✂ **Donald Hubin**, Professor, Philosophy
- ✂ **Dustin Mixon**, Assistant Professor, Mathematics
- ✂ **Eddie Pauline**, Director of Business Development, Office of Economic and Corporate Engagement
- ✂ **Elliot Bendoly**, Professor, Management Sciences
- ✂ **Emily Shaw**, Assistant Professor, Head of Preservation and Reformatting
- ✂ **Emma Oti**, Graduate Student, Earth Sciences
- ✂ **Eric England**, Assistant Professor, Animal Sciences
- ✂ **Eric Katz**, Assistant Professor, Mathematics
- ✂ **Frances Sivakoff**, Post Doctoral Researcher, Entomology
- ✂ **Ghaith Hiary**, Assistant Professor, Mathematics
- ✂ **Giorgio Rizzoni**, Professor, Mechanical and Aerospace Engineering, and Electrical and Computer Science Engineering
- ✂ **Harmony Bench**, Assistant Professor, Dance
- ✂ **Harvey Miller**, Professor, Geographic Information Science



## STEAM MEMBERS 2015 - 2016

- ✂ **Huan Sun**, Assistant Professor, Computer Science and Engineering
- ✂ **Jason Cervenc**, Education and Outreach Director, Byrd Polar and Climate Research Center
- ✂ **Jason Coronel**, Assistant Professor, Communication
- ✂ **Jeff Bielicki**, Assistant Professor, Civil Engineering, Geodetic Engineering
- ✂ **Jeff Agnoli**, Assistant Professor, Office of Research
- ✂ **Jennifer Schlueter**, Associate Professor and Associate Chair, Theatre
- ✂ **Jennifer Sinnott**, Assistant Professor, Statistics
- ✂ **Jesse Kwiek**, Assistant Professor, Microbial Infection and Immunity
- ✂ **Jessica Logan**, Research Scientist, Crane Center for Early Childhood Research and Policy, Education and Human Ecology
- ✂ **Jim Chen**, Assistant Professor, Biomedical Informatics, Internal Medicine and Medical Oncology
- ✂ **Jim Fowler**, Assistant Professor, Mathematics
- ✂ **John Beacom**, Professor, Physics, Astronomy, CCAPP
- ✂ **John Pieper**, Administrative Manager, Mathematics
- ✂ **John Phippen**, Associated Faculty, Agricultural Technical Institute
- ✂ **Jonathan Brown**, Research Scientist/ Lecturer, Chemical and Biomolecular Engineering
- ✂ **Jonathan Capps**, Graduate Student, Art
- ✂ **Jonathan Song**, Assistant Professor, Mechanical Aerospace Engineering
- ✂ **Joshua Goldberger**, Assistant Professor, Chemistry and Biochemistry
- ✂ **Julie Carpenter-Hubin**, Assistant Vice President, Institutional Research and Planning
- ✂ **Kathryn Campbell-Kibler**, Associate Professor, Linguistics
- ✂ **Karen Dannemiller**, Assistant Professor, Civil, Environmental and Geodetic Engineering, Environmental and Health Sciences
- ✂ **Kareem Usher**, Assistant Professor, City and Regional Planning
- ✂ **Kathryn Kelley**, Director, Ohio Manufacturing Institute, Engineering
- ✂ **Kathy Malone**, Assistant Professor, Science Education
- ✂ **Katie Walton**, Assistant Professor, Psychology, Nisonger Center
- ✂ **Keith Warren**, Associate Professor, Social Work
- ✂ **Kelly Purtell**, Assistant Professor, Human Sciences
- ✂ **Ken Rinaldo**, Professor, Art, Art & Technology
- ✂ **Kip Curtis**, Assistant Professor, History
- ✂ **Laura Wagner**, Associate Professor, Psychology
- ✂ **Lauren Jones**, Assistant Professor, Human Sciences
- ✂ **Lauren Squires**, Assistant Professor, English
- ✂ **Leonardo Carrizo**, Lecturer, Communication

## STEAM MEMBERS 2015 - 2016

- ✂ **Leslie C. Moore**, Associate Professor, Teaching and Learning
- ✂ **Lisa Hall**, Assistant Professor, Chemical and Biomolecular Engineering



- 🔗 **Lise Worthen-Chaudhari**, Assistant Professor, Physical Medicine and Rehabilitation
- 🔗 **Liz Sanders**, Associate Professor, Design
- 🔗 **Liz Vivas**, Assistant Professor, Mathematics
- 🔗 **Manoj Srinivasan**, Associate Professor, Mechanical Aerospace Engineering
- 🔗 **Mark Rudoff**, Associate Professor, Cello and Chamber Music
- 🔗 **Mary Faure**, Director, Engineering Technical Communications
- 🔗 **Mary Tarantino**, Professor, Theatre
- 🔗 **Matt Kahle**, Associate Professor, Mathematics
- 🔗 **Maurice Stevens**, Associate Professor, Comparative Studies
- 🔗 **Melissa Crum**, Adjunct, The Barnett Center for Integrated Arts and Enterprise
- 🔗 **Meris Mandernach**, Associate Professor, Head of Research and Education
- 🔗 **Mindi Rhoades**, Assistant Professor, Teaching and Learning
- 🔗 **Nancy Santagata**, Visiting Scholar, Chemistry
- 🔗 **Niles Johnson**, Assistant Professor, Mathematics
- 🔗 **Oksana Chkrebti**, Assistant Professor, Statistics
- 🔗 **Paul Sutter**, Cosmological Research and Community Outreach Coordinator, CCAPP and Chief Scientist at COSI
- 🔗 **Pierluigi Bonello**, Professor, Plant Pathology
- 🔗 **Psaras McGrier**, Assistant Professor, Chemistry and Biochemistry
- 🔗 **Rebecca Ricciardo**, Lab Supervisor, Chemistry and Biochemistry
- 🔗 **Rick Voithofer**, Associate Professor, Educational Policy and Leadership
- 🔗 **Rob Pyatt**, Associate Professor-Clinical, Pathology
- 🔗 **Roman Holowinsky**, Associate Professor, Mathematics
- 🔗 **Ryan Harne**, Assistant Professor, Mechanical and Aerospace Engineering
- 🔗 **Sam White**, Associate Professor, History
- 🔗 **Samantha Frost**, Director, Advancement Events
- 🔗 **Sandra Enmil**, Program Director, University Libraries, Copyright Resources Center
- 🔗 **Sanjeevi Krishnan**, Assistant Professor, Mathematics
- 🔗 **Sathya Gopalakrishnan**, Assistant Professor, Agricultural Environmental and Development Economics
- 🔗 **Scott Lloyd DeWitt**, Associate Professor, English
- 🔗 **Shoshanah Goldberg-Miller**, Assistant Professor, Art Administration, Education and Policy
- 🔗 **Skyler Cranmer**, Associate Professor, Political Science
- 🔗 **Sonia Manjon**, Associate Professor, The Barnett Center for Integrated Arts and Enterprise, Arts Administration, Education and Policy, Latina/o Studies
- 🔗 **Steffen Lindert**, Assistant Professor, Chemistry and Biochemistry

## STEAM MEMBERS 2015 - 2016

- 🔗 **Stephan Frank**, Post Doctoral Researcher and Lecturer, Astronomy
- 🔗 **Sujan Manandhar**, Manager, Distance Learning and Technology and Center for Languages Literatures and Cultures



- 🔗 **Susan Gershman**, Assistant Professor, Evolution, Ecology and Organismal Biology
- 🔗 **Tasos Sidiropoulos**, Assistant Professor, Computer Science Engineering and Mathematics
- 🔗 **Theodore Chao**, Assistant Professor, Mathematics Education
- 🔗 **Tijs van Maasackers**, Assistant Professor, City and Regional Planning
- 🔗 **Tim Linden**, Post Doctoral Fellow, Physics CCAPP
- 🔗 **Tracie McCambridge**, Educator for Teacher and Docent Programs, Wexner Center for the Arts
- 🔗 **Zakee Sabree**, Assistant Professor, Evolution, Ecology and Organismal Biology
- 🔗 **Zoë Plakias**, Assistant Professor, Agricultural, Environmental, and Development Economics

### STEAM ALUMNI MEMBERS

- 🔗 **Aurelie Vialette**, Assistant Professor, Spanish Portuguese
- 🔗 **Cheng Zhang**, Post Doctoral Student, AACAD,
- 🔗 **David McKenzie**, Graduate Student, Graphic Design
- 🔗 **Elsa Donovan**, Assistant Professor, Pediatrics
- 🔗 **Gaj Sivandran**, Assistant Professor, Civil Engineering and Geodetic Engineering
- 🔗 **Hugh Morris**, Post Doctoral Researcher, Biomedical Engineering, College of Optometry
- 🔗 **Johanna Devaney**, Assistant Professor, Music
- 🔗 **Kate Harkin**, Director, P-12 Initiative
- 🔗 **Luis Rademacher**, Assistant Professor, Computer Science Engineering
- 🔗 **Mike Mandel**, Research Scientist, Computer Science Engineering
- 🔗 **Noelle Beckman**, Post Doctoral Researcher, Mathematical Biosciences Institute
- 🔗 **Sam Handelman**, Research Assistant Professor, Molecular Virology, Immunology & Medical Genetics
- 🔗 **Stephen Takas**, Lecturer, Art
- 🔗 **Tanya Saunders**, Assistant Professor, African-American & African Studies



## STEAM FACTORY AT-A-GLANCE

- ▶ Grew over 500% since June 2014, from 24 members to 123 members (July 2016) spanning over 70 disciplines
- ▶ Organized 80+ outreach events reaching 10000+ people in the past four years
- ▶ Since 2014, the STEAM Factory has had eight members awarded NSF Early CAREER Awards with STEAM letters of support for broader impact of research activities
- ▶ STEAM Factory's strength is in its diversity:
  - Funding - supported by seven colleges and offices within Ohio State
  - Academic - 80+ disciplines represented by STEAM membership including 69 departments and 18 colleges, offices and institutes within the university
  - Underrepresented Groups – 43% women represented by STEAM membership and 23% underrepresented racial/ethnic groups
- ▶ Since 2013, the STEAM Factory has hosted over 35 Franklinton Friday and Farmers Market faculty presentations with an average audience of 200 people, and over 7000 people in attendance total. These outreach activities have included 50 Ohio State faculty representing 25+ academic disciplines
- ▶ Over 80 undergraduate and graduate students have presented at STEAM outreach activities
- ▶ Since 2014, the STEAM Factory has hosted 22 STEAM Exchanges (salon-style colloquia) with an average of 30 attendees at each STEAM Exchange, representing over 60 different disciplines. The 49 faculty STEAM Exchange presenters have represented 27 disciplines and attendees have represented over 60 disciplines
- ▶ Since their development in January 2016, STEAM Powered Project (SPP) seed grants have:
  - Awarded a total of \$35,200 in funding
  - To seven collaborative interdisciplinary projects in research, teaching and outreach
  - SPP funding has supported 16 STEAM Factory faculty members projects (and 3 non-STEAM faculty members),
  - SPP faculty have represented 15 different disciplines





## STEAM FACTORY GROWTH



Since June of 2014, The STEAM Factory has experienced 500% growth in its membership, increasing from 24 to over 120 members and widening the breadth of disciplines represented from 15 to more than 80, spanning 18 colleges and centers within Ohio State.

The STEAM Factory takes on the dual challenges of enhancing collaboration across all of the university's research disciplines and engaging the community through provision of unique, transformational opportunities for Ohio State researchers. Members are able to share innovative research projects directly

with a public audience that might otherwise be difficult to reach. The STEAM Factory also develops and mobilizes community and industry partnerships that bring real-world expertise and knowledge to Ohio State students.

The STEAM Factory is located among the artists and innovators at 400 West Rich, in the heart of Franklinton's urban renewal efforts and within close proximity to downtown Columbus, COSI and the Columbus Idea Foundry. This off-campus presence enhances community engagement defined by the Carnegie Foundation as: "the collaboration between institutions of higher education and their larger communities for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity."

The STEAM Factory has relied on a variety of program activities to spark faculty conversations and innovative methods and venues for research dissemination. The STEAM Factory continues to seek opportunities that will support its mission and help expand the range and impact of its interdisciplinary programming.



## STEAM FACTORY MEMBER SUCCESSES

STEAM Factory members are recognized nationally and internationally for their accomplishments in their fields. The recognized members from 2013 – 2016 include:

- **Sanjeevi Krishnan, Assistant Professor, Department of Mathematics**, Air Force Office of Science Research Award, 2016
- **Matt Kahle, Assistant Professor, Department of Mathematics**, NSF RTG Award 2016
- **Jason Cervenec, Education and Outreach Director, Byrd Polar Research Center** – NSF AISL Award, 2016
- **Tijs Van Maasackers, Assistant Professor, Department of City and Regional Planning** - Lumley Research Award, Ohio State College of Engineering, 2016
- **Anne Co, Assistant Professor, Department of Chemistry & Biochemistry** - Lumley Research Award, Ohio State College of Engineering, 2016
- **Arnab Nandi, Assistant Professor, Department of Computer Science Engineering** - Lumley Research Award, Ohio State College of Engineering, 2016
- **Arnab Nandi, Assistant Professor, Department of Computer Science** - IEEE TCDE Award, 2016
- **Harmony Bench, Assistant Professor, Department of Dance** - Battelle Engineering, Technology, and Human Affairs, 2016
- **Chris Orban, Assistant Professor, Department of Physics** - Battelle Engineering, Technology, and Human Affairs, 2016
- **Chuan Xue, Assistant Professor, Department of Mathematics** - NSF CAREER, 2016
- **Robert Pyatt, Assistant Professor, Department of Pathology** - Friend of Education, Hilliard Education Association, 2016
- **Maurice Stevens, Associate Professor, Department of Comparative Studies** - Ronald and Deborah Ratner Distinguished Teaching Award, 2016
- **Robert Pyatt, Assistant Professor, Department of Pathology** - O-H-I-Omics Genetic Counseling Teaching Award, 2016
- **Jonathan Song, Assistant Professor, Department of Mechanical and Aerospace Engineering** – Pelotonia Idea Grant, 2016
- **Kareem Usher, Assistant Professor, Department of City and Regional Planning** – OSU Discovery Theme InFACT SEED Grant, 2016
- **Kathy Malone, Assistant Professor, Department of Science Education** and **Zakee Sabree, Assistant Professor, Evolution, Ecology, and Organismal Biology** – Mathematics and Science Partnership Grant, 2015
- **Theodore Chao, Assistant Professor, Department of Mathematics Education** - OSU EHE SEED Grant, 2016





- **Harvey Miller, Professor, Geographic Information Science** - University Consortium for Geographic Information Science (UCGIS) Research Award, 2015
- **Arnab Nandi, Assistant Professor, Department of Computer Science Engineering** - NSF Early CAREER, 2015
- **Lisa Hall, Assistant Professor, Department of Chemical & Biomolecular Engineering** - NSF Early CAREER, 2015
- **Tasos Sidiropoulos, Assistant Professor, Computer Science Engineering & Mathematics** - NSF Early CAREER, 2015
- **Arnulfo Perez, Assistant Professor, Department of Mathematics, Chris Stewart, and Kathy Malone, Assistant Professor, Department of Science Education**, NSF STEM+C 2015
- **Anne Co, Assistant Professor, Departments of Chemistry & Biochemistry** - NSF CAREER, 2015
- **Luis Rademacher, Assistant Professor, Computer Science Engineering** - NSF Early CAREER, 2014
- **Matt Kahle, Assistant Professor, Department of Mathematics** - NSF Early CAREER, 2014
- **Cheng Zhang, Assistant Professor, AACAD** - Science Visualization Fellowship with NASA, 2014
- **Manoj Srinivasan, Associate Professor, Department of Mechanical Aerospace Engineering** - NSF Early CAREER, 2013





# CHAPTER 2:

## STEAM FACTORY INITIATIVES AND SERVICES

### *FACILITATING COLLABORATION*

#### STEAM COLLABORATION AND COWORKING SPACE AT 400 WEST RICH

The STEAM Factory discovered its future home on the second floor of the 400 West Rich studios in the Franklinton neighborhood of Columbus early in 2013. The building was originally a factory, but the owner had been leasing studio spaces out to small businesses and artists as it quickly became a hub of the arts and innovation in the quickly revitalizing East Franklinton neighborhood. The building is in close proximity to other urban renewal efforts, COSI, and the Columbus Idea Foundry, just across the Scioto River from



downtown. STEAM felt that this location and its surroundings perfectly complimented the diversity within the organization.

The STEAM Factory hosted many design collaboration meetings to determine how the membership envisioned using its new space, what artifacts were needed to encourage collaboration and what types of programming would support this collaboration. The goal was to create a flexible and agile space that supported a coworking environment and enabled STEAM to host many

special events benefitting its membership, the Ohio State community and members of the general public. The STEAM Space at 400 W. Rich was furnished and fully functional by December 2015, with the formal opening celebration in January 2016.

#### THE STEAM SPACE - FACILITIES THAT SUPPORT COLLABORATION AND DISSEMINATION

The STEAM space is intentionally and specifically designed to support its core mission of facilitating collaboration and dissemination. Collaboration is encouraged through formal and informal activities held in the multi-functional space that enable members to share skills, resources, and opportunities. The space is intentionally designed to be easily reconfigurable. Throughout the space, all of the tables and chairs, blackboards, whiteboards, technology and audio-visual equipment can be moved to serve a variety of functions and designs. There are designated “comfy” corners furnished with couches and pillows for those



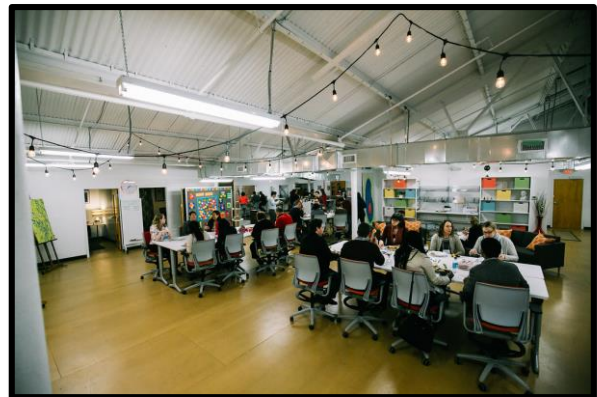
who need to take a break and relax. The space also includes a conference room equipped with three chalkboards and an 18-person conference table.



The STEAM space also helps bridge the gap between the STEAM Factory's initiatives and the Columbus community. Since its existence, STEAM has formed community partnerships with organizations such as the Columbus Idea Foundry, the Franklinton Development Association, the Franklin Park Conservatory, and a variety of other groups. These connections give factory members an opportunity to network and collaborate with a community of artists and innovators, as well as community and industry partners who otherwise would be difficult to reach. The 400 West Rich

location also provides an informal environment that might be more accessible than the Ohio State campus for engaging with a broader public audience.

The facilities at 400 West Rich provide The STEAM Factory with an unparalleled opportunity to conduct outreach and directly engage with the Columbus community. Dozens of members of The STEAM Factory have already participated in the Franklinton Friday Open House and previously hosted bi-weekly Farmers Markets, engaging members of the public and sharing their knowledge using creative, interactive displays.



The development of programming for STEAM faculty as well as university and community partners' use of the STEAM space at 400 West Rich has been significant. Programming has included a wide and evolving variety of seminars, workshops, visiting departmental scholars and speakers and workshops. The STEAM Factory will continue to expand its current mission-driven programming. Funding will be used for the ongoing support of a wide variety of STEAM Factory hosted seminars, workshops, public lectures, colloquia, roundtable discussions, film premieres, symposia and research showcases. These events aid in the scholarship of The STEAM Factory members and also encourage interdisciplinary discussion and collaboration between STEAM members and the greater community.

To further facilitate a culture of creativity and collaboration, the STEAM Factory venue at 400 West Rich provides a neutral creative space for brainstorming research ideas and potential research innovations. It is a place to conduct collaborative research, mentor students, and host engaging interdisciplinary workshops, colloquia and public lectures. It also allows researchers to showcase current work to the greater, non-university public that might otherwise be difficult to reach. These STEAM Factory



programs and initiatives utilize multiple spaces within 400 West Rich, Franklinton and other key areas in Columbus to host workshops, public lectures, seminars and Franklinton Friday exhibitions. Ultimately, The STEAM Factory serves as an unprecedented, widely accessible engagement center for Ohio State University.

As part of Ohio State's broader goal of removing barriers to education, The STEAM Factory fosters an environment that allows its faculty members to educate both inside and outside of the classroom. Programming initiatives and activities facilitate learning and engagement across the Ohio State community, contributing to the university's goal to increase collaborative, interdisciplinary research and enhance the scholarship of Ohio State's world class researchers. This includes beneficial, transformative interactions between different members of The STEAM Factory across academic disciplines. It also includes exchanges between STEAM Factory members, Ohio State students, and non-academic audiences, such as the diverse community of artisans, entrepreneurs, innovators and incubator companies located at 400 West Rich. The STEAM Factory additionally has the valuable opportunity to engage with visitors to 400 West Rich through its Franklinton Friday Open Houses, specialized events and destination events such as Independents Day and Urban Scrawl.

By locating outreach activities both on campus and within the Franklinton area of Columbus, The STEAM Factory contributes to the city's revitalization of a neighborhood that has been economically depressed for several decades. Much national press has been given to the dramatic revitalization efforts currently underway in Franklinton, including the following series for The Atlantic by John Tierney: **Remaking Columbus' Most Downtrodden Neighborhood:** <http://theatlantic.com/story/2015/07/15/columbus-revitalization/418111/>; **How to Attract Artists to a Down-and-Out Neighborhood:** <http://theatlantic.com/ideas/archive/2015/07/15/columbus-revitalization/418111/>; and, **Gentrification 'Without the Negative' in Columbus, Ohio:** <http://theatlantic.com/ideas/archive/2015/07/15/columbus-revitalization/418111/>



## STEAM EXCHANGES

### FACILITATING COLLABORATION: STEAM EXCHANGES

STEAM Exchanges are monthly themed interdisciplinary seminars that provide multiple faculty perspectives to foster opportunities for cross-collaboration between members. This program is intended to facilitate both knowledge and interactions related to current and ongoing faculty research here at Ohio State. STEAM Exchanges are intended to be small (less than 40 people) and informal to allow for increased interaction and lively discussion between STEAM members and their invited colleagues and guests.

#### STEAM EXCHANGES AT-A-GLANCE:

- ▶ 22 STEAM Exchanges
- ▶ 49 faculty presenters
- ▶ 27 disciplines represented by STEAM Exchange presenters
- ▶ 60+ disciplines represented by attendees
- ▶ STEAM Exchange survey responses:
  - 97.7% talked with people outside their disciplines
  - 98.5% said they learned something new
  - 85.7% agree that interactions with people outside of your discipline is important
  - 77.39% interested in presenting at future STEAM Exchanges
  - 92.1% likely to recommend STEAM Exchanges to others

Activities that occur at STEAM Exchanges include but are not limited to:

- ▶ Discussions of current research endeavors, bringing multiple disciplinary perspectives to bear on a single issue with a purpose of identifying opportunities for cross-collaboration



- ▶ Specialty programming that facilitates interdisciplinary faculty collaborations, e.g. “Faculty Research Speed Seminars” and “Describe your Research in 60 Seconds”

“[Our] collaboration would not have been possible without STEAMx. I met Zakee [Sabree] at one of the STEAMx initial meetings and we began discussing ways that we could collaborate in the future. Our collaboration has led to the MSP grant; working with local biology teachers and engineering educators to produce a modeling based high school biology curriculum aligned with bioengineering projects. On another front my department wants to produce a new integrated science course for elementary science preservice teachers. However, it initially hit a roadblock because they did not have any biology professors interested. After I met Zakee and approached he was ready to start discussing it. I am sure our collaboration will continue for many years as through the work with the biology curriculum we have started to discuss the design of a blended MA in Biology education specializing in Evolution, Ecology and Organismal Biology that would be granted through Zakee’s department.”

- ▶ Shared experiences and the transfer of tools and resources to enhance teaching methods, e.g. research commercialization, digital publishing and course creation, incorporation of technology into the classroom, and utilization of remote lectures.

## STEAM EXCHANGE TOPICS 2013 TO PRESENT

- ▶ **April 21, 2016. Topic: Trees**  
Presenters: **Ryan Harne**, (Assistant Professor, Mechanical and Aerospace Engineering), **Enrico Bonello**, (Professor, Department of Plant Pathology), **Laura Kubatko**, (Professor, Evolution, Ecology and Organismal Biology and Statistics)
- ▶ **March 31, 2016. Topic: Preservation**  
Presenters: **Emily Frieda Shaw**, (Assistant Professor, Head of Preservation & Reformatting, University Libraries), **Jon Low**, (Assistant Professor of Comparative Studies, American Indian Studies), **Joel Barker**, (Assistant Professor, School of Earth Sciences, Byrd Polar and Climate Research Center), **Hannah Kosstrin**, (Assistant Professor, Department of Dance, Melton Center for Jewish Studies)
- ▶ **February 25, 2016. Topic: Cheating**  
Presenters: **Shoshanah Goldberg-Miller**, (Assistant Professor, Departments of Arts Administration, Education, and Policy and City and Regional Planning), **Kathryn Corl**, (Associate Professor Emerita, Former Coordinator of the Ohio state university on academic misconduct), **Zakee Sabree**, (Assistant Professor, Department of Evolution, Ecology, and Organismal Biology)
- ▶ **January 21, 2016. Topic: Sustainable Cities**



Presenters: **Harvey Miller**, (Professor, Reusche Chair, Geographic Information Science), **Tijs van Maasakkers**, (Assistant Professor, City and Regional Planning)

► **November 19, 2015 - Reciprocity**

Moderator: **David Sivakoff**, (Assistant Professor, Departments of Statistics and Mathematics)

Presenters: **Zakee Sabree**, (Assistant Professor, Evolution, Ecology & Organismal Biology), **Ruchira Datta**, (Pelotonia Postdoctoral Fellow, The James Cancer Center), **Keith Warren**, (Associate Professor, College of Social Work)



► **October 22, 2015 - Small Size, Big Impact**

Presenters: **Ayaz Hyder**, (Assistant Professor, Environmental Health Sciences & Translational Data Analytics), **James Coe**, (Professor, Department of Chemistry), **Jesse Kwiek**, (Associate Professor, Depts. of Microbial Infection, Immunity, Microbiology & Centers of Microbial Interface Biology & Retrovirus Research)

► **September 24, 2015 - Speed Seminars: My research in 60 seconds** (If you had only 1 minute and 1 slide to explain the core essentials of your academic research, what would you say?)

This introductory STEAM Exchange uses an innovative approach that allows faculty researchers to share and discuss their current work. In September 2015, over 45 faculty members participated in this event which has become the yearly favorite STEAM Exchange for many members.

This speed style event has become so popular that many faculty members and friends of the STEAM Factory now use this format in their own departments and organizations. Jim Fowler (Assistant Professor, Mathematics and Director of Public Outreach for The STEAM Factory) said that he used the Speed Seminars format for "lightning talks" at a conference that he organized at the Fields Institute. Similarly, Ayaz Hyder (Assistant Professor, Division of Environmental Health Sciences and Affiliated Faculty, Translational Data Analytics) offers, "The College of Public Health used the research in 60 second model from STEAM Factory during their Research Day earlier this year. The idea was a hit and everyone benefited from the quick yet informative presentation going on in other faculty members' research programs. We hope to do it again at the next Research Day event for the College."





► **May 7, 2015. Topic: The “A” in STEAM**

Presenters: **Jessica Ann**, (MFA candidate, Department of Art), **Jonathan Capps**, (MFA candidate, Department of Art), **Megan Fitze**, (graduate student, Department of Arts Administration and Policy), **Gretchen McIntosh**, (PhD candidate, Department of Arts Administration and Policy)

► **March 26, 2015. Topic: *Connections*.**

Presenters: **David Sivakoff**, (Assistant Professor, Department of Statistics), **Skyler Cranmer**, (Associate Professor, Department of Political Science), **Tasos Sidiropoulos**, (Assistant Professor, Department of Mathematics and Computer Science Engineering)



► **February 19, 2015. Topic: *Bias*.**

Presenters: Lanier F. Holt, (Assistant Professor, College of Communications), Ghaith A. Hiary, (Assistant Professor, Department of Mathematics), Pamela Salsberry, (Professor, Health Behavior and Health Promotion, College of Public Health)

► **January 22, 2015. Topic: *Progress*.**

Presenters: **Jeff Bielicki** (Assistant Professor, Department of Civil, Environment and Geodetic Engineering and The John Glenn School of Public Affairs), **Christopher Otter**, Associate Professor, Department of History, **Richard Samuels** (Professor, Department of Philosophy and Center for Cognitive and Brain Science)

► **November 13, 2014. Topic: *Movement*.**

Presenters: **Noelle Beckman** (Postdoctoral Fellow, Mathematical Biosciences Institute), **Stephen Takacs** (Lecturer, Department of Art), **Christine Charyton** (Associate Professor of Neurology, The Ohio State University Medical Center).



► **October 6, 2014. Topic: *Blood*.**

Presenters: **Katie Walton** (Assistant Professor of Psychology and Psychiatry, Nisonger Center), **Randolph Roth** (Professor, Department of History and Sociology), **Sam Handelman** (Research Assistant Professor, Center for Pharmacogenomics).

► **September 10, 2014: Topic: *Speed Seminar - My Research in 60 Seconds*.**

Each attendee shared one slide and explained in 60 seconds the core essentials of their respective academic discipline or area of research expertise. The exercise was intended to introduce a diverse



group of researchers to each other and their respective work to foster further discussion and potential collaborations.

► **April 23, 2014. Topic: *Pop.***

Presenters: **Treva Lindsey** (Assistant Professor, Department of Women's Gender and Sexuality Studies), **Tanya Saunders** (Assistant Professor, Department of African-American and African Studies), **Charlie Wilmoth** (Department of Music, Otterbein University)

► **March 27, 2014. Topic: *Workshop on Interdisciplinarity.***

This event adopted a different format than usual. First, a presentation was given by Stephen Myers (Associate Provost, Office of Academic Affairs) about OSU's Discovery Themes and opportunities within the recent Requests for Proposals. Attendees then divided into working groups along disciplinary lines to discuss the needs and required outcomes of research conducted in each field. Finally, attendees divided into groups based on interest in each of the current Discovery Theme topics to brainstorm potential collaborative research topics. Two collaborative research project titles were proposed in the areas of Emerging Disease and Materials for a Sustainable World.

► **February 26, 2014. Topic: *Interdisciplinarity: Academics without borders.***

Presenters: **Micha Elsner** (Assistant Professor, Department of Linguistics), **Lise Worthen-Chaudhari** (Research Assistant Professor, Department of Physical Medicine and Rehabilitation), **Johanna Devaney** (Assistant Professor, School of Music)

► **January 23, 2014. Topic: *Climate change.***

Presenters: **Lonnie Thompson** (Distinguished University Professor in the School of Earth Sciences and Byrd Polar Research Center), **Sam White** (Assistant Professor, Department of History), **Sathya Gopalakrishnan** (Assistant Professor, Department of Agricultural, Environmental, and Developmental Economics)



► **November 7, 2013. Topic: *Speed Seminars.***

This event adopted a different format than the usual Speed Seminars. All attendees first gave a short presentation describing their field of research, as usual. Then the group was split into small working groups, each of which documented the required inputs and outcomes of individual research disciplines. This event was geared towards increasing awareness of potential impediments and opportunities with respect to interdisciplinary collaboration.

► **October 8, 2013. Topic: *Conflict.***

Presenters: **Sandra Enimil** (Head of Copyright Resources Center, Office of Academic Affairs), **Susan Gershman** (Assistant Professor, Department of Evolution, Ecology and Organismal Biology), **Manoj Srinivasan** (Assistant Professor, Department of Mechanical Engineering)





► **May 29, 2013. Topic: *My research, my life.***

Presenters: **James Chen** (Assistant Professor, School of Biomedical Science), **Matthew Kahle** (Department of Mathematics), **Michael Mandel** (Research Scientist, Department of Computer Science and Engineering)

► **April 9, 2013. Topic: *Community.***

Presenters: **Meris Mandernach** (Head of Research Services, OSU Libraries), James Fowler (Lecturer, Department of Mathematics), **Aurelie Vialette** (Assistant Professor, Department of Spanish and Portuguese)

The STEAM Exchange has been instrumental in developing collaborations that are now beginning to result in both funded proposals, sharing of data sets and curriculum and course development. The following testimonies shared by STEAM members are just a sampling of the many research benefits of STEAM Factory participation:

“After speaking at STEAM Exchange in October (about family relationships and autism), I had a conversation with Wolfgang Sadee, who attended the exchange. This led to additional meetings and a research collaboration—they are interested in looking at genetics of autism in large existing datasets (I mentioned several autism datasets during my talk that had not yet come to their attention), and I am interested in family relationships/adjustment and how shared genetic risks + stress may influence adjustment in parents and siblings of kids with autism. I have recently been added to their IRB and we just put in a formal data application for genetic data—they will be doing the genetic analyses and I will be serving as the “phenotype expert.” This is a team I definitely would not be working with if it wasn’t for STEAM!”

--- Dr. Katie Walton, 3/19/15

- Submitted by Katie Walton (Assistant Professor, Department of Psychology) dated 3/9/15





## STEAM POWERED PROJECTS (SPP) SEED GRANTS

In January 2016, The STEAM Factory developed a new micro-grant program intended to provide seed funding for STEAM Factory members working on interdisciplinary projects or collaborations in research, teaching or outreach between one or more STEAM Factory member. The STEAM Factory has offered this seed funding program twice (January 2016 and April 2016) during the past year. The goal of the program is to provide a streamlined seed funding program for collaborations that further the STEAM Factory mission, benefit the STEAM Factory membership as a whole but may not be easily fundable through traditional funding sources. The application provides an abbreviated and peer-reviewed process. Matching external funding is strongly encouraged. Letters of support from department Chairs are also highly recommended. Maximum funding is \$4,000 per STEAM Factory member contributing to the collaboration with a maximum total of \$20,000 per project. Applications are submitted to (will be reviewed by) the STEAM Factory during three funding rounds annually (January 31st, April 30<sup>th</sup> and October 31<sup>st</sup>) and will be reviewed by an interdisciplinary team of their STEAM Factory faculty peers. Project Principal Investigators are also required to submit final project reports and budgets upon completion.

### STEAM POWERED PROJECTS (SPP) AT-A-GLANCE:

- ▶ A total of \$35,200 funds awarded in 2016,
- ▶ Seven collaborative interdisciplinary projects in research, teaching and outreach projects received funding,
- ▶ SPP funds were distributed to 16 STEAM Factory faculty members (and 3 non-STEAM faculty members),
- ▶ SPP faculty represent 15 disciplines

Below is a brief summary description of currently funded STEAM Powered Projects.



## INFORMATION, DIFFUSION DYNAMICS, AND PUBLIC CRISIS MANAGEMENT

**Primary Investigator:** Skyler J. Cranmer, PhD, College of Arts and Sciences— Political Science

**STEAM Collaborators:** David Sivakoff, PhD— Assistant Professor, College of Arts and Sciences—  
Statistics

### Goals

1. Conduct a mobile lab-based experiment to understand how individuals consume, process, and share information related to a disease.
2. Understand how social networks influence the flow of information and how official communications from public health entities compete with socially transmitted beliefs.

### Summary

This project will study participants' knowledge about Hepatitis C/Ebola/HIV: its symptoms, how it spreads, the health consequences of contracting it, and what can be done to stop its further spread. The experiment will be conducted in a mobile lab in such a way that participants will be placed in a social network during the experiment, asking them to communicate their beliefs to one another during the experiment. The project aims to test the hypothesis that beliefs about Hepatitis C/Ebola/HIV are socially influenced by the beliefs of others to whom the participant is connected through their social network.

Participants will be recruited from a variety of existing small groups, ranging from on-campus teams and clubs at OSU to community groups that may be at particularly high risk of contracting one of the diseases under study. Thus, team members will know each other in the real world and enter the study with real social networks. For a group entering the study, its members will be surveyed about (a) their personal characteristics and (b) their social network within the group to dramatically increase the level of realism involved.

**Total Budget:** \$8,000

**Awarded by STEAM Factory:** \$4,000 in April 2016

### Intended Results:

Will help public health organizations understand how much information is needed to stop spread of misinformation about diseases and foster the spread of accurate information.

### Looking Ahead:

Need to create a mobile computer laboratory: Google Chromebooks, oTree software



## BIG HISTORY

**Primary Investigator:** Sam White, PhD— Assistant Professor, College of Arts and Sciences - History

**STEAM Collaborators:** John Beacom, PhD— Professor, College of Arts and Sciences— Physics, Astronomy, CCAPP, Sathya Gopalakrishnan, PhD— Assistant Professor, College of Food, Agriculture, and Environmental Sciences— Agricultural, Environmental, and Developmental Economics, Jim Fowler, PhD— Assistant professor, College of Arts and Science— Mathematics, David Staley, PhD— Associate Professor, College of Arts and Science— History.

### Summary

Big History brings together the cosmic, earth, evolutionary, and human past. The course provides a consilient, non-technical introduction to the essential state of knowledge about the galaxy, planet, life, and humanity. The unifying theme throughout the course is emergence of increasingly complex and fragile systems in a universe forever moving toward entropy. By the end of the course, students acquire a basic grounding in some of the major theories that help explain our place in the cosmos, and a new appreciation of where we came from and where we might be going.

White has introduced Big History at Ohio State with the long-term goal of creating an online GE course that could be offered to both undergraduates and high school students through dual-enrollment or College Credit Plus programs. Given the broad scope of the course and the high-quality materials already produced for high school instruction, it is particularly suited for this purpose. In fall 2015, Dr. Sam White taught Big History (Hist 2720) as twice-weekly lecture course with a once-weekly interactive recitation section. The course involved the participation of five STEAM Factory members to contribute guest lectures in different disciplines.

**Awarded by STEAM Factory:** \$1000

### Notable Achievements:

- Received positive course evaluations
- Involved 5 STEAM Factory members as guest lecturers

### Looking Ahead:

- Need \$1000 for graduate student and transcription support
- Continue to generate content for online course in Spring 2018
- Compile new audio and visual material



## SONG OF THE STARS

**Primary Investigator:** **Paul Sutter, PhD— Visiting Fellow**, College of Arts and Sciences — Physics, Astronomy

**STEAM Collaborators:** **John Beacom, PhD—Professor**, College of Arts and Science — Physics, Astronomy, **Leonardo Carrizo, PhD—Lecturer**, College of Arts and Science — Communications, **Mary Tarantino, PhD—Professor**, College of Arts and Science — Theater

**Summary**

*Song of the Stars* is a ground-breaking cross-disciplinary production engaging astrophysicists, dancers, and filmmakers to create a world-class performance designed to humanize science, awaken curiosity, and intimately connect audiences to the wonders of the universe. *Song of the Stars* will draw audiences into the life story of a star, including its turbulent birth in the early universe, the nurturing of a family of planets, and the loss of a companion. Led by **Seven Dance Company**, a Columbus non-profit dedicated to connecting communities through dance, the one-hour live premiere was held on April 21st at the Capitol Theater.

The live performance will be filmed, edited, and formatted by **Over the Sun** Productions for national distribution. The film will be supplemented by additional educational materials, such as a program book linking specific portions of the choreography to the astrophysics, and classroom guides for both dance and science education. Following the live premiere, individual pieces will be recorded by **COSI** staff with 360-degree cameras, creating a unique immersive experience for distribution to thousands of planetariums worldwide and for use in cutting-edge virtual reality headsets.

**Total Budget:** \$125,000

**Amount awarded by the STEAM Factory:** \$5,000

**Notable Achievements:**

- ❖ Attracted 400 audience members
- ❖ Kickstarter campaign raised \$25,000
- ❖ Films will be distributed nationally on TV, online, and planetariums

**Looking Ahead:**

- ❖ Train a traveling dance troupe and put SOTS on the road
- ❖ Pay the local dancers to perform it at more schools in the state and region
- ❖ Develop next year's theme with dancers paid from the start
- ❖ Incorporate more cutting-edge technology in next year's performance, like paintable circuits, drones, and video





## RADIO UNIVERSE

CONNECTING BIOLOGY, PHYSICS, AND COSMOLOGY

**STEAM Collaborators:** **Paul Sutter, PhD— Visiting Fellow,** (College of Arts and Sciences — Physics, Astronomy, CCAPP), **Rob Pyatt, PhD—Assistant Professor—Clinical,** (College of Medicine — Department of Pathology)

### Goals

1. Explore the science of radio astronomy & how humans generate radio waves
2. Create a 3-5 minute documentary exploring the connections between human biology and cosmic phenomena via radio waves

### Summary

*The Radio Universe* will explore a connection between human and cosmic waves through a 3-5 minute film, showcasing the stunning Very Large Array radio telescope in New Mexico, and featuring interviews with Paul Sutter and Rob Pyatt to explain the science behind human- and cosmic-sourced radio waves. We will acquire and edit *The Radio Universe* in high-resolution 4K, granting output to a variety of formats, from planetarium full-dome to large format flat screens and the web. The film will blend traditional documentary into a full-dome production with engaging narrations, animations that augment human explanation, and breathtaking cinematography.



A standalone exhibit and demo station will complement the short film and strengthen the biology-cosmology connection. The exhibit will promote the development of a personal connection to cosmology as portrayed in the film through exploration of their similarities to this universal phenomenon. Employing simple electronics and repurposing a household satellite receiver, the exhibit will detect the radio emission from the human nervous system and respond with audio and visual cues. Guests will interact with the exhibit and learn how the receiver works and how the human body generates radio emissions.

**Total Budget:** \$7,000 for materials, travel, video editing, licenses

**Amount awarded by the STEAM Factory:** \$4000 in April 2016

### Looking Ahead:

- ❖ Create an interactive exhibit in conjunction with a short documentary
- ❖ COSI and OSU will showcase the documentary in their planetariums





## BUCKEYE VIRTUAL REALITY

**Primary Investigators:** Chris Orban, PhD—Assistant Professor, College of Arts and Sciences - Physics

**STEAM Collaborators:** Jon Brown, PhD—Research Scientist, Lecturer, College of Engineering — Chemical & Biomedical, Jim Fowler, PhD—Assistant Professor, College of Arts and Science — Mathematics, Bart Snapp, PhD—Auxiliary Assistant Professor, College of Arts and Science — Mathematics

### Goals

Develop virtual reality visualizations of STEM concepts to be experienced with Google Cardboard glasses. This should help bridge the gap between the instructor's mental picture and the student's.

### Summary

Like few other disciplines, physics and mathematics have a reputation among students for being particularly impenetrable.

In 2014, Google revealed and disseminated the plans for “Google Cardboard,” which allows the viewer to see 3D visualizations with stereoscopic depth perception, similar to a 3D movie at a movie theater, for about \$5. There is a huge potential for this device to revolutionize STEM education if VR content can be developed and classroom tested on this platform.

During fall 2015 and spring 2016, Prof. Chris Orban worked with OSU Marion’s Chris Porter to develop smartphone-based VR visualizations for undergraduate electromagnetism classes. Dr. Jon Brown was also involved at an early stage allowing a collaboration which produced a demo for Android phones that illustrates electric fields from different distributions of charge. This demo of “BuckeyeVR” has been shown to the public at STEAM factory events. The immersive nature of the VR experience creates a kind of encounter with the mathematical reality of nature that no chalkboard or computer screen can truly replicate.

### Notable Achievements:

- ❖ Implementation of BuckeyeVR into OSU physics classes, on both Android and iOS platforms

### Looking Ahead:

- ❖ Expanding application of this technology into visualization of biological molecules
- ❖ Foster interdisciplinary relationship



## HIV PECHA KUCHA

FROM MICROBIOLOGY TO MACRO HISTORY

**Primary Investigators:** **Jesse J. Kwiek**, (*Associate Professor, OSU Departments of Microbial Infection & Immunity and Microbiology, project lead*)

**Project Collaborators:** **Thomas (Dodie) McDow**, (*Assistant Professor, OSU Department of History*),  
**Zach Reau**, (*Community Engagement Manager, AIDS Resource Center Ohio, Inc.*)

### Goals:

- ❖ Share research findings with the broader community
- ❖ Foster conversation between students, academics and stakeholders
- ❖ Demonstrate the value of combining scientific and humanities approaches to complex issues



### Summary:

The HIV Pecha Kucha project showcased the best collaborative, interdisciplinary work on HIV/AIDS based on an advanced undergraduate course taught by Doctors Kwiek, a virologist, and McDow, a historian. History/ Microbiology 3704, HIV: From Microbiology to Macrohistory was a team-taught class with a goal to put the sciences and humanities in conversation about the HIV virus and the estimated 35.3 million people around the world who are living with it. As a culminating project, students created a Pecha Kucha presentation that explored a transformative, controversial, or an unknown/under-appreciated aspect of the history of HIV that elucidated the moment. The presenters considered their specific HIV topic from a multidisciplinary perspective, drawing from the sciences and humanities. The Pecha Kucha format — 20 slides that advance automatically every 20 seconds — required succinct narratives (6:40 total!) complemented by strong visuals.



The STEAM Factory HIV Pecha Kucha event, held on April 19<sup>th</sup>, 2016, included six outstanding Pecha Kucha presentations from a class of eighty students and presentations from HIV community groups. This event was a celebration of the student's scholarship and provided a chance for a wider conversation. The STEAM Factory venue was ideal for hosting a diverse group in a congenial setting. The event was open to Ohio State affiliates, and we will specifically invited History/Microbiology 3704 students, STEAM factory members, members of the Columbus HIV affected/infected community and select members of



the Ohio State administration. To promote community involvement, we partnered with Mr. Zach Reau, Community Engagement Manager at AIDS Resource Center Ohio, Inc. (ARC), which is Ohio's premier community-based, not-for-profit provider of a comprehensive and cutting-edge response to HIV/AIDS.

Students gained valuable experience presenting their narratives to a broad audience, some of whom will have personal connections with the topics at hand. The visual style and concision of Pecha Kucha made it an ideal launching point for further conversations. This engaging format reflected the value of cross-disciplinary approaches to complex problems, the importance of sharing findings and stimulation audience interaction.

**Total project budget: \$2900.** Amount awarded by the STEAM Factory: **\$1700 (\$1200 cash, \$500 space rental credit).**



## MoBILiSE

MODELING BASED HIGH SCHOOL BIOLOGY CURRICULUM ALIGNED WITH BIOENGINEERING PROJECTS

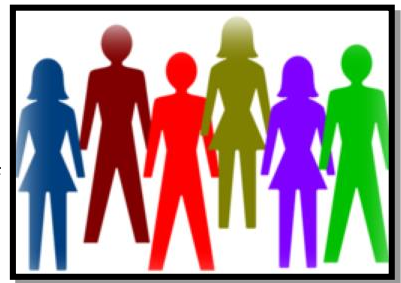
**Primary Investigators: Zakee Sabree, PhD—Assistant Professor, (College of Arts and Sciences — Evolution, Ecology & Organismal Biology), Kathy Malone, PhD—Associate Professor, (College of Education and Human Ecology — Science, Technology, & Mathematics)**

### Goals

This project is designed to conduct a modeling-based high school biology curriculum aligned with bioengineering projects by collaborating with local biology teachers and engineering educators.

### Summary

MoBILiSE's emphasis is on instilling life science content knowledge in 7-12th grade students via inquiry based instruction. The teaching is grounded in science models and scientific modeling with embedded bioengineering projects. The two-year project's goal is to increase teacher and student content knowledge in biology via the usage of modeling Instruction and engineering. The project is developing curricula units for the secondary level (7-12) in which teachers guide students through the development of verbal, pictorial, algebraic and graphical representations (the 'models') of biological phenomena using engineering-informed activities. In addition, the grant supports the development of a secondary level biology concept inventory that will be used to evaluate the effectiveness of the curriculum in classrooms via pre/post testing.



The investigators of this project are STEAM Factory members that met at a STEAM Factory event. Their partnership will produce an innovative curriculum with research results that will affect not only the schools across not only Ohio, but the nation. It will also benefit the STEAM Factory membership as a whole as it serves as an example of how diverse departments can work together to affect change and produce innovative products as well as research.

### Funding

Awarded a \$260,000 Math Science Partnership grant by the Ohio Department of Education, renewable for at least two years and possibly up to four years.

### Link

<https://u.osu.edu/mobiliseosu/>



**Notable Achievements:**

- ❖ Developed modeling-based curriculum
- ❖ Received Math and Science Partnership grant worth \$260,000

**Looking Ahead:**

Design a blended MA in biology education specializing in Evolution, Ecology, and Organismal Biology



## STEAM FACTORY SPECIAL PROGRAMS

### COLLABORATION CAULDRON - JANUARY 29, 2016



STEAM Factory members gathered on Friday, January 29<sup>th</sup> at the collaboration space to celebrate the inaugural Collaboration Cauldron. The night was filled with fun, conversation and opportunities for connections with the current STEAM Factory members representing over 60 disciplines. Attendees were encouraged to submit at least one idea for a potential collaboration on a PowerPoint slide and reminded that indeed, no idea is too outrageous. They were also encouraged to dine, network and perhaps create future collaborations through their participation in various

activities intended to enable a wide variety of interactions. These activities included our very own interactive collaboration network bulletin board intended to highlight the high volume of varied research, teaching and outreach collaborations that exist between STEAM members, board games and questionnaires intended to develop a better understanding of STEAM network hubs.

The collaboration network board highlighted each current STEAM Factory member, including participants within the College of Arts and Sciences, College of Engineering and College of Medicine as well as 12 other Colleges and Offices within Ohio State. Members used various colors of string to indicate research, teaching and outreach collaborations with other STEAM Factory members. By the end of the evening, a colorful web was woven as a small indication of the many ways our members continue to develop connections with one another.

STEAM Factory members provided feedback on the night, including the following small sample. Donna Farland-Smith, Associate Professor in Science Education, commented “It was such an open, relaxing atmosphere. It was well worth my time, getting to know others I would never get to meet even though we work at the same place!” Leonardo Carrizo, lecturer for the School of Communication, had a great time conversing with other members. Carrizo said, “I was able to connect with Kareem Usher, College of Engineering/Austin E. Knowlton School of Architecture City and Regional Planning Section, and we started a conversation about how we might be able to collaborate on a project together.”

For many, the event served as our first “housewarming party” since the STEAM space at 400 West Rich was finally fully functional after a multi-year contract lease negotiation, design development and furnishing process. The STEAM Factory collaboration and co-working space is an agile, bright, colorful



and inviting environment with lots of natural light. The space was deliberately designed to spark innovation and collaboration between STEAM members and the community.

STEAM Factory member John Beacom provided his perspective on the event, “Imagine that you have broad interests and that you like books. For anyone reading this, I think that's a safe wager. Now imagine going to a bookstore where, every time you pick up a book on a random topic, you get to talk to the author. That's what makes the Collaboration Cauldron— and other STEAM Factory events— so much fun.”

## STEAM FACTORY SYMPOSIUM ON ACADEMIA – MAY 13 - 14, 2016

The STEAM Factory hosted its first interdisciplinary symposium on the topic of “Academia” on May 13<sup>th</sup> and 14<sup>th</sup>, 2016. The STEAM Factory partnered with visiting faculty from both MIT and Vanderbilt University’s CURB Center



The opening reception was held on Friday night in conjunction with the STEAM Factory Open House during Franklinton Friday. Symposium attendees and their guests were invited to join a tour of the Franklinton area favorites hosted by STEAM Executive Director, Roman Holowinsky (Associate Professor, Mathematics). Attendees were then welcomed back to the STEAM

Factory, where a special “Collaboration Extravaganza” was underway. It featured interactive demonstrations, activities and micro-lectures presented by STEAM faculty members to celebrate the many collaborative projects that they had worked on over the past year.

### Vanderbilt University Visiting Faculty:

- ❖ **Dr. Elizabeth Meadows**, Senior Lecturer, English, Assistant Director – CURB Center for Arts
- ❖ **Dr. Ole Molvig**, Assistant Professor, History and Physics
- ❖ **Dr. Lijun Song**, Associate Professor, Sociology
- ❖ **Dr. Beth Conklin**, Associate Professor, Anthropology
- ❖ **Dr. Jonathan Gilligan**, Associate Professor, Earth and Environmental Sciences

STEAM Franklinton Friday faculty presenters included: **Chris Orban** (Assistant Professor, Department of Physics), **Jon Brown** (Research Scientist/ Lecturer, Chemical and Biomolecular Engineering), **Paul Sutter** (Visiting Postdoctoral Scholar, Department of Astrophysics), **Rob Pyatt** (Assistant Professor, Department of Pathology), **Teddy Chao** (Assistant Professor, Department of Mathematics Education), **Maurice Stevens** (Associate Professor, Department of Comparative Studies), **Jim Fowler** (Assistant Professor, Department of Mathematics), **Bart Snapp** (Auxiliary Assistant Professor, Department of Mathematics), **Lisa Hall** (Assistant Professor, Department of Chemical & Biomolecular Engineering) and others.



The daylong Symposium began on Saturday morning and consisted of three separate seminar topics: History of Academia, Hierarchy of Academia, and Public v. Private institutions. The afternoon session consisted of a discussion on Disciplines and collaborations, followed by two STEAM Exchange like programs on cultivating environments for interdisciplinary research the role of direct leadership in facilitating interdisciplinary collaboration.



Curb Center:

<http://www.vanderbilt.edu/curbcenter/>

#### SYMPOSIUM SESSION ABSTRACTS

#### **Franklinton Friday**

The STEAM Factory often opens its doors to the public for "Franklinton Fridays," a neighborhood event which joins the community with local artists, innovators, and researchers, all hosting individual programs on the same night. Bigger than any single venue, you might try new food, view fresh art, or participate in a new experience yourself as you explore the building and the neighborhood. At the STEAM Factory venue, the theme of the evening is "collaboration" at its broadest. The public and members are invited to study the STEAM Factory space and interact with the various "STEAM-powered" collaborations.

#### ***History of Academia – Ole Molvig (Vanderbilt University)***

“How do University Cultures Change?” That was the central question of this discussion-based, open-ended reflection on the macro history of university culture over the centuries. At any given moment, universities trumpet their deep roots in medieval tradition while simultaneously promising cutting edge learning environments able to train tomorrow’s innovators. But how do universities actually change (and they certainly have)? Bold leadership? Outside mandates? Reactionary? Progressive? In this session I highlighted just how recent many of the “traditional” elements of our university cultures actually are, but also perhaps question how effective intentional, directional reforms often are.

#### ***Hierarchy of Academia – Hugh Morris (Ohio State University)***

The hierarchy of academia has evolved and continues to evolve since the inception of the tenure track. Funding environments and consideration of financial solvency has driven the increase in positions that support teaching and research. Currently, more than half of all faculty positions are non-tenure according to the American Association of University Professors. Those support positions often enjoy a lower level of benefits and inclusion in departmental, collegial and university level activities. In this session, a postdoctoral scholar, an adjunct professor and a professor transferring from a research-track to a tenure-track presented the challenges they currently face, leading into a discussion of potential solutions to meet their needs.





### ***Public versus Private Institutions***

Even though we all are employed as academics, we understand that our "research cultures" vary greatly depending on what field we work in. It might be less clear, however, how our "jobs" would be different if we worked at another institution. In this session, we worked in groups to identify similarities and differences between working at a large public university (Ohio State) and a smaller private institution (Vanderbilt). We discussed pros and cons of both infrastructures and speculated which characteristics carry over to all public and private institutions and which characteristics are specific to our respective institutions.

### ***"Behind the Scenes" of Disciplines and Collaborations - Sam White (Ohio State University)***

A lot of the fun—and the challenge—in doing multidisciplinary and collaborative research comes in reading work in fields completely different from your own. You might get used to some of the conventions, maybe learn some of the jargon—but as an outsider, as someone who hasn't done this work, how do you really know what's going on?

In this session, we tried to pull back the curtain on collaborations and publications in some very different disciplines. Each presenter was asked to take a favorite publication then take it apart, selecting a few passages or pages and preparing a few notes to explain what went on "behind the scenes": How did the project happen? Who really did the work? What really took up your time? What went right, or wrong, or in an unexpected way? What would the rest of us from other disciplines need to know that doesn't appear on the page or online?

### **STEAM Exchange: *Interdisciplinary Collaboration* – Moderated by Susan Gershman (Ohio State University)**

In this STEAM Exchange workshop, we explored how individual faculty can forge productive interdisciplinary collaborations, and how institutions can facilitate these collaborations. In the first part of this STEAM Exchange, "Cultivating environments for interdisciplinary research," we broke into small groups to discuss issues relevant to faculty seeking interdisciplinary collaborations, including: variation in definitions of interdisciplinary collaboration, what academics in different disciplines need to get out of a productive interdisciplinary collaboration, and how promotion and tenure goals align with interdisciplinary research.

For the second part of this STEAM Exchange, we invited a panel of speakers to briefly address questions including: How do you, as an administrator, envision rewarding interdisciplinary collaboration? What does the administration see as roadblocks or challenges to rewarding interdisciplinary work? What is a good environment to form collaborations? What are the appropriate structures and incentives for junior faculty to succeed? We concluded with a discussion about how administrative leadership can facilitate interdisciplinary research.





# CHAPTER 3: STEAM FACTORY INITIATIVES AND SERVICES

## *PROMOTING DISSEMINATION*

### FRANKLINTON FRIDAYS

#### **PROMOTING DISSEMINATION: FRANKLINTON FRIDAY**

Franklinton Fridays are a neighborhood wide art, music, food and gallery hop that occur the second Friday of every month. The studios, businesses, and institutions of East Franklinton, including 400 W. Rich, host an art crawl for the public. The STEAM Factory, as the educational anchor of 400 W. Rich hosts a diverse array of faculty and post-doctoral presenters over a huge variety of research and outreach topics for Franklinton Friday attendees.

In November 2015, the STEAM Factory hosted its first Franklinton Friday Open House at its space at 400 West Rich. Franklinton Fridays are a monthly neighborhood art, music and food hop held the second Friday of every month. The STEAM Factory Franklinton Friday Open Houses host an ever-evolving array of Ohio State faculty, staff and student research, seminars, art and music presentations, installations, performances, and exhibitions. STEAM Factory members are invited to present demonstrations and interactive activities in the space for community members to engage with the research of the STEAM Factory during these evenings. Opportunities also exist for post-doc and



**STEAM OUTREACH AT-A-GLANCE:**

- ▶ 30+ 400 West Rich Farmers Market faculty presentations (2013-2015)
- ▶ 7 STEAM-hosted Franklinton Friday Open Houses (2015-16)
- ▶ 50 faculty presenters at Franklinton Fridays and Farmers Markets (January 2013 to Present)
- ▶ 25+ academic disciplines represented since (January 2013 to Present)
- ▶ Over 80 undergraduate and graduate students have presented at STEAM outreach activities



undergraduate students to work with their cooperating professors and practice presentation skills. STEAM members that participate in Franklinton Fridays can receive letters of support from the STEAM Factory. Typically, STEAM Factory Franklinton Friday Open Houses ranges from 150-300 attendees monthly.

The STEAM Factory Franklinton Friday Open House is intended to provide a more comprehensive, experiential and detailed experience of the extensive array of disciplines, research and talent housed within the Ohio State University community through its STEAM Factory membership. Following the example of the hugely successful monthly Short North Gallery Hop, the STEAM Factory partners closely with other Franklinton Friday artisans, businesses and galleries to bring visitors access to the latest research, local art, music, and more. Current participants open for tours, exhibitions, live demonstrations and performances during these monthly programs include COSI, the Franklinton Development Association, Columbus Idea Foundry, 400 West Rich Studios, Glass Axis, Ethical Arts Collective, Magic Brush Art Studio and Franklinton Arts District.

In addition to providing faculty members an opportunity to share their research and interests with a broader central Ohio audience, the STEAM Factory outreach programming also provides Ohio State University undergraduate and graduate students the opportunity to stimulate interest in and raising awareness of their research area, and/or by receiving practical training in conducting research outreach with a diverse audience. To date, over 80 Ohio State graduate and undergraduate students have participated in STEAM Factory outreach activities at 400 West Rich.



## 2015-2016 FRANKLINTON FRIDAY THEMES, PRESENTERS, AND PROJECTS

### June 10, 2016 - Starstruck in Franklinton

For the first summer Franklinton Friday, the STEAM Factory dedicated the evening to stargazing. Resident “Agent to the Stars” **Paul Sutter**, Visiting Postdoctoral Scholar, Department of Astrophysics and **Stephan Frank**, Post Doctoral Researcher, Department of Astronomy answered questions and presented star themed activities including a live cam of the surface of the sun and how to create a Hertzsprung-Russell Diagram.



### May 13, 2016 - Collaboration Extravaganza

As a prelude to STEAM’s Symposium on Academia, the May Franklinton Friday was used as a way to celebrate collaborative projects that STEAM members had worked on over the last year. Micro lectures were given by the participants.

Buckeye VR: **Chris Orban**, Assistant Professor, Department of Physics, and **Jon Brown**, Research Scientist/ Lecturer, Chemical and Biomolecular Engineering

Bringing Science to Life through Dance: **Paul Sutter**, Visiting Postdoctoral Scholar, Department of Astrophysics

Collaborations in Informal Science Education: Columbus Science Pub and the JW Family Science Extravaganza: **Rob Pyatt**, Assistant Professor, Department of Pathology

That’s Not Fair: Teaching Mathematics For Social Justice in Early Childhood: **Teddy Chao**, Assistant Professor, Department of Mathematics Education and **Maya Marlowe**, Teacher Columbus City Schools

Playing in the glow of catastrophe: New approaches to trauma, injury, and our complex world: **Maurice Stevens**, Associate Professor, Department of Comparative Studies

Affordable textbooks with Ximera: Not just cheaper, better!: **Jim Fowler**, Assistant Professor, Department of Mathematics and **Bart Snapp**, Auxiliary Assistant Professor, Department of Mathematics

Designing Molecules and Nanoparticles for 3D Printing: **Lisa Hall**, Assistant Professor, Department of Chemical & Biomolecular Engineering, and **Vishnu Sundaresan**, Assistant Professor, Department of Mechanical and Aerospace Engineering



### April 8, 2016 – Creativity

For the April Franklinton Friday our presenters wanted to exemplify how being creative can impact research and be used for outreach opportunities and make meaningful impact outside of traditional academia.

Designing Molecules and Nanoparticles for 3D Printing: **Lisa Hall**, Assistant Professor, Department of Chemical & Biomolecular Engineering

Planning Creative Cities: Global Trends, Local Action: **Shoshanah Goldberg-Miller**, Assistant Professor, Department of Arts Administration, Education, and Policy - created the "Creativity Cauldron" in preparation for the May 12th Barnett Symposium,

Lasers. Telescopes. Dance. Jello. All these things have something in common, and you'll find out what at the STEAM Factory: **Paul Sutter**, Visiting Postdoctoral Scholar, Department of Astrophysics



### March 11, 2016 - Frozen in Time

For the March Franklinton Friday, the STEAM Factory partnered with the Byrd Polar research Center of Ohio State to present interactive presentations and activities for community members involving all things glacial. Activities included:

Selfie Station with Polar Gear: **Jason Cervenec**, Education and Outreach Director, Byrd Polar Research Center

3D Printing and Paleoceanography: **Geoff Dipre**, Graduate Student, Paleoceanography

Simulated Snow and Peruvian Expedition Ice Core Paleoclimatology: **Emilie Beaudon, Alessia Cicconi, and Giuliano Bertagna**, Byrd Polar Research Center

Mummified and Petrified Wood under Microscopes: **George Grant and Joel Barker**, Byrd Polar Research Center

Polar Meteorology and El Nino: **Julien Nicolas**, Byrd Polar Research Center

**February 12, 2016 - Kepler's Music of the Spheres: Harmonies in Mathematics, Music, and Physics**

A multi-faceted presentation of the viewpoints of three distinctly different academic fields on the research of Johannes Kepler and his treatise, *Harmonices Mundi*, and his impact in their respective disciplines. Presenters: **Anna Gawboy**, Assistant Professor, School of Music, **Matthew Kahle**, Associate Professor, Department of Mathematics, **Paul Sutter**, Visiting Postdoctoral Scholar, Department of Astrophysics

**December 11 & 12, 2015 - Holiday Open House and Festivus**

It's "Ask a Spaceman" Live!: **Paul Sutter**, Visiting Postdoctoral Scholar, Department of Astrophysics. Our resident astrophysicist answered questions so that Franklinton could experience complete knowledge of time and space! We also showed off some cute and fun physics-themed toys!

Portraits and Light Modifiers: **Leonardo Carrizo**, Lecturer, Department of Communications - A fun photography portrait session using off-camera flash and multiple light modifiers to achieve different looks.

Crazy Cool Chemistry with Dr. Nancy: **Nancy Santagata**, Visiting Scholar, Department of Chemistry and Biochemistry created slushies, frozen snacks, and a spirit of fun with liquid nitrogen.

Feeling molecules: interactive computer simulations of polymers: **Lisa Hall**, Assistant Professor, Department of Chemical and Biochemical Engineering. See and feel how long chain molecules behave using a 3D monitor and joystick!

The Lottery of Life: How does the luck of the draw impact whether American children succeed?: **Lauren Jones**, Assistant Professor, Department of Human Sciences - Food, Toys, and Clothing were also collected for area families at the event

**November 13, 2015 – Lego Car Challenge**

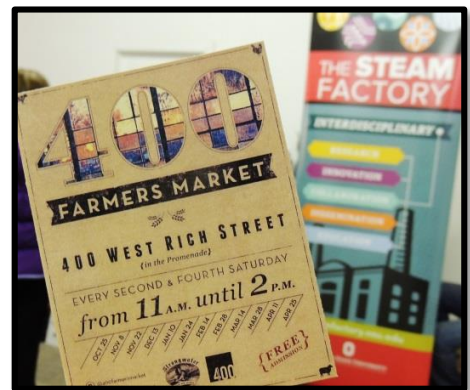
Lego Car Challenge: **Rob Pyatt**, Associate Professor, Department of Pathology. Kids and (adults alike) were given two sets of wheels and a mini-figure, and challenged to build a car that was both fast and safe. The finished cars were then tested for speed on an inclined track and for safety in head-on collisions. If mini-figures were ejected from the vehicles, decapitated, or cut in half, then the vehicles failed the safety test. Participants discovered that it was hard to build a car that was both fast and safe.



## PAST PROGRAMMING – BIWEEKLY 400 W. RICH MARKETS 2013-15

*Biweekly 400 West Rich Markets* – For nearly two and a half years (from January 2013 to July 2015), The STEAM Factory’s presence at the 400 West Rich markets was extremely successful in elevating community and industry recognition of Ohio State’s world class research faculty. As an integral part of the 400 West Rich bi-weekly markets, The STEAM Factory embedded itself in the farmer’s market setting, presenting active research to an audience outside of traditional academia. The presentation of cutting edge research in the same location as artists and vendors provided an approachable environment for members of the community.

In 2015, four (of eight total throughout the entire university) STEAM Factory faculty members were awarded prestigious NSF Early CAREER grants due, in major part, to the inclusion of STEAM market activities (documented in “broader impact” sections as well as STEAM letters of support). This innovative STEAM faculty outreach occurs at a time when many respective departments do not currently have a rewards system in place for this type of activity. Market presence has also facilitated numerous introductions to government, community and industry partners.



*400 West Rich Farmers Markets Presentations.* The STEAM Factory held over 25 presentations at these biweekly markets over the period January 2013 through July 2015. The audience for these events represented a wide spectrum of the Columbus community who attend farmer markets, including both young children and adults, with an average of 150 to 200 attendees at each event.

Ohio State faculty members presenting at 400 West Rich Street bi-weekly Farmers Market include:

- ▶ **Marc Ainger**, Associate Professor, School of Music.  
Topic: Reimagining Sound: With Fourier, Doppler and Max.
- ▶ **John Beacom**, Professor, Department of Physics, Astronomy, and Center for Cosmology and AstroPartical Physics.  
Topic: Universal Gravitation: Falling apples, orbiting planets, expanding universe.
- ▶ **Noelle Beckman**, Postdoctoral Researcher, Mathematical and Biosciences Institute  
Topic: Explore the diversity of tropical forests plant communities.
- ▶ **Angela Brown**, Professor, Department of Optometry  
Topic: Project Color: Color blindness: How does colorblindness influence an artist’s color selection?



- ▶ **James Carlson**, Visiting Professor, Department of Mathematics,  
Topic: Noteshare.io: This is a tool to create, edit, and share lecture notes, cookbooks, manuals, essays, poetry — you name it — on the web.

- ▶ **Theodore Chao**, Assistant Professor, Department of Mathematics Education



Topic: Your slice is bigger than mine: A Pi Day dialogue about teaching mathematics through social justice. How can parents, community members and teachers empower to use mathematics to recognize injustice in their own worlds? How can mathematics embolden children to talk about and confront this injustice?

- ▶ **Christine Charyton**, Visiting Professor, Department of Pathology

Topic: Creativity and innovation among science and art: How does creativity and innovation differ among disciplines such as medicine, physics, art therapy, music and education?

- ▶ **Anne Co**, Assistant Professor, Chemistry and Biochemistry

Topic: Penny alchemy.

- ▶ **Jim Fowler & Bart Snapp**, Assistant Professor and Auxiliary Assistant Professor, Department of Mathematics

Topic: The Humanity of Calculus: Videos and online homework exercises can make Calculus more engaging.

- ▶ **Jim Fowler & Bart Snapp**, Assistant Professor and Auxiliary Assistant Professor, Department of Mathematics

Topic: Mooculus and Ximera an online education platform, turns collaboratively created content into interactive classroom activities - it's "crowdteaching."

- ▶ **Jim Fowler & Bart Snapp**, Assistant Professor and Auxiliary Assistant Professor, Department of Mathematics

Topic: The Topology of Surfaces: Using 3-D glasses to see how to build a surface by gluing together the sides of a polygon.

- ▶ **Anna Gawboy**, Assistant Professor, School of Music Topic: English concertina.







- ▶ **Susan Gershman**, Assistant Professor, Evolution, Ecology & Organismal Biology  
Topic: Ask a biologist.
- ▶ **Monica Giusti**, Associate Professor, Department of Food Science and Technology  
Topic: Project Color: Food Color and Pigments: Anthocyanins, plant pigments that increase visual appeal and nutritional value of foods.
- ▶ **Lisa Hall & Jon Brown**, Assistant Professor and Post-doctoral researcher, Department of Chemical & Biomolecular Engineering  
Topic: Interactive computer simulations of molecules: a 3D monitor and haptic joystick let you see and feel small molecules, long polymers, and micelles.
- ▶ **Matthew Kahle**, Assistant Professor, Department of Mathematics  
Topic: Seeing 4D and Circle packing puzzles.
- ▶ **Delwin Lindsey**, Professor, Department of Psychology  
Topic: Project Color: Color blindness: How does colorblindness influence an artist's color selection?



- ▶ **Michael Mandel**, Research Scientist, Computer Science & Engineering  
Topic: Music Tagging
- ▶ **Arnab Nandi**, Assistant Professor, Computer Science & Engineering  
Topic: Gestural databases
- ▶ **Emma Oti**, Graduate Student, Earth Sciences  
Topic: Arctic Sediment Cores: Interpreting Arctic Climate from Ocean Sediments through Time.

- ▶ **Rebecca Ricciardo**, Instructional Lab Supervisor, Department of Chemistry and Biochemistry  
Topic: Project Color: Inorganic pigments: A study of structure and electronic transitions in the search for non-toxic pigment alternatives.
- ▶ **Stephen Takacs**, Lecturer, Department of Art  
Topic: Camera Obscura and Victrola Obscura: an audio device transformed into optical furniture.
- ▶ **Annie Specht**, Assistant Professor, Dept. of Agricultural Communication, Education, and Leadership



Topic: Pop [Agri]Culture: Farms and farmers have been on movie & TV screens since the 1930s. How have entertainment media portrayals of agriculture changed over time, if they've changed at all?

- ▶ **Manoj Srinivasan**, Assistant Professor, Mechanical & Aerospace Engineering

Topic: Toys, Robots, Humans: from toys to humans, why things move the way they do.

- ▶ **David Staley**, Associate Professor - Department of History

Topic: Is Google Making Us Stupid?: On the History and Future of the Brain-Internet Interface.

- ▶ **David Staley**, Associate Professor, Department of History

Topic: Data sculpture: visualizing "BIG DATA."



## WEBSITE, SOCIAL MEDIA, AND COMMUNICATIONS CAMPAIGN

The STEAM Factory participates in social media and other forms of communication in order to further its twin goals of collaboration and dissemination. Social media can be used to disseminate interdisciplinary research results and also to foster new collaborative projects by promoting new ideas and sharing member interests. By providing a single online presence for many different departments and research areas, STEAM Factory's communication naturally weaves together multiple research strands and prompts those viewing STEAM Factory updates to think in new and creative ways.



The STEAM Factory website is frequently updated; these frequent updates reflect the acute agility of The STEAM Factory. In order to maximize our reach while minimizing the expense of building a custom site, The STEAM Factory uses an industry standard content management system (Drupal) with a theme provided by the College of Arts and Sciences at Ohio State. The theme places STEAM Factory visually within the aegis of academia, while STEAM Factory's customizations provide a glimpse into its innovative way of breaking down departments and knowledge silos.

The website is not merely a marketing channel for STEAM Factory as a whole, but also a channel for raising awareness about its individual members. Projects are showcased on the website with text, photos and video provided by the Principal Investigator. The STEAM Factory broadly and freely promotes individual members and their departments or other affiliations on The STEAM Factory website. Such marketing adds value to core membership, encouraging greater membership and more opportunities for collaboration.

Beginning in January of 2016, the STEAM Factory website underwent a complete renovation. We began by reaching out to members in order to update STEAM member biographies with the most current information. The STEAM Factory website also began a blog that shares information on past events and achievements of STEAM members. This new feature allows for more elaborate details on STEAM events and more descriptive facts on personal STEAM member achievements. These blogs are then shared to the Facebook and Twitter accounts in order to bring social media followers back to the website. Finally, a new Events Calendar allowed viewers to see past and future events, which were posted to all social media accounts.





As of August 2016, the STEAM Factory's increased social media efforts amplified our follower base on all online marketing accounts. Our Facebook page reached 580 likes from 32 different countries and averages around 35 direct engagements per post. The Twitter account has made great improvements by increasing its number of followers to 583 and averaging over 10K impressions per month. As in 2015, we conducted two Haiku Twitter contests for tickets to TEDxOhioStateUniversity and Paul Sutter's performance, Song of the Stars. Each contest accumulated high impressions: TEDx at 17.4K and SOTS at 14.3K. The success of our social media comes from reaching out to STEAM members to help us share their success to our followers.

Finally, STEAM Factory's online activities are two-way; STEAM Factory members frequently mention The STEAM Factory when speaking publicly on research that has been showcased on the website. This provides an opportunity to promote STEAM Factory in other academic circles, with a long term goal of establishing a global network of collaborating STEAM Factories, (much as the Illinois Geometry Lab was replicated elsewhere). The frequent "STEAM Factory" appearances in a wide variety of contexts encourage the broader public to envision just how expansive academia at its best, can be.

The STEAM Factory also works very closely with many outreach partners to amplify the programming and events of the factory and its community partners. External outreach partners include WCBE (90.5FM), Greater Columbus Arts Council, 400 West Rich, and Columbus Idea Foundry. The Ohio State University outreach partners include: The Office of Outreach and Engagement, Office of Research, ASC Communications, Buckeye Leadership Fellows Program, Life Sciences Network, and STEM Initiatives.



## ADDITIONAL STEAM OUTREACH ACTIVITIES AND OTHER PUBLIC EVENTS

Since its founding in 2013, the STEAM Factory has been involved in a variety of outreach activities amplifying the research and interests of its Ohio State faculty members both within the university and more broadly within greater Columbus. The STEAM Factory has also partnered extensively with numerous university offices, colleges and departments to support outreach efforts for junior faculty in recruitment, orientation and retention.

One of the STEAM Factory's most developed new faculty outreach partnerships has been the New Faculty City Road Trips which began Autumn Semester, 2013. The pilot program was supported and implemented by the Office of Academic Affairs, under the leadership of Susan Williams and J. Briggs Cormier and the Office of Outreach and Engagement (O&E). These efforts have been spearheaded by Stephen Myers (Vice Provost, Outreach and Engagement) and Janis Browning (Program Coordinator, Outreach and Engagement). STEAM members regularly serve as "leads" for the excursions, providing advice and fellowship to the new faculty.

### **The STEAM Factory outreach activities have included the following:**

#### CREATE-A-THON AND ARTREPRENEUR EIGHT-WEEK WORKSHOP - MAY THROUGH JUNE 2016

STEAM Factory members Melissa Crum and Sonia Manjon (Director, Affiliate Faculty, The Barnett Center, Latino Studies) led the eight week ARTrepeneur workshop. Participants met three times a week throughout May and June 2016 in the STEAM Factory space. Through the Barnett Center and Creative Control Fest's established networks, the two-month series offered master classes led by locally and nationally renowned creatives to help seasoned and aspiring Columbus artists and Ohio State students create vibrant and sustainable careers.

While Columbus offers many programs to assist artists, The Barnett Center and its partners identified a lack in long-term comprehensive programs for art-centered businesses and students who are aspiring arts entrepreneurs. In early 2015, The Barnett Center and Mosaic Education Network came together to form the ARTrepeneur workshop series which offers three unique components to address the needs of Ohio State entrepreneurial students and Columbus artists: 1) two-month intensive series on finance, marketing, and law; 2) three-months of business workspace in Franklinton's Bottom's Up Coffee Co-op for participants who complete the program; 3) Continued professional development through quarterly arts-centered business programs sponsored by The Barnett Center, ARTfluentia, and Creative Control Fest. These three components satiate the need for business oriented skill-building, while providing time to focus on their businesses, and dedicated working space in a location that supports community building and collaborations.



### NSF EARLY CAREER AWARD: PANEL DISCUSSION - **April 13, 2016**

The STEAM Factory partnered with the Ohio State Office of Research (organizer of this event) and spoke to faculty attendees about the broader impact benefits of research activities provided through STEAM Factory programming opportunities at its collaboration and co-working space in Franklinton. Panelists included numerous previous award winners as well as other helpful administrative and programmatic presenters. Throughout June and July 2016, the STEAM Factory consulted directly with nearly a dozen faculty members regarding their broader impact plans as well as provided numerous letters of support for related programming. The STEAM Factory also sponsored lunch for the workshop attendees.

### HIV PECHA KUCHA - **APRIL 19<sup>TH</sup>, 2016**

Students from the course, HIV: From Macro History to Microbiology co-taught by Dr. Thomas McDow and STEAM Member Dr. Jesse Kwiek, presented interesting and engaging Pecha Kucha presentations at the STEAM Factory. Representatives from The Ohio AIDS Coalition, Project INK, and Equitas Health also presented in the Pecha Kucha format. The presentations spanned a wide variety of issues regarding HIV. This event was one of the first STEAM-Powered Projects.

HIV is a disease not often talked about widely in society, but on this Tuesday night at The STEAM Factory, it was all anyone could talk about. Students from the course, HIV: From Macro History to Microbiology co-taught by Dr. Thomas McDow (College of Arts and Sciences, Department of History) and Dr. Jesse Kwiek (College of Medicine, Department of Microbial Infection and Immunity) presented interesting and engaging Pecha Kucha presentations. A Pecha Kucha style presentation is a quick paced 20 slides that show for 20 seconds a piece. It requires presenters to be creative and fast on their feet.



In total, nine presentations were presented throughout the night. Six of these were by undergraduate students from McDow and Kwiek's class. Representatives from The Ohio AIDS Coalition, Project INK, and Equitas Health also presented in the Pecha Kucha format. The presentations spanned a wide variety of issues regarding HIV. A few of the topics discussed were the history of HIV research, stigma associated with HIV, barriers those with HIV face, and a new medication called PrEP that can help prevent HIV. Not only were the presentations very informative and educational, but the fast-paced style kept the audience engaged throughout the duration of the evening. There were also several breaks which allowed the audience to interact with the presenters by asking any questions they had regarding HIV.

This event was one of the first STEAM-Powered Projects, a yearly grant proposal competition facilitated by the STEAM Factory. These grants are meant to stimulate interdisciplinary projects and collaborations among STEAM Factory members. Kwiek, a STEAM Factory Member, received a grant from the STEAM Factory that made the event possible.



**SONG OF THE STARS - APRIL 21, 2016**

Song of the Stars is a cross-disciplinary production engaging astrophysicists, dancers, and filmmakers to create a ground-breaking performance designed to humanize science, awaken curiosity, and intimately connect audiences to the wonders of the universe.

Led by Seven Dance Company under the artistic direction of Cassia Cramer, the live premiere occurred on April 21, 2016 at the Capitol Theater in Columbus, Ohio. It was filmed and edited for national distribution.

Following the live performance, individual dance segments were recorded using specialized 360-degree cameras in order to create a unique immersive experience in planetariums worldwide, and for use in personal virtual reality (VR) headsets such as the Oculus Rift and HTC Vive.

**COLUMBUS GREEN TEAM – HELD MONTHLY ON THE 3<sup>RD</sup> THURSDAY BEGINNING MARCH 2016**

STEAM Member Jason Cervanec and his team at Byrd Polar Research Center at Ohio State University are members of Columbus’ Green Team, a group of environmental policy advisers for the city of Columbus. The Green Team meets bi-monthly and is made up of subject matter experts, community leaders, and business leaders appointed by the Mayor. A representative from each of the city’s departments is assigned to attend Green Team meetings. The Green Team is further made up of working groups to invest additional focus on a variety of projects and policy.

**O&E NEW FACULTY ROAD TRIP TO THE COLUMBUS MUSEUM OF ART - MARCH 24<sup>TH</sup>, 2016**

New Faculty members were invited to join Nanette Maciejunes, Executive Director, who provided a private tour of the newly renovated museum.

**PI MEASUREMENT CHALLENGE - MARCH 12, 2016**

STEAM Factory member John Niles took a group out to the Great Circle Earthworks for an afternoon of measuring circles and learning about mathematics at the historical site. The challenge was to measure the actual Great Circle. The Pi Measurement Challenge is collaborative outreach event organized by Niles Johnson and Richard Shiels, historian and director of the Newark Earthworks Center. The challenge invited participants of all ages to help with





the measurement and learn more about the history and mathematics of the Great Circle to measure its circumference, measure its diameter, and divide.

The perimeter of the Great Circle is the same as the perimeter of the Wright Earthworks Square about a mile away. And the area of the Wright Earthworks Square is the same as the area of the Observatory Circle attached to the Octagon Earthworks, even further away. The American Indians who built these earthworks 2000 years ago must have known the relationship between circle diameter, perimeter, and area — the number that we now call  $\pi$ .

TIJS VAN MAASAKKERS' PILOT TEST RUN OF OH/LEX - URBAN PLANNING INITIATIVE @ THE STEAM FACTORY AT 400 W RICH - **March 8<sup>th</sup>, 2016**

A group of Ohio State Students and Faculty met to collaborate, discuss and propose solutions to promote the city of Columbus' new agenda to connect neighborhoods. Engagement occurred with a world-class urban planning initiative, helping Ohio State faculty test and simulate tools for urban land redevelopment with an overall goal to learn how to build better neighborhoods. The STEAM Factory provided use of the collaboration and co-working space that provided easy for its professional stakeholders and encouraged people to consider alternative possibilities for land reuse.

PAUL SUTTER SPEAKING AT TEDXOHIOSTATEUNIVERSITY - **March 5<sup>th</sup>, 2016**

Paul Sutter, astrophysics scholar and STEAM member spoke at the TedxOhioStateUniversity event about the correlation between art and science. He presented his show, "Song of the Stars, which is a dance production choreographed to tell the story of a life of a star. The show was performed the following month in April 2016.

KATIE WALTON'S RESEARCH GROUP RETREAT - **FEBRUARY 21, 2016**

STEAM Factory hosted STEAM Member Katie Walton's Research group retreat. The workshop provided training on how to implement Reciprocal Imitation Training, and evidence-based early intervention for children with autism spectrum disorders. This workshop trained seven new student providers in preparation for an upcoming research project comparing the effects of therapist-implemented versus parent-implemented Reciprocal Imitation Training.

ZAKEE SABREE'S LAB GROUP MINI-RETREAT - **SUNDAY, FEBRUARY 21ST**

The Insect-Microbe Symbiosis Lab (IMSL) is seeking to hold its biannual planning meeting at the STEAM Factory space. In this meeting, the group set funding, publication and occupational goals for the next 6-12 months, reviewed past progress, and developed ongoing strategies.





O&E NEW FACULTY ROAD TRIP BY THE COLUMBUS METROPOLITAN CLUB AT COSI - FEBRUARY 9<sup>TH</sup>, 2016.

New Faculty members were invited to join the Columbus Metropolitan Club, President Drake and Interim Provost McPherson to an event honoring new faculty and engaging with one another.

MLK DAY OF SERVICE - JANUARY 18<sup>TH</sup>, 2016.

New faculty participants were invited to volunteer at one of many agencies across Columbus where they served with a diverse group faculty and students to honor the life and work of Martin Luther King Jr.

O&E NEW FACULTY ROAD TRIP TO THE FRANKLIN PARK CONSERVATORY & BOTANICAL GARDENS HOLIDAY MERRY AND BRIGHT DISPLAY - DECEMBER 9<sup>TH</sup>, 2015.

New Faculty met with Jenny Pope, Outreach and Education Director of the Franklin Park Conservatory and toured the special holiday display at the conservatory.

STEP NIGHT OF CREATIVITY - NOVEMBER 13, 2015

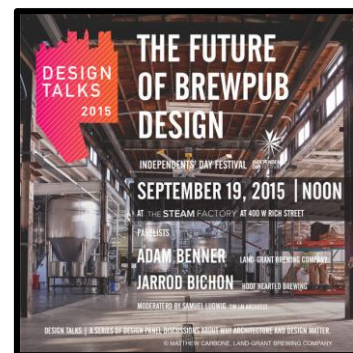
The STEAM Factory partnered with the Second Year Transportation Education Program (STEP) faculty for an evening to explore the innovation and creativity that is happening in Franklinton with the STEAM Factory and the Idea Foundry. The evening included tours of the STEAM Factory space, the Columbus Idea Foundry and the galleries at 400 West Rich Street. The activity was developed with the intent of building community among STEP Faculty and showing faculty the different spaces available for use with activities with their STEP student cohorts.

O&E NEW FACULTY CAMPUS *GHOSTLY* WALKING TOUR OF THE OHIO STATE UNIVERSITY - OCTOBER 28<sup>TH</sup>, 2016.

New faculty were invited to walk the campus with Stephen Myers (Associate Provost, Outreach and Engagement) to learn some spooky and creepy stories about our haunted campus.

ROLLS DESIGN WEEK TOUR - SEPTEMBER 19<sup>TH</sup>, 2015

The STEAM Factory partnered with Tim Lai, Architect at 400 W. Rich St. for a discussion about "The Future of Brewpub Design." This hour-long discussion also featured panelists Adam Benner, Land-Grant Brewing Company, and Jarrod Bichon, Hoof Hearted Brewing and was held during the annual Independents' Day Festival. Design Talks are a





series of hour-long panel discussions on a variety of topics about why architecture and design matter.

#### BRING CARDINAL TURKSON TO COLUMBUS PLANNING MEETINGS - FALL 2015

The STEAM Factory partnered with Don Hubin (Professor Emeritus, Department of Philosophy) to host the Cardinal Peter Turkson planning meetings throughout the fall of 2015. Cardinal Turkson, president of the Pontifical Council for Justice and Peace and the first cardinal from Ghana, visited the Ohio State University for a community discussion on global sustainability on November 2<sup>nd</sup>, 2015 at the Mershon Auditorium. His discussion was followed by a fireside chat with Ohio State President Michael V. Drake. Cardinal Turkson is respected internationally as a Scripture scholar, an advocate for the poor and disenfranchised in the developing world, and a spokesperson for protecting the environment as a matter of social justice. Turkson has long made news with his comments linking ecology and human life and has become the face of climate change at the Vatican, having led the drafting process of Pope Francis's encyclical on the environment, presented at the April 28 Vatican conference on climate change and introduced the encyclical during a June 18 news conference.

#### BUCKEYE BACKERS - SEPTEMBER 14, 2015

The STEAM Factory partnered with Emily Creasap, Program Coordinator of Development and Community Relations at the Marion Ohio State University campus to host a group of Ohio State Marion Alumni volunteers (The Buckeye Backers) for a tour of the STEAM Factory, 400 West Rich and Franklinton. The Buckeye Backers is a group unique to Ohio State Marion and is made of community members and retired staff and faculty. Members volunteer for many events and extra duties on our campus, logging more than 500 hours of service to our campus each year.

#### DEPARTMENT OF ARTS ADMINISTRATION, EDUCATION & POLICY ANNUAL RETREAT - AUGUST 2015

The STEAM Factory hosted faculty from the Ohio State Department of Arts Administration, Education, and Policy at the STEAM Space for their annual team-building retreat.

#### NEW FACULTY CITY ROAD TRIPS - AUGUST 19<sup>TH</sup> & 20<sup>TH</sup>, 2016.

New faculty were invited to join a van ride through notable neighborhoods and areas of Columbus and finish off at the Hilton- Short North for hors d'oeuvres and cocktails.

#### HEALTHTECH HACKATHON - JAN 16-17, 2016



The STEAM Factory members Roman Holowinsky (Associate Professor, Department of Mathematics), Jim Fowler (Assistant Professor, Department of Mathematics) partnered with eight bright developers affiliated with GDG Cherkasy, Ukraine for a 2016 Healthtech Hackathon held at the CoverMyMeds corporate headquarters in Columbus, Ohio. The hackathon included a partnership with Columbus Smart+Open, the STEAM Factory, Multivarious Games, Zoco Design, CoverMyMeds, Columbus Idea Foundry and Hilton Columbus downtown. The 2016 Healthtech Hackathon combined two parallel hackathons running simultaneously in Columbus, Ohio and Cherkasy, Ukraine. This event was intended to increase mutual understanding between cultures, to promote education and technology, and to foster collaborative relationships between programmers and industry partners in Columbus and Cherkasy.

TED X OHIO STATE UNIVERSITY - FEBRUARY 14 2015

STEAM Factory member John Beacom (Professor in the Departments of Physics and Astronomy) joined an incredible and diverse array of speakers for this year's topic, "The Human Narrative." His research focuses on neutrinos — almost massless and almost non-interacting particles that pervade the Universe and that can reveal hidden wonders, such as the core of the Sun, stars that implode, and black holes that are gobbling away. (Trillions of neutrinos passed invisibly through your eyes as you read that sentence.)

O&E NEW FACULTY ROAD TRIP FOR COLUMBUS METROPOLITAN CLUB EVENING MIXER - FEBRUARY 10, 2015.

New Faculty met at COSI with community leaders and the faculty from six central Ohio universities to reinforce their decision to live and work in Columbus.

ARENA TECH NIGHT - JANUARY 20, 2015

Giorgio Rizzoni (Professor of Mechanical and Aerospace Engineering and of Electrical and Computer Engineering) presented on the topic "The Future of Transportation for Sustainable Mega Cities." David Staley (Associate Professor, Department of History) presented on the topic "Is Google Making Us Stupid? On the Future of the Brain-Internet Interface." The standing room only audience consisted of over 150 members of the Columbus business and tech community.



O&E NEW FACULTY ROAD TRIP TO THE COLUMBUS MUSEUM OF ART - December 9, 2014.

New faculty were met by Nanette Maciejunes, Executive Director, who provided a private tour of the museum.



TED X COLUMBUS - NOVEMBER 7, 2014

A diverse group of researchers, professors, artists, motivators and scientists tackled topics surrounding the event's theme of STEAM. The STEAM Factory's very own Director of Outreach, Jim Fowler, was amongst the impressive lineup of speakers. During his talk, "The Humanity of Calculus," Jim shares his mission to get students excited about math and improve how calculus is taught both in the classroom and on the web. He emphasized the human story of calculus and how it helps his students better understand mathematical concepts.



O&E NEW FACULTY ROAD TRIP TO FRANKLIN PARK CONSERVATORY & BOTANICAL GARDENS - OCTOBER 22, 2014.

New Faculty met with Jenny Pope, Outreach and Education Director of the Franklin Park Conservatory and toured the conservatory.

NATIONAL SCIENCE WRITERS CONFERENCE OPENING RECEPTION - OCTOBER 17, 2014

The Ohio State University hosted over 350 science writers from across the country for ScienceWriters2014. To help kick off the weekend, The STEAM Factory presented almost a dozen Ohio State faculty research and outreach projects at the opening reception of the convention. STEAM Factory presenters included: Jim Fowler (Department of Mathematics), Anna Gawboy (Department of Music), Susan Gershman (Department of Evolution, Ecology and Organismal Biology), Lisa Hall (Department of Chemical and Biomolecular Engineering), Roman Holowinsky (Department of Mathematics), Matthew Kahle (Department of Mathematics), Arnab Nandi (Department of Computer Science and Engineering), Rebecca Ricciardo (Department of Chemistry and Biochemistry), Bart Snapp (Department of Mathematics), and Manoj Srinivasan, (Department of Mechanical and Aerospace Engineering). In attendance were writers from The New York Times, Wall Street Journal, Washington Post, Reuters, NPR, NOVA, NBC News, The Atlantic, National Geographic, Scientific American, among others.

NEW FACULTY ROAD TRIP TO COLUMBUS DOWNTOWN NORTH MARKET AND 400 W. RICH STREET.

**September 10, 2014**

New faculty toured Columbus' Short North, downtown, and Franklinton districts before stopping for appetizers, drinks, and conversation at a downtown restaurant.





**NEW FACULTY ROAD TRIP TO THE FARM SCIENCE REVIEW - SEPTEMBER 16, 2014**

New Faculty members were invited to join Columbus Metropolitan Club members for a day at the Ohio State University's three-day showcase of agricultural production, technology, and education.

**UNIVERSITY EXPLORATION ADVISING PANEL DISCUSSION - AUGUST 13, 2014**

The STEAM Factory directors participated on a panel discussion for a portion of a day-long University Exploration advisory staff training retreat. They shared their career trajectories and recommendations for student involvement in a variety of academic and interdisciplinary activities.

**ASC STAFF APPRECIATION DAY - AUGUST 1, 2014**

The STEAM Factory hosted Cheng Zhang (Post-doc with The Advanced Computing Center for Art and Design (ACCAD)) with her presentation of "The Moon Experience – A computer simulation of being an astronaut on the moon." Over 200 Ohio State students, faculty and staff attended the event.

**IMAGINE 400 SHOWCASE - APRIL 25, 2014**

The 400 West Rich event space hosted a showcase gallery party, featuring work from a variety of building tenants, including The STEAM Factory. The target audience for this event was the Franklinton and wider Columbus community, including both children and adults. Presenters coordinated by The STEAM Factory included: STEAM Factory member Lise Worthen-Chaudhari (Research Assistant Professor, Department of Physical Medicine and Rehabilitation), who presented collaboratively with choreographer Mikey Thomas (Director, Movement Activities); STEAM Factory members Stephen Takacs (Lecturer, Department of Art) and Rebecca Ricciardo (Instructional Lab Supervisor, Department of Chemistry and Biochemistry), and OSU faculty Delwin Lindsey (Professor, Department of Psychology), and Angela Brown.



**COSI AFTER DARK - January 10 and June 5, 2014**

COSI hosts a series of monthly events aimed at adults (aged 21 and over) from all over the Columbus area. STEAM Factory member Stephen Takacs (Lecturer, Department of Art) demonstrated his camera



obscura project Brownie In Motion (see more information further below in this report) at two of these events, each of which was attended by more than 300 people.

COLLEGE OF ARTS AND SCIENCES ALUMNI TAILGATE - **OCTOBER 19, 2013**

This event, hosted on the Ohio State campus, attracted a large number of Ohio State alumni and their families. The STEAM Factory hosted a booth at which John Beacom (Professor, Department of Physics and Department of Astronomy) presented a demonstration on universal gravitation.

GO WEST! FESTIVAL - **OCTOBER 12, 2013**

Go West was a community festival held in Franklinton and presented by the Franklinton Arts District, attended by the broader Columbus community including families and children. The STEAM Factory hosted a series of demonstrations and displays at a booth, including presentations by members Anne Co (Assistant Professor, Department of Chemistry and Biochemistry), Manoj Srinivasan (Assistant Professor, Department of Mechanical and Aerospace Engineering), and Arnab Nandi (Assistant Professor, Department of Computer Science and Engineering), as well as five Ohio State graduate and undergraduate students.





# CHAPTER 4:

## EXAMPLES OF STEAM FACTORY MEMBER COLLABORATIONS

All of our members share in The STEAM Factory’s collaborative spirit. Here are some examples of projects that our members have organized over the past couple years. Each project was supported by The STEAM Factory through administrative support, funding and/or use of the STEAM Factory space and/or resources.

### OHI/O HACKATHON

*Arnab Nandi and Meris Mandernach*

To foster a tech culture amongst students at Ohio State and cultivate technical talent in Columbus and the Ohio region, “OHI/O” — Ohio State’s Second Annual Hackathon and programming contest was held Friday October 3rd 2014 through Sunday October 5th 2014. Over 200 undergraduate and graduate student programmers built working software and demonstrated it to a live audience of students, faculty, and representatives from tech companies.



Students competed for over \$5000 in prizes and were judged on categories including technical difficulty, creativity, usefulness, and presentation. OHI/O 2013 and 2014 were made possible by Hortonworks, Google, Teradata, Persistent Systems, Epic, Wexner Medical Center, CoverMyMeds, OSU College of Engineering, The STEAM Factory, OCIO, OSU Department of Computer Science & Engineering and the Open Source Club.





## PROJECT COLOR

*Felipe Castelblanco, Roman Holowinsky, Rebecca Ricciardo*

**Initial Concept:** The starting point for the STEAM Factory's "Project Color" came from Rebecca Ricciardo, who coordinated the general chemistry curriculum for roughly 1000 freshmen during the spring semester of 2014. She had students create pigments from inorganic materials, produce paint from those pigments and, finally, use the paints to create works of art.

**Evolution:** As Rebecca shared her course activities with various members of the STEAM Factory and the outside community, it was suggested that we provide some additional incentive for the students in the form of competition in the form of a prize (e.g. gallery showings of the completed artwork with chemistry posters describing the chemical properties of the paint). The project further evolved into a study of color that went far beyond simply creating pigments from inorganic materials. The idea organically developed into a general education class examining color from various angles of research and history, thereby investigating the environmental, economic and cultural impacts of color. The course objective was to bring awareness to different issues surrounding color combining an educational component around each topic.

At the completion of Project Color, the following STEAM Factory members were involved: Rebecca Ricciardo (Chemistry and Biochemistry), Anne Co (Assistant Professor in the Department of Chemistry and Biochemistry), Monica Giusti (Assistant Professor in the Department of Food Science and Technology) and Felipe Castelblanco (Fergus Family Visiting Artist in the Urban Arts Space).

As part of this project, four presentations were held at the 400 West Rich Market (spring 2014) and an online competition was held for student artwork generated as part of the course. Photographs of the artwork were uploaded to The STEAM Factory's Facebook page ([www.facebook.com/theSTEAMfactory](http://www.facebook.com/theSTEAMfactory)), and nearly 10,000 people interacted with the site to vote for their favorite piece of art. The winning artworks were displayed at the Imagine400 Showcase held at 400 WEST Rich on April 25, 2014.







## BROWNIE IN MOTION: AN ITINERANT ART INSTALLATION

*Stephen Takacs*

*Brownie In Motion* is a project by STEAM Factory member Stephen Takacs (Lecturer in the Department of Art), which was funded in part by the Outreach and Engagement Impact Grant awarded to The STEAM Factory in 2013.

The *Brownie in Motion* is a modular, room-sized camera obscura that functions as an immersive art installation, a functioning camera, photographic darkroom, and a didactic tool. Physically, this piece is a to-scale replica of an iconic Kodak Brownie box camera that has been enlarged 18.5 times to a footprint of 5' 3" x 8' 5", with a height of 8'.



At the SPE Midwest Conference in Nebraska.

Viewers of *Brownie In Motion* are encouraged to enter the installation and “become the camera.” On the front of the camera are a lens and a small infrared sensor connected to the camera shutter. When the sensor is activated by motion, it opens the shutter allowing light to enter via the lens. The lens projects an upside-down image of the exterior onto a large spool of thin transparent fabric in the interior of the camera. This allows the participant to gaze at the outside world from inside the object in a manner similar to camera obscuras that were popular in 18th and 19th century.

Within this camera obscura, the everyday world is re-contextualized by literally turning the perception of the world on its head. The analogue image capture technology in *Brownie In Motion* is different than most modern image making devices, though the concept and the optical phenomenon of the camera is still the same, and serves as a powerful and engaging teaching tool.

Stephen is using his camera not only to educate but to create an important ongoing series of photographs that document practitioners of disappearing crafts and trades. All of the black and white images in this series are shot and chemically developed by hand inside of the camera obscura, much like early itinerant photographers of the 19<sup>th</sup> century.

Stephen has toured the nation with this project. The project has been displayed at the Cleveland Ingenuity Festival in September 2013, the Columbus Mini Maker Faire held at COSI in October 2013, and the 2013 Society for Photographic Education Midwest Conference in Lincoln, Nebraska.



Takacs has conducted a series of demonstrations using the camera obscura at a wide variety of venues and events, including:

- ▶ The 400 West Rich Winter Market on December 14, 2013. The audience for this demonstration was the regular variety of market goers (see metrics for these markets in the next report section).
- ▶ COSI's After Dark events held on January 10, 2014 and June 5, 2014. The target audience for these events was adults from all over the Columbus area. At the "Steampunk Carnival" event on June 5, Takacs used a photobooth-style presentation to capture photographic images of event participants.
- ▶ 51<sup>st</sup> SPE National Conference | Collaborative Exchanges: Photography in Dialogue (Baltimore, MD)
- ▶ March 6 – 9, 2014: 2014 Nationwide Children's Hospital Starry Night Family Festival held at the Westerville South High School on April 6, 2014. The audience included families from Westerville and surrounding neighborhoods.
- ▶ Imagine400, a showcase gallery held at the 400 W. Rich event space on April 25, 2014. This event attracted over 300 attendees from Franklinton and the Columbus community.
- ▶ Ohio Camera Collectors Society Annual International "Original Collectors Show" held in Columbus on May 17, 2014. The audience for this event included camera enthusiasts from central Ohio.
- ▶ Columbus Idea Foundry Open House event held at the Columbus Idea Foundry site in Franklinton on June 1, 2014.
- ▶ The 2014 Great Oregon Steam Up at Antique Powerland in Brooks, Oregon.
- ▶ Penland School of Craft in Asheville, North Carolina.



At the Cleveland Ingenuity Festival

Internet resources and links resulting from this work include:

- <http://makezine.com/2014/06/05/giant-interactive-camera-obscura/>
- <http://www.simplifiedbuilding.com/blog/portable-frame-for-traveling-camera-exhibit/>
- <http://www.lomography.com/magazine/lifestyle/2014/06/04/an-interview-with-photographer-stephen-takacs>
- <http://614columbus.com/2014/06/a-photograph-worth-a-hundred-years/>



## RECREATING ALEXANDER SCRIBIN'S TASTIERA PER LUCE

*Anna Gawboy*

Anna Gawboy (Assistant Professor, School of Music) used STEAM Factory funding to help bring a public performance of her research to fruition. Gawboy spent a weeklong residency at Utah State University on November 18-23, 2013, which culminated in a lighted performance of Alexander Scriabin's Prometheus, Poem of Fire op. 60 with the Utah State University Orchestra and combined choirs, conducted by Laura Jackson.

The piece was composed in 1910, and represents the earliest attempt to combine music and colored lights in a multimedia spectacle. In the past, the work was seldom performed, and when it was, designers frequently ignored Scriabin's obscure indications and inserted their own visuals. Gawboy's research, based on analysis of archival materials, filled in many gaps regarding Scriabin's vision.

While in Utah, Gawboy had the opportunity to work closely with several students and involve them in critical aspects of the performance. Gawboy addressed several classes, which ranged in size from 10 to 900. Gawboy also delivered three lectures "Color-music relations in Scriabin's Prometheus, Poem of Fire," "Interpreting Scriabin," and a pre-concert talk about the performance that was streamed live. Gawboy also sat on two panels: "Western Esotericism and the University," with Chris Scheer, Marco Pasi, and Brian McCuskey, and "Performing the Poem of Fire," with Laura Jackson and Chris Scheer. She additionally participated in the workshop: "Writing Program Notes" co-facilitated with Chris Scheer.



The audience for this work included the students and faculty of Utah State School of Music, the wider Utah State University community, and the general public in Logan, Utah.

In addition, Gawboy gained substantial research scholarship benefit from this work. She notes the following:



*“Public performance is the most comprehensive, authentic way I can disseminate my research in this piece to the public. Each time I design a performance, adapt it to a new environment, and communicate it to a new audience, I learn new information about the work itself. Since I intend to stage this piece in the future, I will use this information to develop my interpretation of the piece further.”*

Internet resources, documented stories and links resulting from this work include:

- <http://www.york.ac.uk/history-of-art/enchanted-modernities/scriabin-holst-concert/>
- <http://www.laurajackson.net/web/events.aspx?date=11%2F22%2F2013>
- <http://cachevalley.fox13noWestcom/m/h/events?ct=d&evid=281878942>
- <http://eventful.com/logan/events/prometheus-poem-fire-/E0-001-059734883-4>
- <http://www.usu.edu/ust/index.cfm?article=53323>
- <http://usuartnews.blogspot.com/2013/11/visitors-coordinate-concert-at-utah.html>



## STEAM MATH CIRCLES

*Bart Snapp, James Fowler*

STEAM Math Circles is a workshop-based educational series aimed at students and teachers in middle school, where a large attrition occurs in science and math.

Broadly, STEAM Circles aims to excite students and collaborate with teachers to think about real-world problems at the level of grade-specific course curriculum.

The STEAM Math Circles will build on the existing Math Circle program for students, organized collaboratively between college faculty, mathematics teachers and administrators, including STEAM Factory members Bart Snapp and Jim Fowler.

Jim Fowler and Bart Snapp worked with Columbus Math Circle Workshop for Teachers to host immersive multi-day mathematics workshops for junior high school teachers. This multiday immersion workshop was organized collaboratively between college faculty, math teachers, and administrators. Each session explored mathematical concepts like proof and reasoning, synthetic geometry, optimization, basics of graphing, problem posing, and counting arguments. STEAM Circles crossed disciplines, including mathematics, hydrology, environmental economics and aerial acrobatics, to promote a holistic consideration of multiple perspectives in addressing real world problems.

**Link:** [http://www.mathcircles.org/Wiki\\_WhatIsAMathCircle](http://www.mathcircles.org/Wiki_WhatIsAMathCircle)

Looking Ahead:

Working to apply Math Circles format to other subject areas:

- Aerial Acrobatics
- Environmental Economics: used to determine water flow rates and extent of water pollution.





## CIRCLE PACKING PUZZLES

*Matthew Kahle*

Through STEAM Factory funding, Matthew Kahle utilized the skills and equipment at the Columbus Idea Foundry by commissioning the construction of a Packing Circles puzzle. Circle packing is the study of the arrangement of circles of equal or varying sizes on a given surface so that no overlapping occurs and all circles touch another. The associated "packing density" of an arrangement is the fraction of the surface covered by the circles. Kahle constructed the packing circles puzzle as a means of exploring this mathematical problem in a tactile way, thereby making the challenge accessible to a wider range of people. "Most of this body of work is on packing objects in Euclidean space, which is infinite. But the problems become even harder if you try to pack them in a finite region, such as a square," Kahle says.

To begin the project, Kahle gave Bandar all the specifications, including exact dimensions for each puzzle. Through The STEAM Factory's Outreach and Engagement Impact Grant, Bandar was able to laser cut the packing circles to specifications. The puzzle was brought to the STEAM Factory's booth at the 400 West Rich Farmers Market on November 9, 2013, where a wide audience played with it including children of varying ages. The larger impact of this project is providing a more efficient way to pack and ship goods.



An article about this project can be found online at: <https://steamfactory.osu.edu/news/discovery-surprise>.

### Funding

Funded in part by the STEAM Factory 2013 Outreach and Engagement and Impact Grant

### Notable Achievements:

- Creating a challenging puzzle which was demonstrated for a public audience
- 10 year old came up with novel solution

### Looking Ahead:

Need funds to create more puzzle prototypes for possible commercialization



## LINKING ECONOMICS IN HYDROLOGY

A COUPLED MODEL OF THE PHYSICAL PROCESSES AND ECONOMIC BEHAVIOR IN THE UPPER BIG WALNUT CREEK WATERSHED

*Sathya Gopalakrishnan, Gaj Sivandran*

### Goal:

1. To develop a coupled model linking agricultural decisions and the hydrological processes determining the transport of pollutants from a watershed to a receiving water body
2. To combine economic and hydrology information in the Upper Big Walnut Creek watershed to validate the model and estimate cost benefit parameters to determine the agricultural input decisions.

**Summary:** Humans are constantly changing the environment surrounding them. Understanding the multidirectional feedbacks between human behavior and natural systems often requires more than just superimposing an economic model on the bio-physical system. Using the assembled data as a baseline to simulate alternative climate and land use scenarios, we also examined the potential impact of climatic change on water quality in the Hoover Reservoir. The newly developed research capacity provided insights for long-term solutions as policymakers today grapple with balancing a growing demand for agricultural output and sustainable management of aquatic ecosystems.

**Funding:** 2013 Seed Grant - Ohio Agricultural Research and Development Center

### Publications:

- Liu, Gopalakrishnan, Browning, Herak and Sivandran, "Estimating the impact of water quality on surrounding property values in Upper Big Walnut Creek Watershed", Selected Paper for presentation at the Agricultural & Applied Economics Association's 2014 AAEA Annual Meeting, Minneapolis, MN, July 27-29, 2014.
- Liu, Gopalakrishnan, Browning, Herak and Sivandran, "Estimating the impact of water quality on surrounding property values in Upper Big Walnut Creek Watershed", 2014, in Preparation for submission to Land Economics.
- Browning, Callaway, King and Sivandran, 2013. SWAT modeling of nutrient fluxes into surface waters under increased climate variability. Gordon Conference Catchment Science: Interactions of Hydrology, Biology and Geochemistry, Andover NH.

### Notable Achievements:

- Mentoring for one PhD candidate and two Masters students
- Held events on climate change connecting hydrology and economic tradeoffs organized by Science Education Council of Ohio with Sam White for high school science teachers

**Looking Ahead:** Need funding for more Graduate Student support to do more integrated modeling



## OH-LEX: OHIO LAND EXCHANGE

***Mattijs Van Maasakkers, PhD—Assistant Professor***

College of Engineering— City and Regional Planning

### **Summary**

In the 1800s, during the Industrial Revolution, there was not enough space. Dense populations swarmed into cities hoping to get a piece of the American Dream. In response to these growing cities, land was strategically mapped out to accommodate large amounts of people, and even more land was planned out when those people started their own businesses.

But what happens when the opposite occurs? What happens when people pack up and leave these cities, abandoning their land and structures previously used to house their businesses?

The Ohio Land Exchange plans to address exactly that. Starting with Lima, Ohio, the program hopes to encourage stake-holders that are interested in more space (such as Head Start Lima) to negotiate and share structures in the city, and ultimately turn those tax deficiencies into productive lands.

Van Maasakkers, along with two co-principal investigators, Kristi Cheramie and Jacob Boswell, started the project in the summer and plan to work with the city of Lima for two years, and hopefully move on to other cities in Ohio after that.

The first phase of the OH-LEX is interviewing prospective stakeholders. Then, a map will be constructed based on the areas that each organization likes. If their interests overlap, a negotiation is planned to try to accommodate the needs of each group.

12 students headed out into Lima neighborhoods on Oct. 3 to begin surveying the land. This project is a perfect example of a community-university partnership .It provides the city very detailed data about the condition and economic viability of some of these properties. The university with its much more advanced tools and equipment can take the data, synthesize it, and bring it back in a way that becomes economically useful.”

### **Funding**

Outreach and Engagement Impact Grant — Awarded \$30,000

### **Notable Achievements:**

Intended Results—

- Create maps of ideal sites for stakeholders
- Apply this method to other shrinking Ohio cities





## 2016 PI MEASUREMENT CHALLENGE

*Niles Johnson, PhD—Assistant Professor, College of Arts and Sciences — Mathematics*

### Summary

The Pi Measurement Challenge is collaborative outreach event organized by Niles Johnson and [Richard Shiels](#), historian and director of the [Newark Earthworks Center](#). The challenge invited participants of all ages to help with the measurement and learn more about the history and mathematics of the Great Circle to measure its circumference, measure its diameter, and divide.

The perimeter of the Great Circle is the same as the perimeter of the Wright Earthworks Square about a mile away. And the area of the Wright Earthworks Square is the same as the area of the Observatory Circle attached to the Octagon Earthworks, even further away. The American Indians who built these earthworks 2000 years ago must have known the relationship between circle diameter, perimeter, and area — the number that we now call  $\pi$ .

Four teams participated, two for circumference and two for radius. After averaging the teams' measurements, here are the results:

Circumference: 3372.5 ft

Diameter: 10171.5 ft

$\pi$  Measurement: 3.1474

Percent Error: 00.19%





# PROTOTYPING FUTURE LEARNING EXPERIENCES — PHYSICS EDUCATION WORKSHOPS

*David McKenzie, MFA Candidate, College of Arts and Sciences — Department of Design*

## Goals

Prototyping with a non-designer team of physics faculty, staff and students to co-design an ideal student learning experience for Introductory Physics students

## Summary

This project began by identifying and conducting interviews with a small group of faculty, staff, and students about the current learning environment of an introductory physics class at Ohio State. Next, the group separated into formal workshops where group members created a display of their ideal physics learning environment. Results found that the faculty workshops produced an integrative lecture and lab studio-style set-up while the student workshop provided ideas for a more abstract layout, including a GPS app and methods for TAs to connect with students who were not physically in attendance. A third workshop was conducted to integrate the ideas proposed by the faculty and students. The outcome was a proposal for a GPS-enabled application that would allow students studying the same subject to form local study groups and receive virtual support from instructors and teaching assistants.

## Link

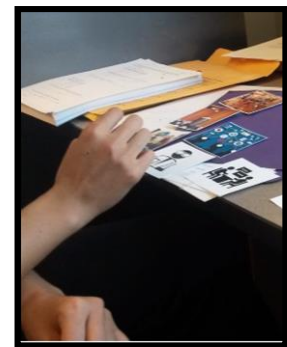
<http://davidmckenzie.co.uk/2015/12/01/prototyping-future-learning-experiences/>

## Notable Achievements:

- Using a prototype “seed” method to solve abstract problems
- Groundwork for a local study group GPS app

## Looking Ahead:

- Developing the GPS app
- Expanding the learning method across other departments’ teaching methods





# CREATE-A-THON AND ARTREPRENEUR WORKSHOP SERIES

**Melissa Crum** — Founder, Mosaic Education Network

**Sonia Manjon** — Director, Affiliate Faculty, The Barnett Center, Latino Studies

## Summary

Columbus is ranked the 6th most creative city in the US (Wallace, 2015). However, the research grounding this ranking does not reflect local artistic entrepreneurs' level of success or the business support available to make a creative enterprise profitable. While Columbus offers many programs to assist artists, The Barnett Center and its partners identified a lack in long-term comprehensive programs for art-centered businesses and students who are aspiring arts entrepreneurs. In early 2015, The Barnett Center and Mosaic Education Network came together to form the ARTrepreneur workshop series which offers three unique components to address the needs of Ohio State entrepreneurial students and Columbus artists: 1) two-month intensive series of finance, marketing, and law; 2) three-months of business workspace in Franklinton's Bottom's Up Coffee Co-op for participants who complete the program; 3) Continued professional development through quarterly arts-centered business programs sponsored by The Barnett Center, ARTfluentia, and Creative Control Fest. These three components satiate the need for business-oriented skill building, time to focus on their businesses, and dedicated working space in a location that supports community building and collaborations.



Workshop participants met three times a week Tuesdays, Wednesdays, and Thursdays through May and June 2016 in STEAM Factory space 400 Rich in Franklinton. Through the Barnett Center and Creative Control Fest's established networks, the two-month series also offered master classes led by locally and nationally renowned creatives to help seasoned and aspiring Columbus artists and Ohio State students create vibrant and sustainable careers.





## MOOCULUS:

*Jim Fowler*

### Summary:

Calculus One is a massive open online course held on Coursera and YouTube, featuring over 25 hours of video and exercises. Jim Fowler taught and designed the course with an emphasis on practice problems instead of just lecturing. The 16 week course was first made available in Spring Semester of 2012-2013.

Jim Fowler's team used Ruby on Rails to build the platform, and used Khan Academy as a framework to build the practice problems in MOOCULUS. The course begins with an introduction to functions and limits, then moves into derivatives, linear approximation, and ends with sections on integration. The set up encourages peer to peer and student instructor interaction. MOOCULUS sees a diverse group of students, involving more older learners than most online courses, and young people from all over the world, including a 14 year old girl in Pakistan.

The practice problem software also allows for data to be collected on more than the number of problems that are answered correctly. It also includes the amount of time taken on a problem and number of hints that were used. This form of data collection illuminates the ways that students learn and practice and also offers methods to design future online learning courses.

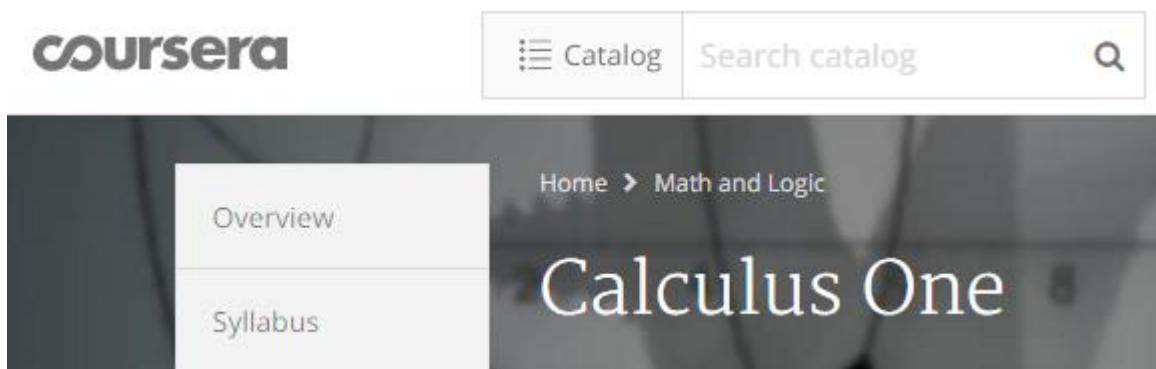
The MOOCULUS platform has expanded to allow people to log in using their Google ID, allowing students to access the course from anywhere, at any time.

### Looking Ahead:

- ❖ Creating an Interactive Textbook
- ❖ Making more Interactive worksheets

### Notable Achievements:

- ❖ More than 250,000 Participants
- ❖ YouTube Channel surpassed 1 million moves





# CHAPTER 5:

## ADDITIONAL STEAM PROGRAMS/SERVICES

### MEMBERSHIP SERVICES

STEAM Factory membership is open to faculty, staff and post-doctoral researchers within the Ohio State University. The STEAM Factory programming and activities and services are specifically designed to support its Ohio State membership in the development of collaborations in research, teaching and service within the university and greater Columbus community (e.g. STEAM Exchanges, Franklinton Friday Open Houses).

Additionally, there are many STEAM services and benefits that are offered exclusively to membership. These benefits include nearly unfettered access to the STEAM collaboration and co-working space, access to the STEAM member network, provision of research letters of support, invitations to formal and informal members-only events and amplification of STEAM member events and successes through STEAM Factory marketing efforts, among others.

### BENEFITS OF STEAM PARTICIPATION

The STEAM Factory provides a unique opportunity for researchers since the combined expertise of the entire membership can be leveraged for cross-mentoring of interdisciplinary research. Scholarship benefits to the faculty members directly feed back into the engagement partnership by providing additional avenues of research to discuss at public events, developing new and improved materials for disseminating research in an engaging manner and enhancing the skill of faculty members in discussing their research with the community.

The STEAM Factory contributes to the scholarship of research, teaching and outreach for its members. The scholarship is and will be documented in a variety of different forms, including, but not limited to: journal papers written as part of research collaborations, presentations made at academic conferences and public events, videos made of presentations at public events, displays and exhibits that will be uploaded to the Ohio State Knowledge Bank. Specific ways in which The STEAM Factory programming and activities benefit STEAM members include:



- Training in how to engage with a broad public audience
- Development of community and industry partner relationships
- Feedback on publicly-funded research
- Transfer of teaching skills, techniques and tools across research disciplines
- Development of new methods for displaying, visualizing and disseminating research
- Opportunities for enhanced cross-faculty interaction, engagement and research collaboration

## MEMBER ACCESS TO THE STEAM COLLABORATION AND CO-WORKING SPACE AT 400 WEST RICH

The STEAM Factory collaboration and co-working space is one of over 130 studios at 400 W. Rich. This nearly 3,700 square foot space offers:

1. Conference room space, a larger co-working area, a kitchenette facility, one and half bath with a shower (in case you like to bike, do yoga or work-out throughout your day) as well as smaller rooms for those that need a private space.
2. A bright and welcoming work environment with vaulted ceilings and skylights where our members can come and escape from the everyday routine of their campus or home office space.
3. As a member, the space is open 24/7 for access. Members are provided access via a special access codes into the building and a key to the STEAM space.
4. The space can also be reserved as an agile venue to host classes, group meetings, and presentations, often at no cost to members. The STEAM Factory has developed a space rental policy detailing the specifics of larger group space requests by both members as well as those outside of The STEAM Factory. Reservations must be made through Charlene Brenner, Project Coordinator for The STEAM Factory.
5. 400 W. Rich is a convenient, easily accessible location with ample parking and other area amenities including Strongwater restaurant, art galleries and is also a short walk to other downtown locations including COSI, The Columbus Idea Foundry and the newly renovated Scioto Mile Metro Park.
6. Access to the STEAM Factory space reservation calendar which keeps members updated on space use and reservations.

## ACCESS TO STEAM MEMBER NETWORK

### **Connections Magnified**

The STEAM Factory fosters and encourages collaboration between its ever-growing list of members and beyond. STEAM provides many diverse opportunities for members to meet others from various



departments who may not have typically met throughout their daily activities on campus. Members form professional connections that often lead to amplification and further development of traditional and non-traditional research, teaching and service projects as well as provide opportunities for new interdisciplinary ventures and a unlimited possibility for additional opportunities to which members may not have been otherwise exposed.

### **Member Listserv**

Members can readily receive information on STEAM events, research and news via the membership listserv. Members are also able to readily contact their widely diverse network of fellow STEAM members with opportunities for collaboration, requests for resources and information on different news items, events and programs. A wide variety of inquiries have been posed to the membership listserv including searches for grant collaborators, requests about how to integrate technology into classroom teaching and crowdsourcing opinions about the effectiveness of research tools. There have even been requests seeking members to serve on the scientific panel at the Wizard World Comic Con. Members have access to an amazing breadth and depth of expertise via the STEAM membership listserv. Members with interesting challenges, questions and ideas are encouraged go ahead and throw it out to our membership for thoughts, recommendations and input to helpful responses.

## RESEARCH SUPPORT

### **Professional Development**

STEAM hosts and participates in various professional development opportunities for members including interdisciplinary seminars and professional development panels. Members form lasting professional connections by collaborating and engaging with fellow STEAM members, as well as gain professional experience presenting research to both peers and the community through a variety of outreach opportunities.

### **Research and Writing Groups**

Members have developed ongoing writing groups to meet in the space and work on writing research, publications and grant proposals. These meetings are scheduled by members at their convenience.

## GRANT OPPORTUNITIES

The STEAM Factory has played an important role in obtaining grants for both individual and collaborative projects for its members through writing letters of support, providing a vehicle to amplify the broader impacts of Ohio State faculty research and developing its own collaborative grant submissions. Further, in 2016 The STEAM Factory developed the STEAM Powered projects grant for STEAM Factory members.



### Letters of Support

The STEAM Factory provides its members with grant proposal Letters of Support. As of May 2016, STEAM Factory members have been awarded nearly \$6 million in grants that have included STEAM Factory letters of support, including multiple NSF Early CAREER award winners.

### MEMBER ONLY SPECIAL EVENTS

In addition to STEAM events that are open to the public, the STEAM Factory hosts many types of events and programs designed specifically for members as a way to better facilitate connections, collaborations and conversations among academics from different fields. The STEAM Factory regularly programs formal and informal special events for our members to socialize, network, and enjoy each other's company. Provide faculty and staff casual settings to meet and get to know one another outside of common research or academic spaces. The community built from STEAM Factory informal gatherings can also lead to wonderful conversations; intersections in interests and professional collaborations in the future. Past events include the Symposium on Academia, the Collaboration Cauldron, annual celebrations, informal happy hours and lunches, Donuts and coffee at STEAM and more.



### MARKETING AND PROMOTIONAL OPPORTUNITIES

#### Friends of STEAM Listserv

All STEAM Members have access to our Friends of STEAM Listserv, our general public facing mailing list that provides a broader community, business and partner audience than that within Ohio State alone. We encourage members to send information regarding special events, workshops, guest lecturers, panel discussions that they would like shared with a broad community audience our way to get the word out.





### Peer Promotion via the STEAM Factory Website and Social Media

When a STEAM member gets tenured or awarded a research grant or teaching award, we encourage them tell us! We love to share our members' accomplishments! The STEAM Factory maintains a very active online presence through its social media and website activities and often shares the accomplishments, accolades and events of its diverse and prolific STEAM membership. The website and social media channels provide not merely a marketing channel for STEAM Factory as a whole, but also a channel for raising awareness about individual members in The STEAM Factory; projects are showcased on the website with text, photos and video provided by the principal Investigator or member. The STEAM Factory broadly and freely promotes individual members and their departments or other affiliations on its website. Such marketing adds value to the STEAM membership, which then encourages greater membership and therefore more opportunities for collaboration.

#### Website

The STEAM Factory website ([www.steamfactory.osu.edu](http://www.steamfactory.osu.edu)) is frequently updated; these frequent updates reflect the acute agility of The STEAM Factory. In order to maximize our reach while minimizing the expense of building a custom site, The STEAM Factory utilizes the College of Arts and Sciences at Ohio State's standardized Drupal platform. The theme places STEAM Factory visually within the aegis of academia, while STEAM Factory's customizations provide a glimpse into its innovative way of breaking through established departmental and knowledge silos.

#### Social Media



<https://www.facebook.com/theSTEAMfactory/>



<https://twitter.com/theSTEAMfactory>

@theSTEAMfactory

The STEAM Factory participates in social media and other forms of communication in order to further its twin goals of collaboration and dissemination. Social media is used to disseminate interdisciplinary research results, share events and also to foster new collaborative projects by promoting new ideas and sharing member interests. By providing a single online presence for many different departments and research areas, STEAM Factory's communication naturally weaves together multiple research strands and prompts those viewing STEAM Factory updates to think in new and creative ways.



The STEAM Factory also works closely with many outreach partners to amplify STEAM programming and events. External outreach partners include WCBE (90.5FM), Greater Columbus Arts Council, 400 West Rich, and Columbus Idea Foundry. The Ohio State University outreach partners include: The Office of Outreach and Engagement, Office of Research, ASC Communications, Buckeye Leadership Fellows Program and the Lantern.

You can view a list of our sponsors and affiliates at <https://steamfactory.osu.edu/sponsors-and-affiliates-2>.

### **Community Partner Events**

The STEAM Factory engages regularly with a diverse group of community partners on events and other projects to both strengthen the Franklinton community and give members more opportunities to engage members of the public with research in dozens of varied disciplines.

### **Outreach Events and Activities**

Access to special outreach events, seminars and workshops allow for the sharing of cutting edge research, projects and programs of STEAM faculty member research to a public that might not otherwise access it.

## STEAM STUDENT PROGRAMS

Undergraduate and graduate students working with members of The STEAM Factory benefit from having access to faculty mentors that represent an extensive array of disciplines, and having opportunities to practice conveying their work to a broader public audience while simultaneously developing real-world experience and skills outside the traditional classrooms. Additionally, students involved with STEAM faculty are also given the opportunity to work closely with STEAM university and community partners. STEAM Factory proposed student programs include the following:

► **Buckeye Leadership Fellow Challenge September 8 - October 20, 2015**

Development of a STEAM Factory/Buckeye Leadership Fellows Program (BLF) pilot leadership challenge program in which an interdisciplinary group of STEAM Factory faculty worked closely with BLF student scholars through a six-week real world challenge. The challenge of creating a project management system in the new STEAM Space was given to a group of Ohio State students. Four teams presented and a winner was selected. The STEAM Factory hired four undergraduate students from the BLF challenge to work on a variety of projects. This resulted in the Ideation board, a station in the STEAM Space that allows members to pose collaboration ideas.



► **STEAM Factory Student Internships**

The development of a variety of interdisciplinary STEAM Factory student internships and fellowships that partner with existing university student and scholar programs. The STEAM Factory worked closely with numerous student interns from the Professional Writing minor program. Professional Writing minor student interns have included: Chrissy Foltz (Class of 2017, Marketing) Leah Franklin (Class of 2016, Strategic Communications), Brittany Law (Class of 2018, Psychology and Women's Gender and Sexuality Studies) and Taryn Stanley (Class of 2017, Strategic Communications and Consumer Science).

► **Dr. Leslie Fine (Associate Professor of Marketing, Fisher College of Business) on her senior capstone Project-Based Marketing Course (BUSML 4204: MARKETING PROJECTS)**

The development of partnerships with departmental capstone classes to create opportunities for interdisciplinary senior capstone projects. During the Fall 2015, the STEAM Factory worked closely with Dr. Leslie Fine (Associate Professor of Marketing, Fisher College of Business) on her senior capstone Project-Based Marketing Course (BUSML 4204: MARKETING PROJECTS - Client STEAM Factory). The STEAM Factory met repeatedly with 45 students in the course broken up into seven teams. Project-Based Marketing Consulting (BUSML 4204: Marketing Projects) is an action-based learning experience as well as a competition. Students worked within their teams on STEAM marketing needs and developed the following deliverables:

- A comprehensive marketing implementation plan and presentation
- A fully developed set of collateral marketing materials which included print materials, website sample pages; sample social media posts and outreach materials.
- Research insights, findings and other analyses that supported team recommendations.

► **Dr. Shoshanah Goldberg-Miller and ARTEDUC 5673 - Symposium Issues.**

The STEAM Factory worked closely with Shoshanah Goldberg-Miller's class on Symposium Issues. The course explores new ideas or changing arts policy issues through readings and visiting experts to prepare students for participation in biennial Barnett symposium. STEAM met with the entire class on repeated occasions to offer insights into guerilla marketing and social media ideas, development and fundraising and event planning and implementation. The STEAM Factory also worked closely with the class for participation in its April 2016 Franklinton Friday Open House. The class developed multiple interactive demonstrations and activities for the general public that focused on both the Barnett Symposium Outreach as well as varying definitions and conceptions of creativity.

► **Dr. Mattijs van Maasackers and CRPLAN 3300 - Planning for and with People.**

The STEAM Factory worked with Tijs for his course on urban agriculture. The students developed public engagement processes for with Matt Barnes of RootsUp (a local company focused on deploying innovative urban agriculture models) for a Franklinton neighborhood project utilizing



an abandoned lot. The STEAM factory was an appropriate space because of its location, but also because it gave the students a real-life example of the redevelopment of existing buildings. A group of Ohio State students and faculty met to collaborate, discuss and propose solutions to promote the city of Columbus' new agenda to connect neighborhoods. Engagement occurred with a world-class urban planning initiative, helping Ohio State faculty test and simulate tools for urban land redevelopment with an overall goal to learn how to build better neighborhoods. All of the Forge collaborations, from Kiva to #ForgeAhead, promote stronger neighborhoods.

► **Tijs van Maasakkers' Pilot test run of OH/Lex - Urban Planning Initiative @ The STEAM Factory 400 W Rich – March 8<sup>th</sup>, 2016**

The STEAM Factory worked with Tijs to offer a test run of a public engagement tool he is developing for his research and work in Lima, Ohio, funded under the Outreach and Engagement Impact grant. A similar negotiation simulation was developed around vacant land reuse in New Orleans and Tijs needed to beta test the tool with some professionals before using it at a public event in Lima (which they utilized in June 2016). The STEAM Factory provided use of the collaboration and co-working space that provided easy for its professional stakeholders and encouraged people to consider alternative possibilities for land reuse.

## 2015-16 STEAM FACTORY STUDENT INTERNS

The STEAM Factory has worked closely with undergraduate and graduate student interns from the Ohio State University as well as other universities nationally. STEAM Factory interns receive regular professional development experience in a variety of settings within a diverse group of disciplines.



STEAM interns also gain valuable experience assisting in the development, planning and implementation of marketing, programming, development efforts and event coordination. STEAM interns regularly assist the STEAM Factory with planning and implementation of events both on and off of the Ohio State campus and have a variety of outreach opportunities with faculty, staff, students, business and industry partners as well as members of the general public. STEAM interns also assist in a wide variety of

writing projects, including grant writing and reporting, the development of news and outreach stories, efforts for gathering, organizing and synthesizing data, statistics and information for future programming, planning and event development.

- Jessie Crawford, Programming Intern (Class of 2016, Masters in Arts, Administration, Education & Policy)





- Erika Vocke, Marketing Intern (Class of 2016, Strategic Communications)
- Chrissy Foltz, Programming Intern (Class of 2017, Marketing)
- Avni Bapat, Programming Intern (Class of 2016, Neuroscience & Psychology)
- Taryn Stanley, Professional Writing Intern
- Annabelle Sudue, Professional Writing Intern (Class of 2017, Fashion and Retail Studies)
- Austin Channell, Summer Visiting Intern (Class of 2018, Engineering, Vanderbilt University)
- Denise Costin, Summer Visiting Intern – (Class of 2018, Mathematics and Computer Science, The University of Chicago)
- Leah Franklin, Professional Writing Intern (Class of 2016, Strategic Communications)
- Caroline Milliken – Buckeye Leadership Fellow Intern (Class of 2016, Strategic Communications and English)
- Theodor Coman - Buckeye Leadership Fellow Intern (Class of 2019, Finance)
- Haiyan Cheng - Buckeye Leadership Fellow Intern (Class of 2016, Accounting)
- Xiaohan Huo - Buckeye Leadership Fellow Intern (Class of 2017, Accounting)

#### PREVIOUS STEAM FACTORY STUDENT INTERNS

- Emily Liptow – STEAM Factory Intern (Class of 2015, Industrial Engineering)
- Emily Erossy – Professional Writing Intern (Class of 2015, English)
- Emily Norris – Professional Writing Intern (Class of 2015, French)



# CHAPTER 6: OUTCOMES, IMPACTS, AND PLANS

## BALANCED SCORECARD

Sathya Gopalakrishnan (Assistant Professor, Agriculture, Environmental & Developmental Economics), The STEAM Factory Director of Evaluation and Metrics and Julie Carpenter-Hubin (Director, Institutional Research and Planning, Office of Academic Affairs), with input from the Evaluation & Metrics Working Group, have developed a balanced scorecard to aid the STEAM Factory in aligning its programs and activities with its mission of facilitating collaborative teaching, research and outreach. Below is the STEAM Factory Balanced Scorecard covering the dates from January 2013 (unofficial founding of the STEAM Factory) to Present.

### STEAM Factory Balanced Scorecard - 2016

Financial Performance		
Objectives	Measures	Status: June 16
Secure Competitive Grants	Proposal volume	48 Grants submitted
	Dollars raised with STEAM Factory support	\$5,497,870
Establish Strategic Partners	Relationships developed	30+

Objectives	Measures	Status: June 16
Expand outreach & engagement	Outreach events	80+
	No. of people reached	10,000+
	No. of Columbus outreach partners	14
Enhance teaching & learning	No. of graduate students trained with interdisciplinary mentorship	2



	No. of undergraduate students involved in research projects	16
Reputation & Visibility	Recognition received by STEAM Factory members for research, teaching and/or outreach	13

Objectives	Measures	Status: June 16
Research & Innovation	Ongoing; Completed STEAM supported member projects	17
Demonstrate leadership	No. of members with NSF Early career awards	8
	No. of members with recent significant research awards	21

Objectives	Measures	Status: June 16
Recruit superior talent	No. of STEAM Factory members	123
Achieve diversity	By departments, colleges	69 departments, 18 colleges, offices & institutes
Engage existing faculty in productive collaboration	No. of cross disciplinary faculty research contact hours; disciplinary diversity in STEAM Exchange participation	2000+ research service hours, 60+ disciplines for attendees, 27 disciplines for presenters
	Research, teaching, outreach collaboration network connections made	126
	Total STEAM Powered Project seed grants awarded	\$35,200



## OUTCOMES AND IMPACTS

- Establishment of an integral Ohio State presence – seminars, lectures, workshops and outreach activity – in the Franklinton community
- Establishment of a regular presence by representatives of The STEAM Factory and student interns in Franklinton and regular seminars, lectures and workshops within larger STEAM space
- Establishment of 30+ new community, business and industry partnerships and strengthening of existing key partnerships
- Sharing of skill sets and experiences across members of The STEAM Factory to enhance research, teaching and outreach methods
- Establishment of the STEAM Factory as a Columbus portal into the diverse array of Ohio State research and resources
- Increased awareness of Ohio State research activities in the wider community through activities at the STEAM Factory collaboration and co-working space in 400 West Rich and the Franklinton neighborhood
- Development of new materials and methods for visualizing research and creating interactive displays for engaging with both academic and non-academic audiences
- Identification of innovative interdisciplinary research, teaching and outreach opportunities
- Provision of a forum for regular interaction and discussion across academic disciplines
- **Important Numbers for Outcomes and Impacts:**
  - Most diverse faculty network at Ohio State featuring 123 members, representing 69 Departments and 18 Colleges / Institutes
  - Hosted 22 STEAM Exchange Colloquia
  - Engaged 2000+ Hours of faculty interaction in STEAM Factory collaborative research activities







- 48 Research proposals submitted by STEAM Factory members with STEAM Factory letters of support
- 15 ongoing STEAM member collaborations
- Over \$5.6 million in research grants secured by STEAM members with STEAM Factory letters of support
- 7 STEAM Powered Project Seed Grants awarded involving 15 STEAM faculty members
- Hosted and participating in over 80 outreach events
- Featuring over 50 faculty presenters
- Representing over 25 research disciplines
- Over 10,000 Columbus community members reached
- Over 80 undergraduate and graduate students presenters involved at STEAM outreach activities

Peer validation and evaluation of projects will be based on both internal and external feedback. All of these evaluation metrics could potentially be used as evidence for success of The STEAM Factory in applications for additional funding sources. Internal feedback will be generated by The STEAM Factory



Board of Directors and The STEAM Factory Evaluation and Metrics working group. Items for internal discussion will include the appropriate use of program funds, opportunities for cost recovery and fiscal sustainability via grants and external funding; success of current STEAM Factory program activities toward the group's stated goals and objectives; activity inclusiveness for all targeted audiences for regular review and evaluation.

The results of these discussions will be used to refine the project activities in consultation with the university and community partners as appropriate. Additionally, an annual internal report will be generated to provide feedback on the progress and growth of the group, the activities undertaken over the preceding year as well as financial data. A copy of the report will be provided annually for ongoing stakeholder feedback to community partners and Ohio State funding sources.



## QUALITATIVE IMPACT

“At a big university like Ohio State, it can be hard to learn what's going on and to get involved in projects outside your department or discipline. The STEAM Factory has enabled me to meet faculty and make connections across the college and university. It has provided not only a place to work and meet, but also a real sense of intellectual community, where I can exchange ideas with colleagues from diverse disciplines. STEAM Factory events have been the most lively and engaging that I've found at OSU. “

-Sam White (Assistant Professor, History)

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“STEAM Factory has been an incredible resource in finding and creating connections to faculty from other departments. I would've never been able to get some projects started without these connections. Additionally, the space at 400 W Rich creates an ideal venue for outreach and community engagement - two things that I am very passionate about.”

-Paul Sutter (Astrophysicist, Department of Astronomy, and Chief Scientist at COSI)

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“I am getting (and seeking to get) exposure to people and ideas from other parts of campus that I wouldn't normally encounter. The STEAM Factory facilitates that very well, in at least two ways. There's the intellectual curiosity and coolness of being exposed to what others are doing, and there's the social network aspect of it that greases the wheels for collaborations/partnerships on proposals/projects and such. For example, I would have never known about the Dust Library and all of the neat stuff to think about with dust. Also, I've submitted proposals that require multi-disciplinary teams, and I would have had to find, introduce myself, and navigate a relationship with a potential co-PI, when the opportunity presented itself if it weren't for STEAM Factory. With STEAM Factory, I can email Arnab and say "Hey, there's this opportunity... are you game to go in on it with me?" for example. We already have a sense of (a) what each other does, and (b) each other. (Both the professional and the personal are important!) In a related aspect, I had dinner on Monday with Sathya and Sivakoff and a DT hire candidate. I think that it would have been a little more difficult for Sathya (on the search committee) to find relevant and interesting people across campus to join for dinner (in part as a recruitment strategy). I think this sort of thing will be increasingly important as the university pursues more DT hires and more joint hires.



I also appreciate all of the "infrastructure" that STEAM Factory has in place / is putting in place for outreach and community engagement. I haven't yet been too engaged with that, but it is helpful to know and be able to get involved with it.

-Jeff Bielicki (Assistant Professor, Department of Civil, Environmental, and Geodetic Engineering and the John Glenn School of Public Affairs)

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"When I was offered a tenure-track position in the Knowlton School at OSU I had been to Columbus exactly once, namely for my job talk. My partner had never been here. Having lived in Boston together for the previous 8 years, where both of us went to MIT for graduate school, we did not know much about Columbus or Ohio State University. One of the things we both loved about the community we were a part of in Boston was that it was diverse, oriented towards creating societal impact and open to new ideas. While my partner is not an academic, she is in the same field as I am, urban and regional planning, which means our professional networks generally overlap. I received another tenure track offer right after the one from OSU and this would have allowed us to stay in Boston. On our recruitment visit, I asked if we could visit 400 W. Rich, since one of the faculty members in the Knowlton School told me about the STEAM factory and the development of a dedicated space there. On a freezing February morning, we were shown the space in 400 W. Rich, back then still very much under construction. Not only did Roman show up, but several other folks from the STEAM factory and 400 W. Rich were there to talk to us about faculty life in Columbus. Not only did this give us a sense of possibility, it also communicated that Ohio State, institutionally, supports the kind of diverse, action-oriented and open networks that we are passionate about. We still love Boston and all it has to offer, but seeing the STEAM factory and interacting with some of its members, even briefly, allowed us to imagine a life in Columbus that simply walking around campus never could have achieved."

-Mattijs van Maasakkers (Assistant Professor, City and Regional Planning)



## BROADER IMPACTS OF STEAM FACTORY ACTIVITIES

The STEAM Factory has engaged in a diverse range of outreach activities and participated in over 80 events reaching over 10,000 members of the greater Columbus community. The STEAM Factory's diverse outreach activities have engaged both tenured and junior faculty, graduate and undergraduate students in outreach opportunities. The outreach potential and impact of these activities have been strongly recognized by funding agencies such as the National Science Foundation (NSF). Below is a small sample of these anonymized STEAM member NSF reviewer comments as to the benefits of STEAM programming on the broader impacts of faculty research:

- “The PI has been a leader in the STEAM factory, which provides a unique impact on the community... There is a focus is on bringing underrepresented groups in to the facility, and (the outreach activity) has been demonstrated in STEAM.”
- “The STEAM factory was viewed very positively in the discussion. This effort is outstanding. These efforts to interact with the community and the world at large are impressive. (The PI) also has a strong plan for broader impact via the STEAM initiative.”
- The PI is creatively coupling to existing programs at OSU . . . for education and outreach. (The PI's) plans there are exciting.”
- “Strengths: STEAM is a unique program for public awareness and outreach activities of the proposed research. The STEAM program for community outreach is good. The PI has outreach activities to incorporate deprived neighborhoods in Columbus, OH. A CoPI has interactive displays, which act as educational tools.”
- (The PI has a) strong plan for broader impact via the STEAM initiative.
- STEAM is a unique program for public awareness and outreach activities of the proposed research.

## MEMBER PERCEPTIONS AND VALUE OF THE STEAM FACTORY – A GROUNDED THEORY APPROACH – 2015 TO 2016

The STEAM Factory Evaluation & Metrics Working Group was tasked with developing metrics to measure the success of the STEAM Factory. Initially, the Evaluation and Metrics working group found designing metrics that captured both the quantitative and qualitative impacts rather challenging. The working



group decided to move forward with a foundational “ground-up” approach to designing appropriate measures to determine the STEAM Factory’s success. During the summer of 2015, the STEAM Factory hosted four small facilitated focus group discussions featuring four questions related members interests, benefits and conflicts related to their STEAM Factory membership. There was approximately a 25% participation rate by STEAM membership for the focus group discussions. Each focus group was facilitated, audio-recorded and transcribed and the transcripts were comprehensively mined for common themes and unique ideas.

The following themes emerged from the grounded theory approach to be the primary interests of STEAM Factory members through their membership participation:

1. Networking opportunities,
2. Opportunities for recognition of member efforts via STEAM Factory communication channels,
3. Opportunities for membership communication,
4. Desire to participate in STEAM Factory events, and
5. Opportunities for career development.

The above-mentioned themes established the foundation as to what items STEAM would measure to evaluate STEAM Factory’s success. Following the completion of the grounded theory evaluation efforts, the STEAM Factory developed a beta version of STEAM Factory “Collaboration Network” board. The Collaboration Network tool was developed in January 2016 on a large 6’ by 6’ bulletin board in preparation for the STEAM Factory Collaboration Cauldron. Each STEAM Factory member’s name was included within their own college or office. Members were encouraged to interact with the tool by using designated colors of yarn to differentiate collaborations in research, teaching and outreach. Over 35



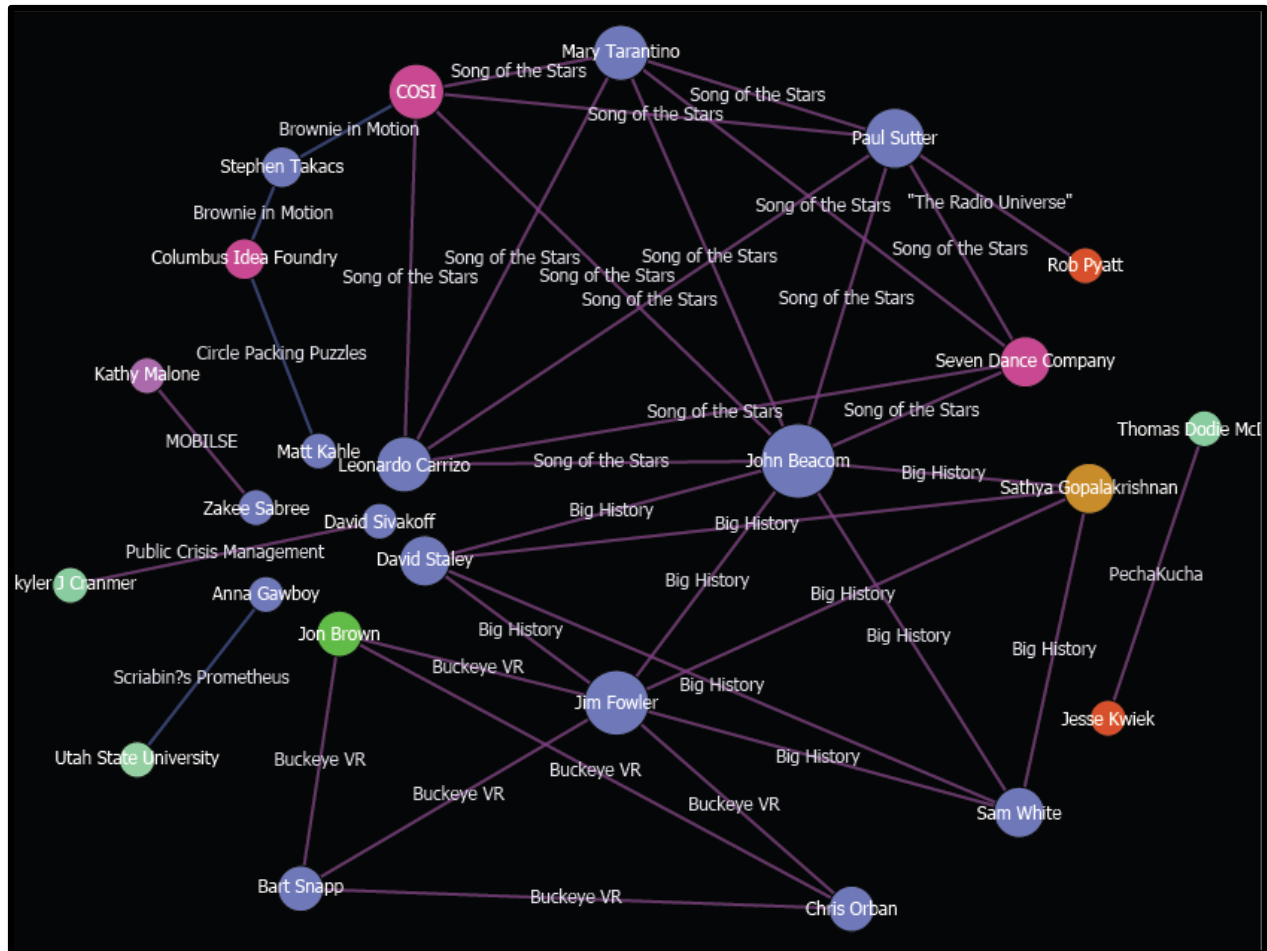
members (of nearly 85 existing members) interacted with beta tool. STEAM student interns then recorded all of the above mentioned collaborations and recorded 57 collaborations among STEAM members. The STEAM Factory followed up with all STEAM collaborators for additional details on identified collaborations.

In effort to better gauge the extent of STEAM collaborations, the STEAM Factory conducted short member interviews during the Spring 2016 semester. The response rate for this

effort was 36% of STEAM Factory members. Questions focused on information on the extent of member collaborations derived from STEAM Factory participation. Member responses were recorded and STEAM



Collaboration Network visualizations were developed. Below is one visual representation of STEAM Factory member collaborations.





# CHAPTER 7: BUDGET

## 2015-16 ANNUAL OPERATING BUDGET

### Budget Summary

The STEAM Factory FY 2015-16 expenses totaled \$307,228.48 including one-time design, furniture and equipment expenses of \$100,929.77. The first column includes the budget category and details of these expenses are described in the budget justification below.

<b>STEAM FACTORY FY 2015-16 ANNUAL OPERATING EXPENSES</b>	
<b>Personnel Salary/Benefits</b>	
Project Coordinator	\$73,713.40
Operations Manager	\$15,609.02
Consulting for Photography/Video	\$5,625.00
Student Employees	\$15,994.92
<b>Personnel Salary/Benefits</b>	<b>\$110,942.34</b>
<b>Rent/Utilities - 400 West Rich Street</b>	
Leasing fee	\$412.83
400 West Rich Large Space Rent	\$44,546.17
400 West Rich St. Large Space Utilities	\$0.00
<b>Rent</b>	<b>\$44,959.00</b>
<b>Ongoing Program Expenses</b>	
STEAM Powered Projects	\$35,200.00
Conferences/Workshops	\$5,953.30
STEAM Exchange, Franklinton Friday & Member Events	\$7,762.92
<b>Program Expenses</b>	<b>\$48,916.22</b>
<b>Operating Expenses</b>	
Furniture & space design (one-time expenses)	\$95,654.92



Equipment/Electronics (one-time expenses)	\$5,274.85
Office materials & supplies	\$756.89
Promotional/printed materials	\$724.26
Miscellaneous	\$1,452.63
<b>Operating Expenses</b>	<b>\$102,410.92</b>
<b>Total FY 2015-16 STEAM Expenses</b>	<b>\$307,228.48</b>

The STEAM Factory FY 2015-16 expenses totaled \$307,228.48 including one-time design, furniture and equipment expenses of \$100,929.77. The first column includes the budget category and details of these expenses are described in the budget justification below.

Budget Justification:

- Personnel Salary/Benefits.* A total of \$110,942.34 was spent on personnel salary and benefits during the FY 2015-16 period. Personnel salary and benefit expenses included payroll expenses for Charlene Brenner, full-time project coordinator, and John Pieper, part-time Operations Manager. Additional expenses include hourly salaries and benefits for student interns and a graduate student intern. A small portion of the personnel salary and benefits was spent on independent consultant photographers and videographers who took both photographs and videos during evening and weekend STEAM Factory events for the design and production of marketing materials, including flyers, publicity articles, and use on the website and social media.
- Rent/Utilities - 400 West Rich Street.* A total of \$44,959.00 was spent on rent and utility expenses for an approximately 3,600 square foot space in the 400 West Rich building, in the East Franklinton Creative Arts District during the FY 2015-16 period. Facilities at 400 West Rich provide an opportunity for STEAM members to use the collaboration and co-working space. The STEAM space provides an unrivalled opportunity to conduct outreach and directly engage with the Columbus community (e.g. Franklinton Friday Open Houses) in an informal environment. It is more accessible than the Ohio State campus for engaging with artists and a public audience that would otherwise be difficult to reach. It hosts a variety of public events, informal lectures and educational groups.
- Program Expenses.* A total of \$48,916.22 was spent on ongoing program expenses during the FY 2015-16 period. Ongoing program expenses included expenses for the STEAM Powered Projects seed grant. This was designed to support STEAM member collaborations by providing small amounts of funding for research, teaching and outreach collaborations that are difficult to fund through traditional methods. Program expenses also included costs for associated with hosting visiting scholars for the annual STEAM Factory symposium and to send the Project Coordinator to the annual NORDP (National Organization of Research Development Professionals) conference. Ongoing





program expenses also included food and catering costs to support public outreach events and monthly faculty interdisciplinary seminars, colloquia and intermittent special membership events.

- *Operating Expenses.* A total of \$102,410.92 was spent on additional operating expenses during the FY 2015-16 period. Additional operating expenses included large one-time expenditures for furniture and space design and for the purchase of equipment and electronics including projection and audio/visual equipment. Funds were spent on office materials/supplies as well as the production and development of marketing materials, including flyers, portable signs, publicity articles and equipment and required for the variety of workshops, seminars and public outreach events.

## SUSTAINABILITY

The STEAM Factory will work closely with existing and new university, community and industry partners while constantly identifying possible areas of reciprocal benefits, including funding possibilities from a variety of sources. In the past year, The STEAM Factory has developed an initial space rental policy for organizations both internal and external to the Ohio State University community. The STEAM Factory secured nearly \$2,000 in space rental income and is currently monitoring daily membership use while considering opening up the space for additional rental possibilities. The STEAM Factory also simultaneously continues to prioritize the main use of the space as a collaboration and co-working facility for members as well as a venue for a variety of academic seminars, workshops and educational opportunities.

Additionally, the STEAM Factory will continue to establish itself as a resource for Ohio State faculty to showcase the broader impacts of their research and to provide a forum for holding public seminars, lectures and the like. These activities have successfully provided opportunities for junior faculty at Ohio State to demonstrate a broader community impact for their research, as evidenced by the eight NSF Early CAREER awards to STEAM members in the past few years, even as these outreach activities are often not rewarded within respective departments. Since July 2015, the STEAM Factory has provided seventeen (17) grant proposal letters in support of broader impact activities through the STEAM Factory programming and space. Additionally, in the past year, the STEAM Factory has begun to request a small budget allocation to support participation in developing and hosting these outreach activities. Successful grant proposals have already secured nearly \$5,000 in additional funding for STEAM broader impact activities, with an additional \$24,000 requested for outstanding proposals awaiting decisions. Future proposals arising from The STEAM Factory's activities are intended to incorporate small amounts of funding as part of their research budget, benefiting the individual members of The STEAM Factory and Ohio State in general.

Finally, the STEAM Factory continues to seek external funding opportunities appropriate for collaborative research, outreach and engagement to provide financial sustainability and support. The STEAM Factory will



also work closely with its Ohio State University and external partners to identify additional funding sources through the establishment of philanthropic alumni relations, private giving campaigns and the development of a STEAM Factory endowment fund.



# CHAPTER 8:

## STEAM FACTORY BOARD OF DIRECTORS AND PARTNERS

### BOARD OF DIRECTORS

- ❖ **Roman Holowinsky, Chair**, Associate Professor, Mathematics
- ❖ **Sam White, Director of University Involvement**, Associate Professor, History
- ❖ **Jim Fowler, Director of Outreach**, Assistant Professor, Mathematics
- ❖ **Sathya Gopalakrishnan, Director of Evaluation and Assessment**, Assistant Professor, Agriculture, Environmental & Developmental Economics
- ❖ **Arnab Nandi, Director of Collaborative Research**, Assistant Professor, Computer Science and Engineering
- ❖ **Jim Chen, Director of Funding and Grants**, Assistant Professor, Biomedical Informatics and Internal Medicine

### ADVISORS

- ❖ **Stephen Myers**, Associate Provost, Office of Outreach and Engagement
- ❖ **Christopher Hadad**, Dean, Natural and Mathematical Sciences
- ❖ **Janet M. Weisenberger**, Senior Assoc. Vice President, Office of Research

### UNIVERSITY PARTNERS

- ❖ **Kay Wolf**, Vice Provost, Academic Policy & Faculty Resources
- ❖ **Carol Diedrichs**, Director, University Libraries
- ❖ **Caroline Whitacre**, Senior Vice President for Research
- ❖ **Scott Self**, Chief Advancement Officer
- ❖ **Charles Lockwood**, Dean, College of Medicine
- ❖ **David B. Williams**, Dean, College of Engineering
- ❖ **Bruce McPheron**, Executive Vice President and Provost
- ❖ **Mike Hofherr**, Vice President & Chief Information Officer
- ❖ **Patricia Houston**, Professional Minor Writing Program
- ❖ **Matt McNair**, Vice President, Office of Business and Finance
- ❖ **Susan Williams**, Vice Dean, College of Arts and Sciences
- ❖ **Mike Boehm**, Vice Provost for Academic and Strategic Planning
- ❖ **David Manderscheid**, Executive Dean and Vice Provost, College of Arts and Sciences



- ❖ **Wayne Carlson**, Vice Provost & Dean, Undergraduate Education
- ❖ **Damon Jagers, Vice Provost and Director**, The Ohio State University Libraries
- ❖ **Janet Weisenberger**, Senior Associate Vice President, Office of Academic Affairs
- ❖ **Chris Hadad**, Dean, Natural & Mathematical Sciences
- ❖ **Christopher Hans**, Associate Professor, Statistics
- ❖ **Luis Casian**, Professor & Chair, Mathematics
- ❖ **Janis Browning**, Program Coordinator, Outreach and Engagement
- ❖ **Peter McGinty**, Associate Vice President of Strategic Marketing And Communication
- ❖ **Adrienne Nazon**, Vice President of Marketing, Chief Marketing Officer

## INDUSTRY PARTNERS

- ❖ **Tom Murnane**, ARC Business Advisors
- ❖ **William (Rod) Sharp**, ASC Alumni Board
- ❖ **Jeff Sharp**, Story Mining & Supply Co.
- ❖ **Thomas Dann**, JP Morgan
- ❖ **Steve Habash**, Perez & Morris
- ❖ **Jennifer McNally**, Columbus Arts Marketing Association
- ❖ **Scott Gale**, ASC Alumni Society
- ❖ **Eric Burgess**, ASC Alumni Society
- ❖ **Craig Friedman**, ASC Alumni Society
- ❖ **Joe Heimlich**, COSI
- ❖ **Cindy Foley**, Columbus Museum of Art
- ❖ **Lauren Emond**, Columbus Museum of Art
- ❖ **David Spurlock**, Hilton, Columbus/Downtown
- ❖ **Jack Storey**, Franklinton Development Association
- ❖ **Kris Howell**, Columbus Idea Foundry
- ❖ **Leonard Niebauer**, 400 West Rich
- ❖ **Azuka MuMin**, COSI
- ❖ **Jordan Davis**, Columbus Partnership
- ❖ **Stephen Pence**, Strongwater
- ❖ **Kim Kiehl**, Ohio History Connection
- ❖ **Sheli Smith**, The Past Foundation
- ❖ **Jamie Goldstein**, Greater Columbus Arts Council
- ❖ **Tom Katzenmeyer**, Greater Columbus Art Council
- ❖ **David Chesebrough**, COSI
- ❖ **Jenny Pope**, Franklinton Park Conservatory
- ❖ **Alex Bandar**, Columbus Idea Foundry
- ❖ **Jamie Goldstein**, Greater Columbus Arts Council
- ❖ **Gary Cavin**, City of Columbus
- ❖ **Rory McGuinness**, City of Columbus
- ❖ **Doug Kridler**, Columbus Foundation
- ❖ **Ben Blanquera** Columbus Collaboratory
- ❖ **Joy Chivers**, Gladden House



- ❖ **Matt Richard Barnes**, Trident Design

## OUTREACH PARTNERS

- ❖ **Jim Coe**, WCBE-FM
- ❖ **Paul Suttter**, COSI
- ❖ **Ben Lewis**, Office of Outreach & Engagement
- ❖ **Sandi Rutkowski**, College of Arts and Sciences Communications
- ❖ **Pete Gordon**, Columbus Collaboratory
- ❖ **Nancy Colvin**, Columbus Underground
- ❖ **Elana Synder**, The Lantern
- ❖ **Jenny Pope**, Franklinton Park Conservatory
- ❖ **Cindy Foley**, Columbus Museum of Art
- ❖ **Sheli Smith**, The Past Foundation
- ❖ **Jamie Goldstein**, Greater Columbus Arts Council
- ❖ **Stephen Pence**, Strongwater
- ❖ **Leonard Niebauer**, 400 West Rich