The Year in Informal STEM Education

CAISE's Reflections on 2017

caise | center for advancement of informal science education

OSU Oregon State University | UW | ASTC | NSF

Introduction to the Year in ISE 2017

This report is designed to track and characterize sector growth, change and impact, important publications, hot topics/trends, new players, funding, and other related areas in Informal STEM Education (ISE) in 2017. The goal is to provide information and links for use by ISE professionals, science communicators, and interested stakeholders who want to discover new strategies and potential collaborators for project and proposal development.

Designed as a slide presentation and divided into sectors, it can be used modularly or as a complete report. Each sector reports on research, events and milestones. Users can freely use the slides in their own presentations and reports. This is the first year that CAISE has assembled extensive news from the ISE sectors. Please let us have your feedback about what you found useful and suggestions for future Year in ISE reports by emailing caise@informalscience.org.

Disclaimer: We reached out to professional associations, institutions, and credible leaders within networks who can speak for the different ISE sectors. We are grateful for their input. To manage the scope of this report we have focused on meta analyses, consensus reports, and compendia. This report is not designed to be comprehensive, exhaustive, nor to provide an endorsement, but rather to highlight things CAISE heard about in 2017 that are potentially useful resources for the ISE field.

The Year in ISE: Sectors and Categories

In 2017 CAISE added 350 evaluation and research resources (including research products, reference materials, and research & evaluation instruments) to the informalscience.org repository drawn from the major field sectors included in this report. This report is not designed to duplicate the informalscience.org repository but to highlight a sample of research and practice undertaken last year.

- Youth and Afterschool
- Media
- Making and Tinkering
- Cyberlearning and Gaming
- Citizen Science
- Public Science Events
- Zoos and Aquariums
- Public Libraries
- Science Centers and Museums
- Other Notable Publications

The Year in ISE: Sections

Select Publications
research, reports, meta analyses, consensus reports and compendia

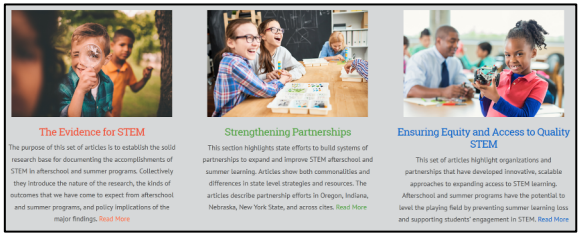
By the Numbers
data, trends, and geographic locations

Other Resources and Notable Moments
conferences, policies, events, practitioner resources

Select Publications

Youth and Afterschool

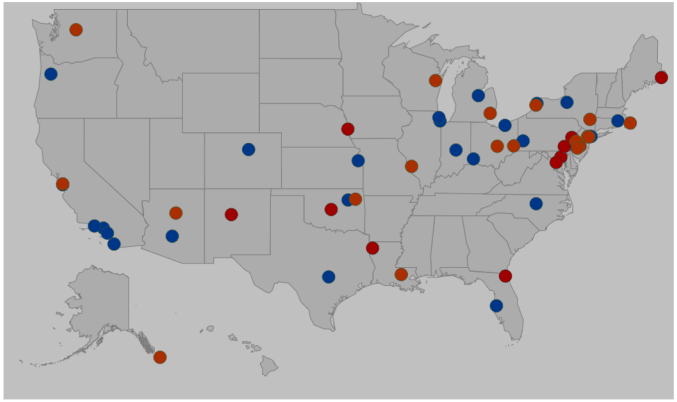
- *STEM Ready America* STEM Next - Ottinger, R., et al.
- *Afterschool & STEM: System-Building Evaluation 2016*
  Allen, P.J. et al.
- *The SAGE Encyclopedia of Out-of-School Learning*
  Edited by: Kylie Peppler
- *STEM Out-of-School-Time Summative Evaluation Report*
  Cadenhead, C.



STEM Ready America papers are divided into three categories: Evidence, Partnerships, and Equity

Youth and Afterschool

- STEM Ecosystems established in 56 communities across the U.S.
- The YOUmedia Network community continues to grow its national, open network of libraries, museums, and community centers
- Afterschool Alliance Fact sheet: Children Achieve More with Afterschool STEM

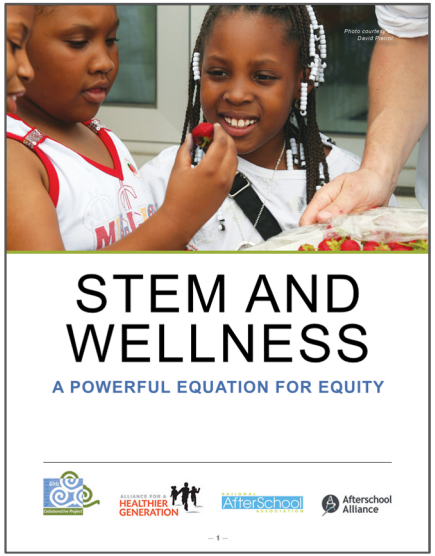


STEM Ecosystems are active in 56 communities across the U.S.

Youth and Afterschool

- *STEM and Wellness: A powerful equation for equity* issue brief from the Afterschool Alliance, National Girls Collaborative Project, Alliance for a Healthier Generation, and National Afterschool Association provides resources for programming in out-of-school settings around STEM, food, and wellness.

- Afterschool Alliance launches *Impacts Database* of evidence-based research supporting the impact of out-of-school learning.



STEM and Wellness Report from Afterschool Alliance, NGCP, Alliance for a Healthier Generation, and National Afterschool Association

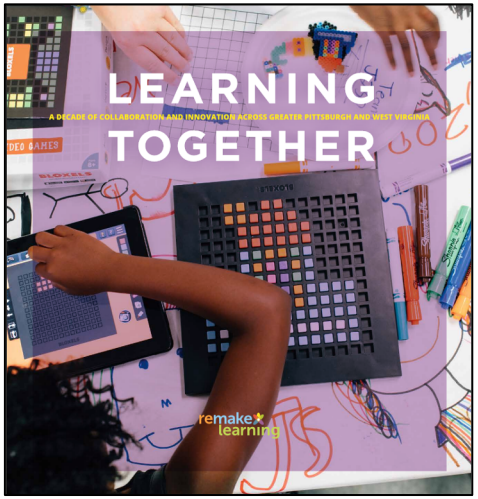
Making and Tinkering

- *Empirical Studies on the Maker Movement, a Promising Approach to Learning: A Literature Review* Papavlasopoulou, S. et al.
- *Math in the Making: Reflections for the Field* Pattison, S. et al.
- *The Makerspace Movement: Sites of Possibilities for Equitable Opportunities to Engage Underrepresented Youth in STEM* Calabrese Barton, A. et al.
- *The Promise and the Promises of Making in Science Education: A Literature Review* Bevan, B.

Math in the Making

Making and Tinkering

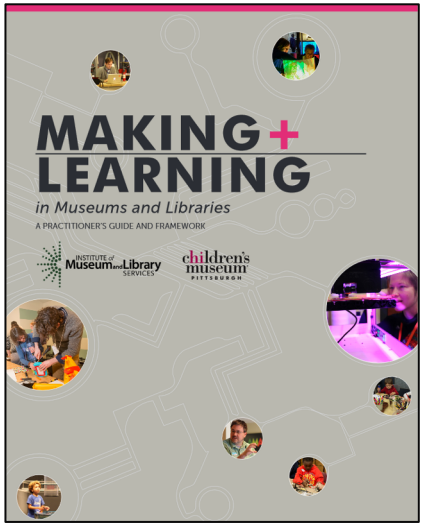
- May 2017, MakerEd hosted their third annual Maker Educator Convening
- Remake Learning report *'Learning Together: a decade of collaboration and innovation across greater Pittsburgh and West Virginia'*



Remake Learning ten-year impact report on the Pittsburgh community effort

Making and Tinkering

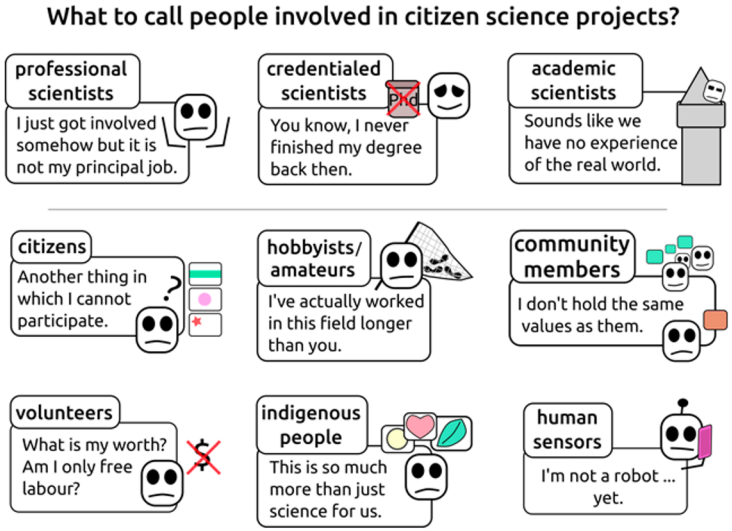
- *Making and Learning in Museums and Libraries; A practitioner's guide and framework* - Children's Museum of Pittsburgh
- American Education Research Association (AERA) convention sessions:
  Equitable Pedagogies and Relationality in Making
  Making Spaces for Youth From Nondominant Communities
  From Making to Agentic Participation
- *Maker-Centered Learning: Empowering Young People to Shape their Worlds* Clapp, E.P. et al.
- Children's Museum of Pittsburgh releases *Making Connections* - a card game to help practitioners facilitate interactions with the public in makerspaces
- Frankenstein200 kits combine maker-style activities with storytelling and conversations about responsible innovation



Making + Learning in Museums and Libraries

Citizen Science

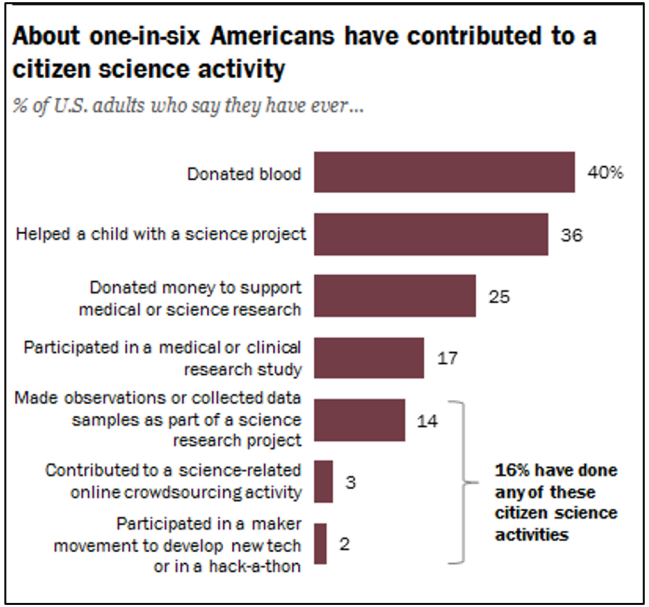
- *Citizen Science Terminology Matters: Exploring Key Terms* Eitzel, M.V. et al.
- *Youth-focused citizen science: Examining the role of environmental science learning and agency for conservation* Ballard, H.L. et al.
- *The Promise of Community Citizen Science* Chari, R. et al.



From *Terminology Matters*: Illustrated examples of negative interpretations of commonly used names to describe people participating in citizen science

Citizen Science

- CitSci.org continues to grow:
  - Over 1K projects -- Over 4K members -- Over 1M volunteers
  - First wholly independent conference (600 attendees)
  - 117 events on CitSciDay (with SciStarter)
- City Nature Challenge 2017 Dallas/Fort Worth takes the lead with 24,081 observations April 14 - 18
- *Citizen science, science-related hobbies and participation in informal science activities* Funk, C. Gottfried, J. and Mitchell, A. Pew Research Center - 16% of U.S. adults have: made observations/collected data samples, contributed to a science-related online crowdsourcing activity, participated in a maker movement or hack-a-thon.



"The past two decades have seen a resurgence in direct public engagement with science"

Citizen Science

- The Cloud and the Crowd launches four hour-long citizen science episodes
- *Citizen Science and Youth Learning* and *Citizen Science: Activating STEM Learning Out of School* Cornell Lab of Ornithology and 4-H
- Sci-Girls Connect new videos and resources on citizen science
- *Citizen Science - Everybody Counts* Caren Cooper, TEDx Talk
- The Citizen Science Association becomes an independent 501c3 non-profit and hires its first staff

The Crowd and the Cloud - four hour-long episodes

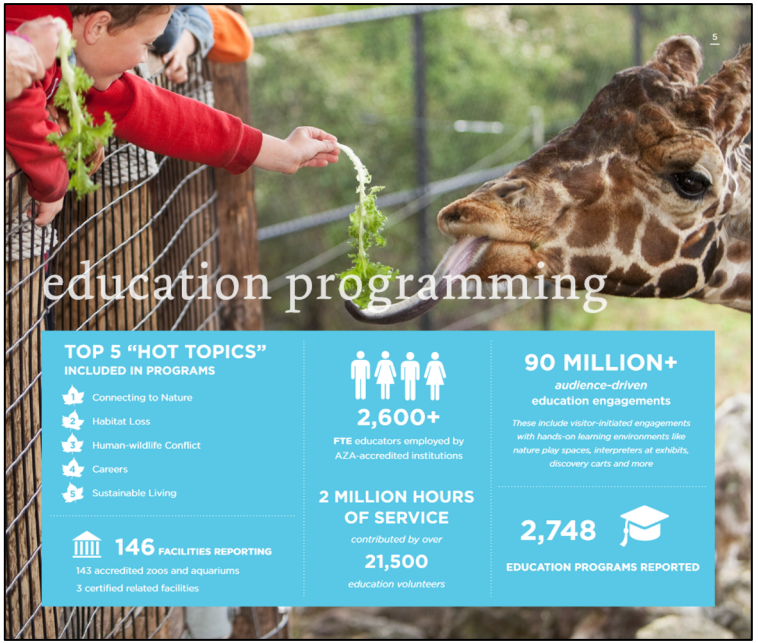
Zoos and Aquariums

- *Reflecting on Practice Through Action Research: The Zoo and Aquarium Action Research Collaborative*
  Kisiel, J., Rubin, A., and Wright, T.
- *Quantifying long-term impact of zoo and aquarium visits on biodiversity-related learning outcomes*
  Jenson, E. A. et al.
- *Impact of a global biodiversity education campaign on zoo and aquarium visitors.* Jenson, E. A. et al.

The Jenson et al. articles are part of a growing collection in the ZooWise project website whose mission “aims to bring institutions together towards common goals in an improvement-oriented network.”

Zoos and Aquariums

- Association of Zoos and Aquariums *2016 Annual report on conservation and science*:
  - > 98 percent of responding facilities offer education programs that engage participants on a conservation issue and promote a related action
  - Half of reporting facilities offered STEM education programs reaching > 5.6 million people on-site and online
  - 45 facilities reported providing teacher trainings, curriculum resources and free planning visits that reached > 79,000 teachers



Association of Zoos and Aquariums Annual Report on Conservation and Science - statistics for education programming

Zoos and Aquariums

Other Resources and Notable Moments:

- Association of Zoos and Aquariums Research Agenda Update - full text in notes below
- *Constructive Dialog about Climate Change* National Network for Ocean and Climate Change Interpretation - NNOCCI. NSF STEM For All 2017 Video Showcase Presenters', Facilitators', and Public Choice awardee (see video to the right).

Constructive Dialog about Climate Change. NSF STEM For All 2017 Video Showcase

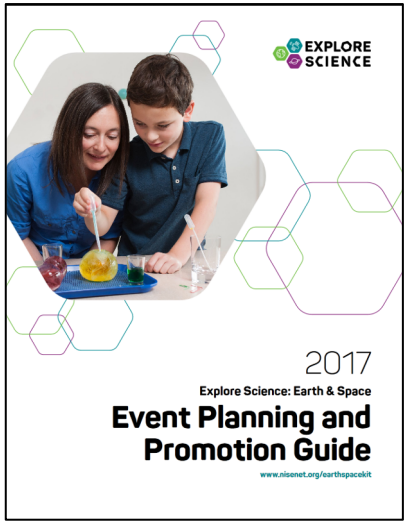
Science Centers and Museums

Genial Project - Exploratorium

- *Science centres and science engagement activities as research facilities: blurring the frontiers between knowledge production and knowledge sharing* Merzagora, M.
- *Generating Engagement and New Initiatives for All Latinos (GENIAL) Conference Proceedings* Exploratorium
- *Research on Organizational Change in a National Network of Informal Science Education Institutions* Beyer, M. et al.
- *Application and Adaptation of an Institutional Learning Framework* Foutz, S. and Thoma, C. ACM CMRN
- *Play and Children's Museums: A Path Forward or a Point of Tension?* Luke, J.J. et al.

Science Centers and Museums

- *Explore Science: Earth & Space - Event Planning and Promotion Guide*
  Science Museum of Minnesota
- *The ActApp: Sharing Research and Evaluation Tools across the ISE Field*
  Sacco, K.
- *Connected Science Learning* NSTA and ASTC. Two issues of the journal:*STEM Learning Surrounds Us* and *STEM for Early Learners*
- Science Center World Summit took place November in Tokyo – protocol
- Informal STEM Learning Professional Framework ASTC, Oregon State University, Lifelong Learning Group at COSI, University of Washington Museology Dept., and Pacific Science Center

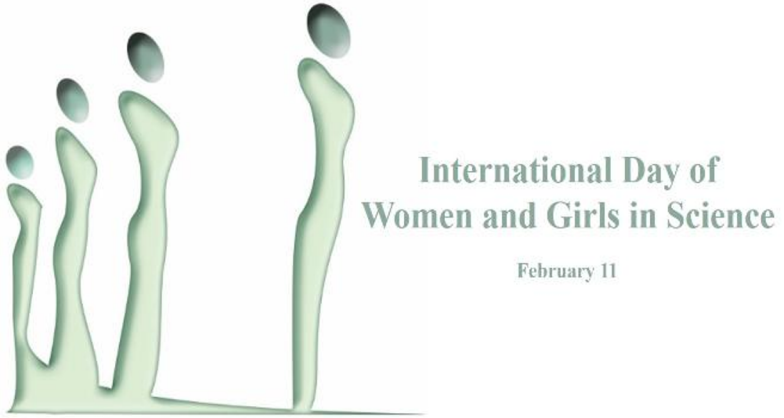


Explore Science Earth & Space
Event Planning Guide

Media Projects

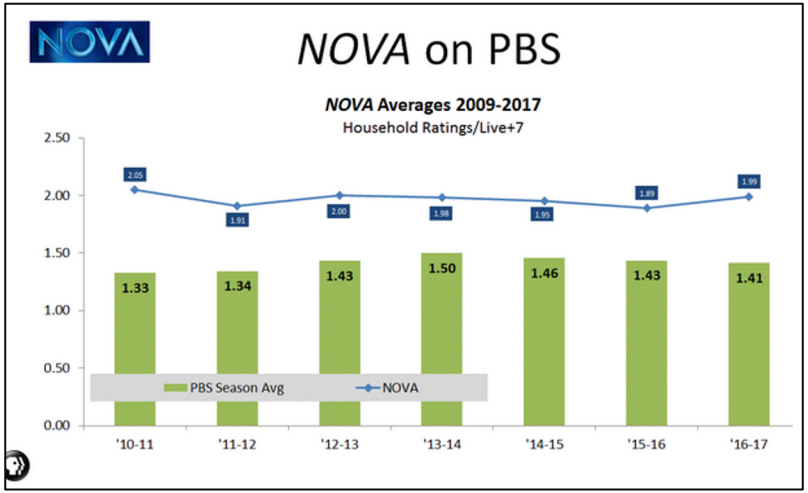
- *Social justice and out-of-school science learning: Exploring equity in science television, science clubs and maker spaces* Dawson, E.

- *Addressing the impact of the media on the gender gap in science: 2nd Commemoration of the International Day of Women and Girls in Science conference review* Neenan, E. E and O'Neill, A.



Media Projects

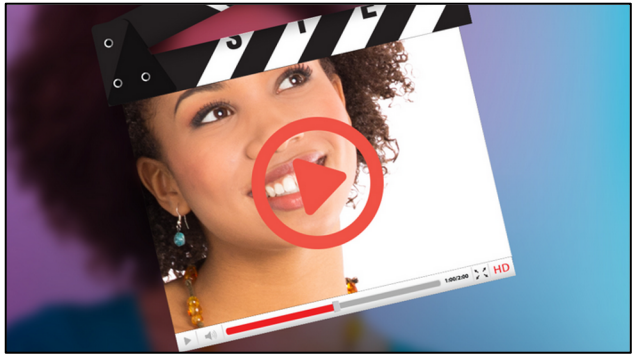
- *Science News and Information Today* Funk, C. et al. Pew Research Center
- *NOVA Tops 4.5 Million Viewers: Trends, Filters, and Recent Greenlights* Documentarytelevision.com.
- *These Science videos topped the charts—and stole our hearts—in 2017* AAAS



Despite generally shrinking audiences for broadcasters, NOVA's 3-Season rating trend is positive

Media Projects

- *SciGirls Strategies: Using Gender-Equitable Teaching Strategies and STEM Video Narratives to Engage Girls in Nontraditional STEM Fields* Karl, R., McLain, B., Santiago, A.
- *Calling All Producers: Creating media for Hispanic families* Aprendiendo Junto Council.
- *Teens and STEM Careers* childhoodtrends.org



SciGirls Strategies: Digital Media Narratives: Educator-Created Videos and Role Model Videos

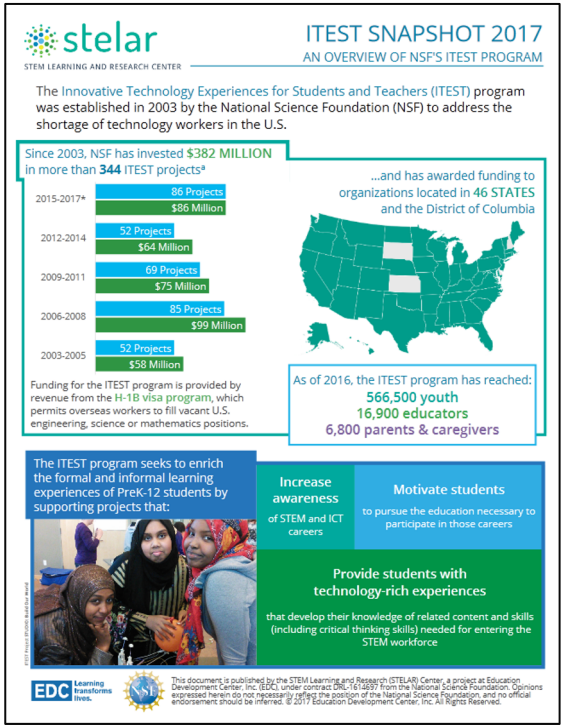
Cyberlearning and Gaming

- *Cyberlearning Community Report: The State of Cyberlearning and the Future of Learning With Technology* Roschelle, J., Martin, W., Ahn, J. & Schank, P. (Eds.)
- *From Good Intentions to Real Outcomes - Equity by Design in Learning Technologies* Reich, J., Ito, M. The Digital Media + Learning Research Hub Report Series on Connected Learning
- *Building the foundational skills needed for success in work at the human-technology frontier* Malyn-Smith, J. et al. STELAR
- *Play in the Museum: Design and Development of a Game-Based Learning Exhibit for Informal Science Education* Rowe, J. P. et al.

Cyberlearning Community Report

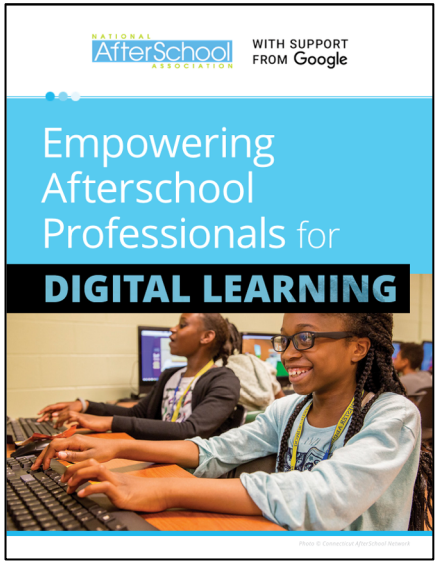
Cyberlearning and Gaming

- *ITEST Snapshot 2017 - An Overview of NSF's ITEST Program*
  - The STEM Learning and Research Center (STELAR) is an NSF-funded Resource Centers that serves projects funded to provide innovative technology experiences for students and teachers in informal and formal settings
  - ITEST youth and educators learn to use cutting-edge technologies
  - 38% of youth are from racial groups underrepresented in STEM; 56% of ITEST projects specifically target girls
  - The ITEST community is comprised of more than 230 unique institutions and partners



Cyberlearning and Gaming

- *Empowering Afterschool Professionals for Digital Learning* Russell, C.A. National Afterschool Association
- *Computational Thinking for a Computational World* Digital Promise
- Frankenstein200 alternate reality game retells the Frankenstein story through an immersive online game
- *Gaming and the NISE Network: A Gameful Approach to STEM Learning Experiences*
- *ED Games Expo 2018: A Showcase for Education Learning Games and Technologies*



Empowering Afterschool Professionals for Digital Learning

Public Science Events

- *Public Engagement with Science: A guide to creating conversations among publics and scientists for mutual learning and societal decision-making* Bell, L. et al. Museum of Science, Boston
- *Validating a scale that measures scientists' self-efficacy for public engagement with science* Evis, J. R. et al.
- *Assessing Public Engagement Outcomes by the Use of an Outcome Expectations Scale for Scientists* Peterman, K. et al.
- *Preaching to the Scientifically Converted: Evaluating inclusivity in science festival audiences* Kennedy, E. B. et al.

Public Engagement with Science: A Guide to creating conversations among publics and scientists for mutual learning and societal decision-making

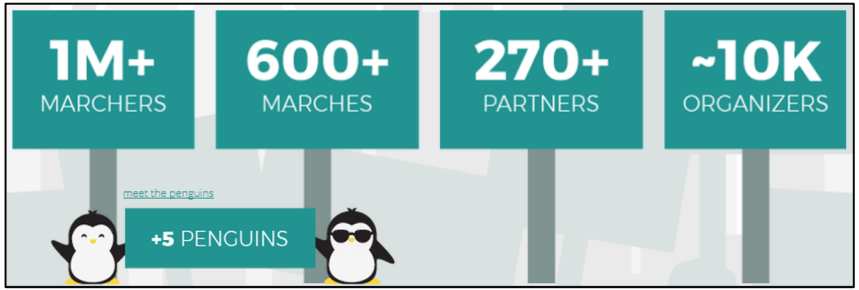
Public Science Events

- *Science Festival Alliance Annual Report - 2017*
- Science Festival Alliance membership hit an all-time high of 54 independently operated festivals in 2017 reaching over 2 Million attendees with more than 4,000 collaborating organizations, and more than 11,000 volunteers
- *Americans and the 2017 Eclipse: An initial report on public viewing of the August total solar eclipse* Miller, J.D. [For more Eclipse details see Public Libraries sector]

Science Festival Alliance Annual Report 2017

Public Science Events

- March for Science by the Numbers
- *2017: The Year in Public Science Events* Science Festival Alliance
- Public Science entertainment is growing; examples:
  - Two Bit Circus
  - Science Riot



March for Science: By the Numbers

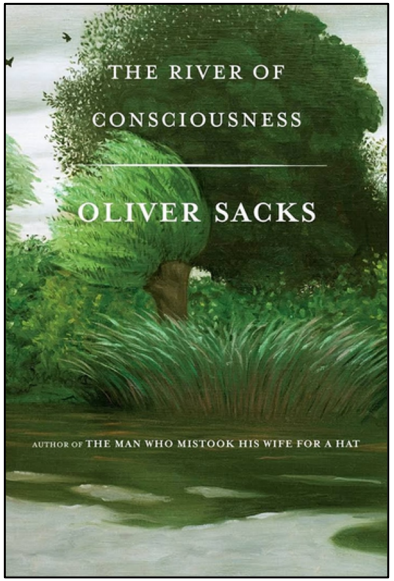
Public Libraries

- *Strengthening Networks, Sparking Change: Museums and Libraries as Community Catalysts* Norton, M., Dowdall, E.
- *Library and afterschool partnerships: How afterschool providers are working together with public libraries* Afterschool Alliance, Space Science Institute's National Center for Interactive Learning (NCIL) and the American Library Association
- *Visual Documentation in Makerspaces* Fontichiaro, K.
- *STEM Equity in Informal Learning Settings: The Role of Libraries* Shtivelband, A. et al.
- *Building on the STEM Movement: programming Recommendations for Library Professionals* Shtivelband, A. et al.

Library and afterschool partnerships

Public Libraries

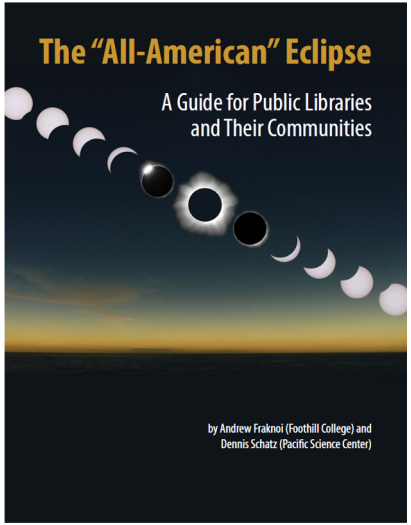
- Best Science Books of 2017 according to Science Friday
- Outstanding Science Trade Books for Students K–12 (2017)
  National Science Teachers Asso. (NSTA)



The River of Consciousness.
A posthumous collection of
Oliver Sacks's essays

Public Libraries

- Libraries played a significant role in Eclipse activities:
  - *Eclipse Resource Center* STAR Library Network (*STAR Net*)
  - *Eclipse: A Celestial Achievement for Public Libraries* Dusenbery, P. et al.
  - *The "All-American" Eclipse: A Guide for Public Libraries and Their Communities* Andrew Fraknoi and Dennis Schatz
  - *When The Sun Goes Dark* Andrew Fraknoi and Dennis Schatz
- STEM Activity Clearinghouse (*STAR Net*) adds new resources and activities



The "All-American" Eclipse: A Guide for Public Libraries and Their Communities

Other Notable Publications and Moments

- *This is What STEM Looks Like: How to get and keep girls engaged in STEM* Women's Foundation of Colorado (2017).
- *Communicating Science Effectively: A Research Agenda* National Academies
- The School for the Future of Innovation in Society at Arizona State University created the Center for Innovation in Informal STEM Learning, co-directed by Paul Martin and Rae Ostman.

Second most downloaded National Academies publication in 2017

This is the first year that CAISE has assembled extensive news from the ISE sectors. Please let us have your feedback about what you found useful and suggestions for future Year in ISE reports by emailing caise@informalscience.org.

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