



**Center for
Science and the
Imagination**

**Arizona State
University**

2018/19
Annual Report



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Each year when we gather to write the annual report, I start by wondering what exactly we did in the past year, if we accomplished anything, and whether we did the right things, or enough things. And each year by the end of the process, I am renewed in my admiration for the energy and creative output of the CSI team and our many collaborators.

In 2018-19 we continued to pursue some of our most important projects and to cultivate new initiatives. The center published three significant books: first, a Columbia University Press collection, *A Year Without a Winter*, edited by a team of CSI fellows, staff, and faculty collaborators: Dehlia Hannah, Brenda Cooper, Joey Eschrich, and Cynthia Selin. Second, a beautiful collection of original art, science fiction, and nonfiction titled *The Weight of Light* (after a Walt Whitman poem), which explores what a true solar energy economy will look like. Finally, we produced *Everything Change, Volume II*, collecting the winning stories from our second annual climate fiction writing contest, with over 500 entries from 66 countries. Several of the stories from these collections have been praised by critics and selected for inclusion in year's best anthologies of science fiction, and Nnedi Okorafor's "Mother of Invention" from *A Year Without a Winter* was a finalist for the prestigious Locus Award.

Nnedi's story also appeared in *Future Tense Fiction*, a highly successful collaboration between CSI, *Slate* magazine, New America, and most recently, 3 Arts Entertainment in Los Angeles. *Future Tense Fiction* now publishes an original science fiction story by an acclaimed author each month in *Slate*. Several of these stories have also been selected for "year's best" anthologies, and one of our authors, Carmen Maria Machado, was recently honored with a Guggenheim Fellowship. And at the tail end of this annual-report year, Annalee Newitz received the Theodore Sturgeon Memorial Award for "When Robot and Crow Saved East St. Louis," her *Future Tense Fiction* story about a lovable disease-fighting bot who has to find community in unexpected places to stop a burgeoning epidemic.

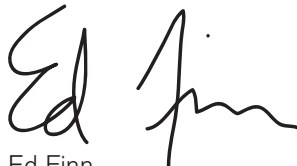
Our research related to the Frankenstein Bicentennial reached important milestones. Thanks to the efforts of Ruth Wylie, Bob Beard, Peter Nagy, and other collaborators, we concluded data collection on our National Science Foundation transmedia project. The team

is developing a set of papers to disseminate our findings across the fields of informal science education, public history, learning sciences, science and technology studies, and the humanities.

In late 2018 we launched AI Policy Futures, a new initiative supported by the William and Flora Hewlett Foundation and Google. The project, led in partnership with the Open Technology Institute at New America, investigates science fiction narratives for policy insights about artificial intelligence, and will lead to a taxonomy of AI as it has been envisioned in the archives of science fiction. Using the taxonomy and a series of interviews with science fiction authors and editors, policy experts, and technologists, we will commission a series of original science fiction stories to be published in Future Tense Fiction on *Slate*. These stories will advance “useful fictions” about the near future of AI and the challenges we should be grappling with as automation and narrow forms of machine intelligence continue to transform our economy and society.

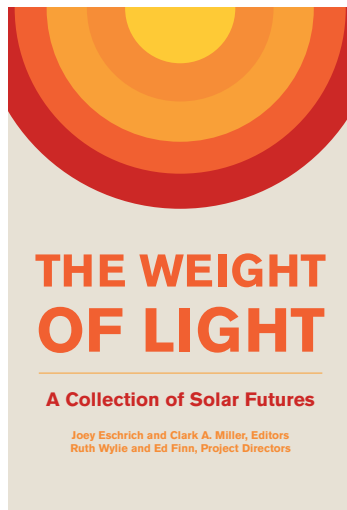
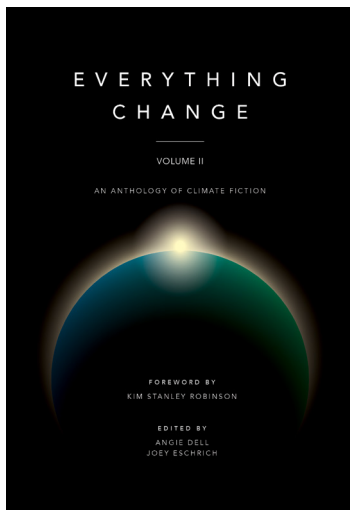
The past year has also given us new opportunities to forge connections with external institutions and collaborators. In November 2018, CSI co-hosted the Joan Ganz Cooney Center at Sesame Workshop in a two-day symposium on the future of immersive media for young children. At this convening of experts and industry leaders in virtual and augmented reality, content production, education, psychology, and related fields, we considered the potential consequences of these emerging technologies through a set of speculative future exercises, research-based talks, and panel discussions.

As ever, we continue to explore new dimensions of the imagination as it is expressed through narrative, research, and public engagement. We look forward to new collaborations and adventures... please be in touch if you have ideas for how we might work together.

A handwritten signature in black ink, consisting of the letters 'Ed' followed by a stylized, cursive 'Finn'.

Ed Finn
Director

CSI Publications 2018-19



Books

Dell, A., & Eschrich, J. (Eds.) (2019). *Everything Change: An Anthology of Climate Fiction, Volume II*. Tempe, AZ: Center for Science and the Imagination, Arizona State University.

Eschrich, J., & Miller, C. A. (Eds.) (2019). *The Weight of Light: A Collection of Solar Futures*. Tempe, AZ: Center for Science and the Imagination, Arizona State University.

Hannah, D., Cooper, B., Eschrich, J., & Selin, C. (Eds.) (2019). *A Year Without a Winter*, Columbia Books on Architecture and the City. New York: Columbia University Press.

Scholarly Publications

Ahmed, I., Giroto, V., Mawasi, A., Whitehurst, A., Wylie, R., & Walker, E. (2019). Co-Design for Learner Help-Giving across Physical and Digital Contexts. In Lund, K., Niccolai, G. P., Lavoué, E., Hmelo-Silver, C., Gweon, G., and Baker, M. (Eds.), *13th International Conference on Computer Supported Collaborative Learning (CSCCL) 2019, Volume 2* (pp. 545-548). Lyon, France: International Society of the Learning Sciences.

Ahmed, I., Mawasi, A., Wang, S., Wylie, R., Bergner, Y., Whitehurst, A., & Walker, E. (2019). Investigating Help-Giving Behavior in a Cross-Platform Learning Environment. In Isotani, S., Millán, E., Ogan, A., Hastings, P., McLaren, B., & Luckin, R. (Eds.), *Artificial Intelligence in Education: 20th International Conference, Proceedings, Part 1* (pp. 14-25). Cham, Switzerland: Springer.

Finn, E. (2018). Phoenix Will No Longer Be Phoenix if Waymo's Driverless-Car Experiment Succeeds. *MIT Technology Review* 121(4), 46-53. <https://www.technologyreview.com/s/611420/phoenix-will-no-longer-be-phoenix-if-waymos-driverless-car-experiment-succeeds>

Finn, E. (2018). How Predictions Can Change the Future. In Crist, M., & Eveleth, R. (Eds.), *What Future 2018: The Year's Best Writing on What's Next for People, Technology & the Planet* (pp. 24-31). Los Angeles, CA: Unnamed Press.

Finn, E. (2019). The Black Box of the Present: Time in the Age of Algorithms. *Social Research* 86(2).

Nagy, P., Wylie, R., Eschrich, J., & Finn, E. (2018). Why Frankenstein is a Stigma among Scientists. *Science and Engineering Ethics* 24(4), 1143-1159.

Talbot, R. M., Wylie, R., Dutilly, E., & Nielsen, R. (2018). The Relationship between Format and Cognitive Depth of Science Teacher-Generated Questions. *Research in the Schools* 25(1), 35-46.

Wylie, R., & Finn, E. (2019). Foreword. In Sobel, K., *Immersive Media and Child Development: Synthesis of a Cross-Sectoral Meeting on Virtual, Augmented, and Mixed Reality and Young Children* (p. 4). New York: Joan Ganz Cooney Center at Sesame Workshop.

Posters, Presentations, and Exhibits

Aguilera, E., Olivia S., Mawasi, A., & Cortes, L. (2018, November). Expanding Analytical Perspectives on Digital-Age Literacies. Presentation at the Annual Meeting of the Literacy Research Association.

Beard, B., Finn, E., Nagy, P., & Wylie, R. (2019, May). Transmedia Storytelling for STEM and STS Learning. Interactive demonstration at the 2019 STEM for All Video Showcase, an online event presented by TERC and funded by the U.S. National Science Foundation.

Finn, E. (2019, February) Science and Imagination: A Blueprint for Better Future. Presentation at the NISE Network Earth & Space Partner Meeting 2019, Arizona State University.

Finn, E., Wylie, R., Nagy, P., Zarka, E., & Hurlbut, B. (2018, October). Haunted Science: Frankenstein, Zombies, and Our Obsession with the Monstrous. Panel presentation at the Zombie Apocalypse Medicine Meeting (ZAMM 2018), Arizona State University.

Hudson, A. D. (2018, October) Solarpunk Leisure in Low-Carbon Futures. Presentation at the re:publica Sequencer Los Angeles conference.

Hudson, A. D. (2019, February) Move Quietly and Plant Things: Computation in Solarpunk Futures. Presentation at Crafting the Long Tomorrow conference, University of Arizona at Biosphere 2.

Hudson, A. D. (2019, March) The SSPs Are Cli-Fi Stories: Communicating and Examining Scenarios Using Speculative Fiction. Presentation at Scenarios Forum, University of Denver.

Mawasi, A. (2019, February). Students' Help-Giving Behavior in a Distributed Collaborative Learning Environment. Presentation at the 5th Annual Education Research Conference, hosted by the Mary Lou Fulton Teachers College Doctoral Council, Arizona State University.

Mawasi, A. (2019, April). Students' Help-Giving Interactions Using Educational Technology for Collaborative Learning in a Middle School Classroom. Presentation at Underrepresented Intellect: A Research Symposium for Graduate Students of Color, Arizona State University.

Posters, Presentations, and Exhibits (Continued)

Mawasi, A., Nagy, P., & Wylie, R. (2019, April). What does Ethics Mean? Middle School Students' Perceptions of Science Ethics. Presentation at the Annual Meeting of the American Education Research Association.

Mawasi, A., & Wylie, R. (2019, March). Integrating Narrative-based and Transmedia Learning into Higher Education Social Innovation Curriculum. Presentation at the 22nd Spanish Graduate Literature Conference, School of International Letters and Cultures, Arizona State University.

Popular Media

Eschrich, J., & Cooper, B. (2019, April 8). From Guilt to Hope: Why We Write Climate Fiction. *Locus* magazine. <https://locusmag.com/2019/04/brenda-cooper-guest-post-from-guilt-to-hope-why-we-write-climate-fiction>

Eschrich, J., & Dell, A. (2019, January 10). Literally, Stories of Climate Change. *iMPACT* magazine. http://www.assistasia.org/impact_magazine/Ed27_JanMar2019.pdf

Eschrich, J., & Lawton, R. (2019, March 21). Can Climate Change Fiction Build Consensus, Empathy? KPBS San Diego public radio. <https://www.kpbs.org/news/2019/mar/21/climate-fiction-builds-consensus-empathy>

Eschrich, J., & Litkowski, B. (2019, February 12). In the Face of Climate Chaos, Writers Find Grief and Hope. *ASU Now*. <https://asunow.asu.edu/20190212-creativity-face-climate-chaos-writers-find-grief-and-hope>

Finn, E. (2018, November 15). A Smarter Way to Think About Intelligent Machines. *The New York Times*. <https://www.nytimes.com/2018/11/15/opinion/killer-robots-ai-humans.html>

Finn, E., Aktipis, A., & Lundberg-Kenrick, D. (2019, June 8). Monster Algorithms. *Zombified* podcast. <https://zombified.fireside.fm/monsteralgorithms>

Finn, E., & Goldstein, S. (2018, July 17). Will Phoenix Be the Same After Driverless Cars Take Over? KJZZ 91.5 public radio. <https://kjzz.org/content/672138/will-phoenix-be-same-after-driverless-cars-take-over>

Popular Media (Continued)

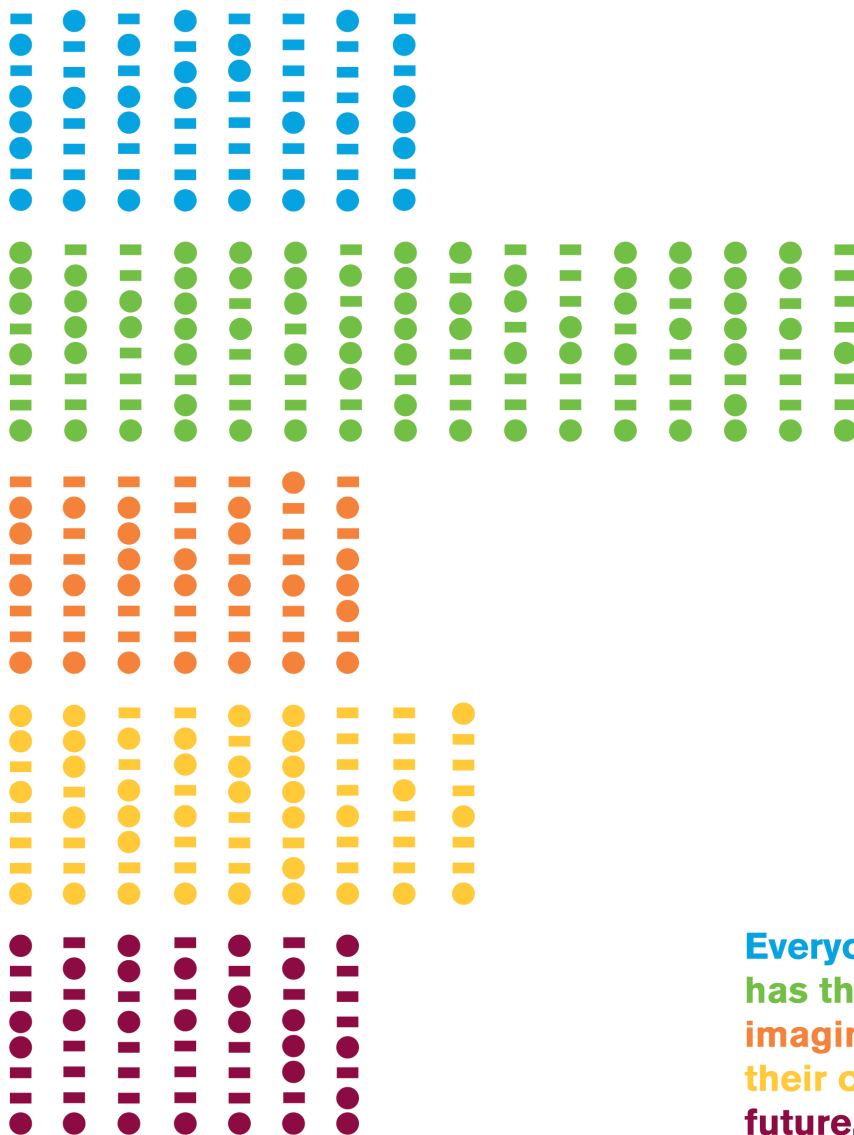
Finn, E., & Maynard, A. (2018, September 26). How Humans Fit into Google's Machine Future. *The Conversation*. <https://theconversation.com/how-humans-fit-into-googles-machine-future-102373>

Finn, E., & Richardson, C. (2018, September 27). What Algorithms Want. *This Is Not A Pipe* Podcast. <https://www.tinapp.org/episodes/whatalgorithm-swant>

Hudson, A. D. (2018, December 3). Mammoth Steps. *Terraform*, Vice Media. https://www.vice.com/en_us/article/d3bxwq/mammoth-steps-science-fiction-terraform

Hudson, A. D. (2019, March 29). Under the Grid. *Grist* magazine. <https://grist.org/article/under-the-grid-detroit-goes-full-on-solar-in-this-fictional-future>

Hudson, A. D. (2019, June 28). Under This Rock. *Little Blue Marble*. <https://littlebluemarble.ca/2019/06/28/under-this-rock>



Everyone
has the right to
imagine
their own
future.

Deji Bryce Olukotun

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Sci-Fi House
Tesla Road Trip
Wells Fargo Sustainability
Imaginary College
Visits and Conversations



Frankenbook
Frankenstein Bicentennial Concert
Frankenstein200 Updates
Chatbot Café



Drawn Futures: Arizona 2045
Grand Challenges Engineering
Ubiquitous Collaboration Support (UbiCoS)
Hermanas Conference and TEC is for Girls
MLFTC STEM Camp



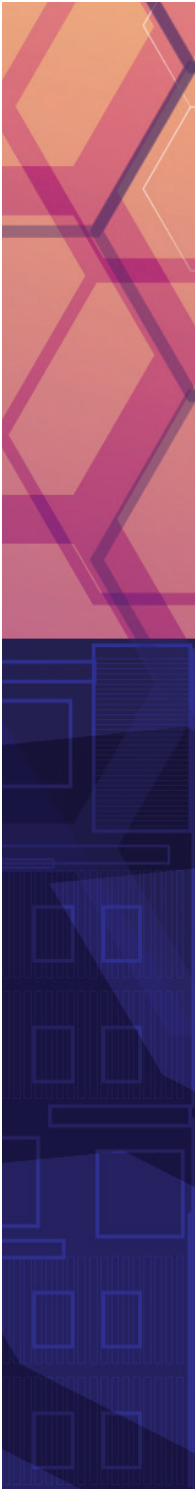
Emerge: Invention!
Emerge Gallery
The Sculpture Garden



Science & Imagination

How can we harness imagination as a resource for confronting our biggest problems? How can we tell new stories that inspire hope, agency, and ambition?

Illustration by Michael Duah for Andrew Dana Hudson's short story "Under the Grid," in *The Weight of Light*.



Center for Science and Imagination





The Weight of Light

The Weight of Light explores human futures powered by solar energy, with an upbeat, solarpunk twist. A transition to clean energy is increasingly necessary, and urgent, in the face of global climate change. But what will it actually be like to live in the photon societies of tomorrow? How will a transition to clean, plentiful energy transform our values, markets, and politics? Solar technologies can be planned and governed in many different ways. The choices we make will profoundly shape the futures we inhabit.

The Weight of Light comes out of a Narrative Hackathon workshop hosted by CSI and ASU's School for the Future of Innovation in Society (SFIS) in May 2018, with support from ASU's Quantum Energy and Sustainable Solar Technologies Engineering Research Center (QESST). It's the latest in a series of experiments using collaborative gatherings as the foundation for book projects that reach across genres and tell gripping stories about technology, society, and possible futures.

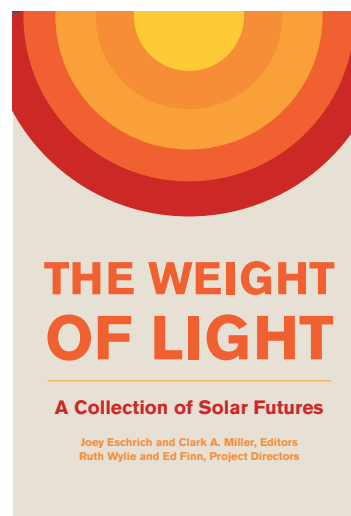
The book features original science fiction short stories and essays, along with illustrations created by artists local to the Phoenix area. Contributors include acclaimed and

emerging science fiction authors, electrical engineers, scholars of energy and society, political scientists and ethicists, sustainability researchers, systems and aerospace engineers, anthropologists, and environmental engineers.

The Weight of Light was edited by CSI's Joey Eschrich and Clark A. Miller of SFIS, with CSI's Ed Finn and Ruth Wylie acting as project directors. The book is free to download, read, and share. It received attention in regional and national media, including a review on the leading technology website *The Verge* and short stories reprinted on Vice Media's *Terraform* channel and in the environmental magazine *Grist* (in their first experiment with publishing fiction!).

Illustration by Kirsten Newkirk for Corey Pressman's short story "Divided Light," in *The Weight of Light*.

csi.asu.edu/books/weight 



Future Tense Fiction

CSI continues to publish a monthly series of science fiction stories in *Slate* magazine titled Future Tense Fiction. Over the course of the year, Future Tense Fiction has brought a diverse group of accomplished authors into the series, including Ken Liu, Annalee Newitz, and Indrapramit Das. Each story is accompanied by original artwork and a nonfiction response essay by an expert exploring some technical or research-based aspect of the science fiction.

Future Tense Fiction is an exciting extension of the larger Future Tense partnership between ASU, *Slate*, and New America. In the past year, Future Tense Fiction has also established a partnership with 3 Arts Entertainment in Los Angeles, creating opportunities to adapt these stories for film, television, and the web. 3 Arts complements our existing networks with its track record of major hits as a talent management and production company, including TV shows *The Good Place*, *Parks and Recreation*, and *American Vandal*, as well as numerous films.

Future Tense Fiction stories have been earning accolades in the science fiction community, with several being included in “year’s best” anthologies and one story, Annalee Newitz’s “When Robot and Crow Saved East St. Louis,” honored with the Theodore Sturgeon Memorial Award for best short fiction published in 2018.

CSI has signed a publication agreement with the highly regarded independent publisher Unnamed Press to produce an anthology of Future Tense Fiction stories that will be published in October 2019.

Our stories from 2018-2019 are:

July 2018: “The Starfish Girl,” by Maureen F. McHugh, with a response essay by sports historian Victoria Jackson

August 2018: “When We Were Patched,” by Deji Bryce Olukotun, with a response essay by computer scientist Jeanna Matthews

September 2018: “Lions and Gazelles,” by Hannu Rajaniemi, with a response essay by evolutionary biologist Rowan Hooper

October 2018: “Burned-Over Territory,” by Lee Konstantinou, with a response essay by universal basic income advocate Sebastian Johnson

November 2018: “Overvalued,” by Mark Stasenko, with a response essay by money manager Zachary Karabell

December 2018: “When Robot and Crow Saved East St. Louis,” by Annalee Newitz, with a response essay by engineer and AI researcher Janelle Shane

January 2019: “Thoughts and Prayers,” by Ken Liu, with a response essay by digital culture researcher Adrienne Massanari

February 2019: “Mpendulo: The Answer,” by Nosipho Dumisa, with a response essay by reproductive technology expert Sarah Elizabeth Richards

March 2019: “The Arisen,” by Louisa Hall, with a response essay by librarian Jim O'Donnell

Science & Imagination

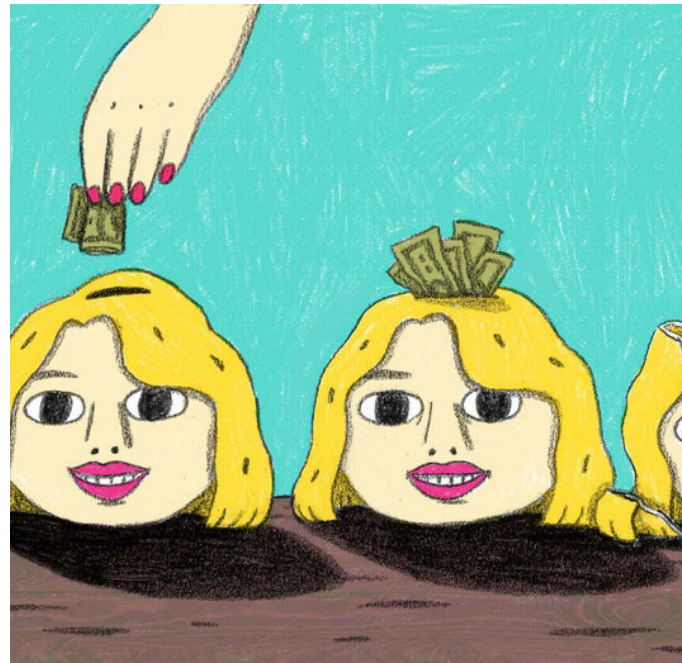
April 2019: “The Song Between Worlds,” by
Indrapramit Das, with a response essay by
astronomer Lucianne Walkowicz

May 2019: “No Moon and Flat Calm,” by
Elizabeth Bear, with a response essay by
disaster expert Amanda Ripley

June 2019: “Space Leek,” by Chen Qiufan
(aka Stanley Chen), with a response essay by
architecture professor and space-settlements
expert Fred Scharmen



Illustration by Sarula Bao for “Thoughts and Prayers.”



Top: Illustration by Lisa Larson-Walker for “No Moon and Flat Calm.”

Bottom: Illustration by Doris Liou for “Overvalued.”

AI Policy Futures

Science fiction has long speculated about a future of thinking machines and artificial beings. Now, with artificial intelligence (AI) becoming ubiquitous, we need to learn from these speculations to navigate towards a future we want.

In 2018, CSI partnered with the Open Technology Institute at New America on a project to explore the intersection of science fiction and AI tech policy. AI Policy Futures, supported by the William and Flora Hewlett Foundation and Google, investigates what science fiction can and can't teach us about our AI policy conundrums. Advised by a board of experts—including science fiction authors Cory Doctorow, Malka Older, and Madeline Ashby along with designers, technologists, artists, policy experts, and ethicists—Ed Finn and graduate researcher Andrew Dana Hudson reviewed a wide swath of stories, novels, movies, games, and more, and built a taxonomy of fictional AI systems.

We brought this research to a daylong event on May 7, 2019 in Washington DC, hosted by Future Tense, ASU's partnership with *Slate* and New America on emerging technology and society. The event featured a public series of panels and talks that discussed our real-life AI challenges, the literary tradition of AI imaginaries, and how we can bridge fiction and fact to find our way towards just and positive AI futures. We also convened a private gathering of experts to discuss new areas for research and storytelling, which will be used to commission a set of original science fiction stories that will be published as part of our Future Tense Fiction project in 2019-2020.



Science & Imagination



CSI's Ed Finn moderates a panel at the "What Sci-Futures Can (and Can't) Teach Us About AI Policy" event in Washington, DC. From left: Ed Finn, Malka Older, Ashkan Soltani, Kristin Sharp. Photo courtesy of New America.

EVERYTHING CHANGE

VOLUME II

AN ANTHOLOGY OF CLIMATE FICTION



FOREWORD BY
KIM STANLEY ROBINSON

EDITED BY
ANGIE DELL
JOEY ESCHRICH

Imagination and Climate Futures

A partnership with ASU's Virginia G. Piper Center for Creative Writing, the Imagination and Climate Futures Initiative (ICF) explores how imagination shapes humanity's response to climate change, and how art and literature, merged with science, can create solutions to climate challenges.

Science & Imagination

Everything Change, Volume II

We published our second anthology of climate fiction, drawn from our global Everything Change Climate Fiction Contest, in January 2019. The book was edited by Angie Dell of the Virginia G. Piper Center for Creative Writing and Joey Eschrich of CSI.

The contest, held in 2018, invited writers to submit stories exploring climate chaos and human responses to it, set in ecosystems, built environments, and communities all around the world. The global response to our challenge was astounding: we received more than 540 submissions from 66 different countries.

Our grand prize-winning story was “Monarch Blue” by Barbara Litkowski, a near-future tale set in the southwestern United States about migrant labor, reproductive health, and the effects of environmental degradation on women’s bodies. The book features work by authors from the United States, Canada, Sri Lanka, the United Kingdom, Malta, and Australia.

Everything Change, Volume II: An Anthology of Climate Fiction is free to download, read, and share, and features a foreword by legendary science fiction author Kim Stanley Robinson, the lead judge for the Everything Change Contest.

The book received great reviews from NPR Books and *The Chicago Review of Books*, and coverage in a number of other media outlets. “Monarch Blue” reached new audiences through a reprint in *iMPACT*, a social innovation magazine for the development sector in Asia.

Annual Lecture

The destabilizing effects of climate change aren’t limited to natural resource depletion, ecosystem loss, extinctions, and sea level rises—they also ripple out to political systems, migration and conflict, governance and culture.

Our fifth annual Imagination and Climate Futures Lecture was delivered on April 18, 2019 by award-winning journalist and acclaimed novelist Omar El Akkad. In his lecture, El Akkad discussed the research, writing, and public reception of his novel *American War*, which imagines a future United States fractured by climate chaos. El Akkad stressed that we are already seeing—but often ignoring, denying, or misrepresenting—the disastrous effects of climate change around the world, and especially in vulnerable coastal regions like southern Louisiana, where he traveled as a journalist before writing the novel.

Previous lectures in the Imagination and Climate Futures series have been delivered by Hugo, Nebula, World Fantasy, and Locus Award-winning novelist Kim Stanley Robinson; Pulitzer Prize-winning author and journalist Elizabeth Kolbert; Hugo, Nebula, Compton Crook, and Michael L. Printz Award-winning author Paolo Bacigalupi; and legendary author, activist, and critic Margaret Atwood.

Science Fiction Awards and Honors

This year, we were honored to see a number of stories we commissioned, edited, and published included in “year’s best” science fiction anthologies, nominated for awards, or otherwise recognized. A few highlights:



Illustration by Lisa Larson-Walker for “When Robot and Crow Saved East St. Louis.”

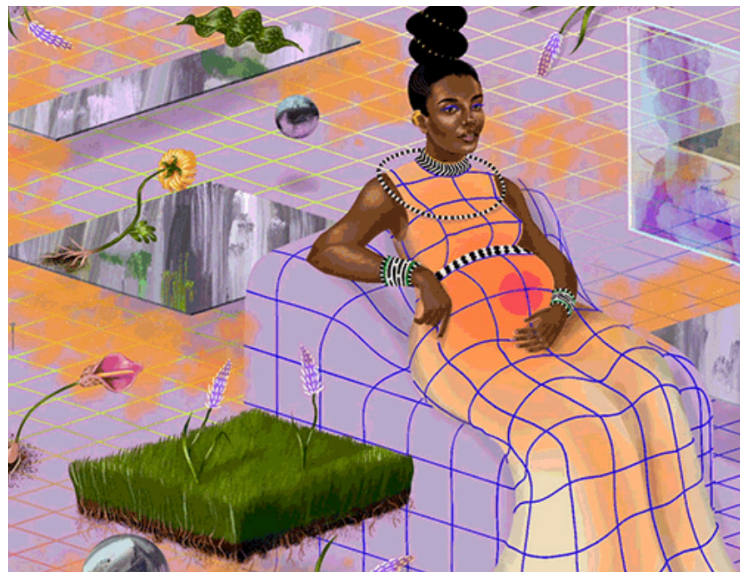


Illustration by Shyama Golden for “Mother of Invention.”

Science & Imagination

“When Robot and Crow Saved East St. Louis” by Annalee Newitz, from our Future Tense Fiction project, was honored with the Theodore Sturgeon Memorial Award for the best short fiction published in 2018. (This is our second Sturgeon winner—Cory Doctorow’s “The Man Who Sold the Moon,” from our *Hieroglyph* anthology, won the award in 2015.) Newitz’s story was also selected for *Best American Science Fiction and Fantasy 2019*, series edited by John Joseph Adams, guest editor Carmen Maria Machado.

“Mother of Invention” by Nnedi Okorafor, from our Future Tense Fiction project and our book *A Year Without a Winter*, was named a finalist for the 2019 Locus Award for best short story.

“The Use of Things” by Ramez Naam and “Vanguard 2.0” by Carter Scholz, from our book *Visions, Ventures, Escape Velocities*, were selected for *The Year’s Top Hard Science Fiction Stories 2*, edited by Allan Kaster.

“Mother of Invention” by Nnedi Okorafor and “A Brief and Fearful Star” by Carmen Maria Machado, from our Future Tense Fiction project, plus “Widdam” by Vandana Singh and “A World to Die For” by Tobias S. Buckell, from our book *A Year Without a Winter*, were selected for *Locus* magazine’s 2018 Recommended Reading List. Future Tense Fiction was also spotlighted in *Locus* year-in-review pieces by critics Karen Burnham and Jonathan Strahan.

“Domestic Violence” by Madeline Ashby and “Lions and Gazelles” by Hannu Rajaniemi, from our Future Tense Fiction project, were selected for *The Best Science Fiction of the Year, Volume 4*, edited by Neil Clarke.

“A Bright and Fearful Star” by Carmen Maria Machado, from our Future Tense Fiction project, and “Widdam,” from our book *A Year Without a Winter*, were selected for *The Best Science Fiction and Fantasy of the Year, Volume 13*, edited by Jonathan Strahan.



Illustrations by Doris Liou for “Lions and Gazelles” and “A Brief and Fearful Star.”

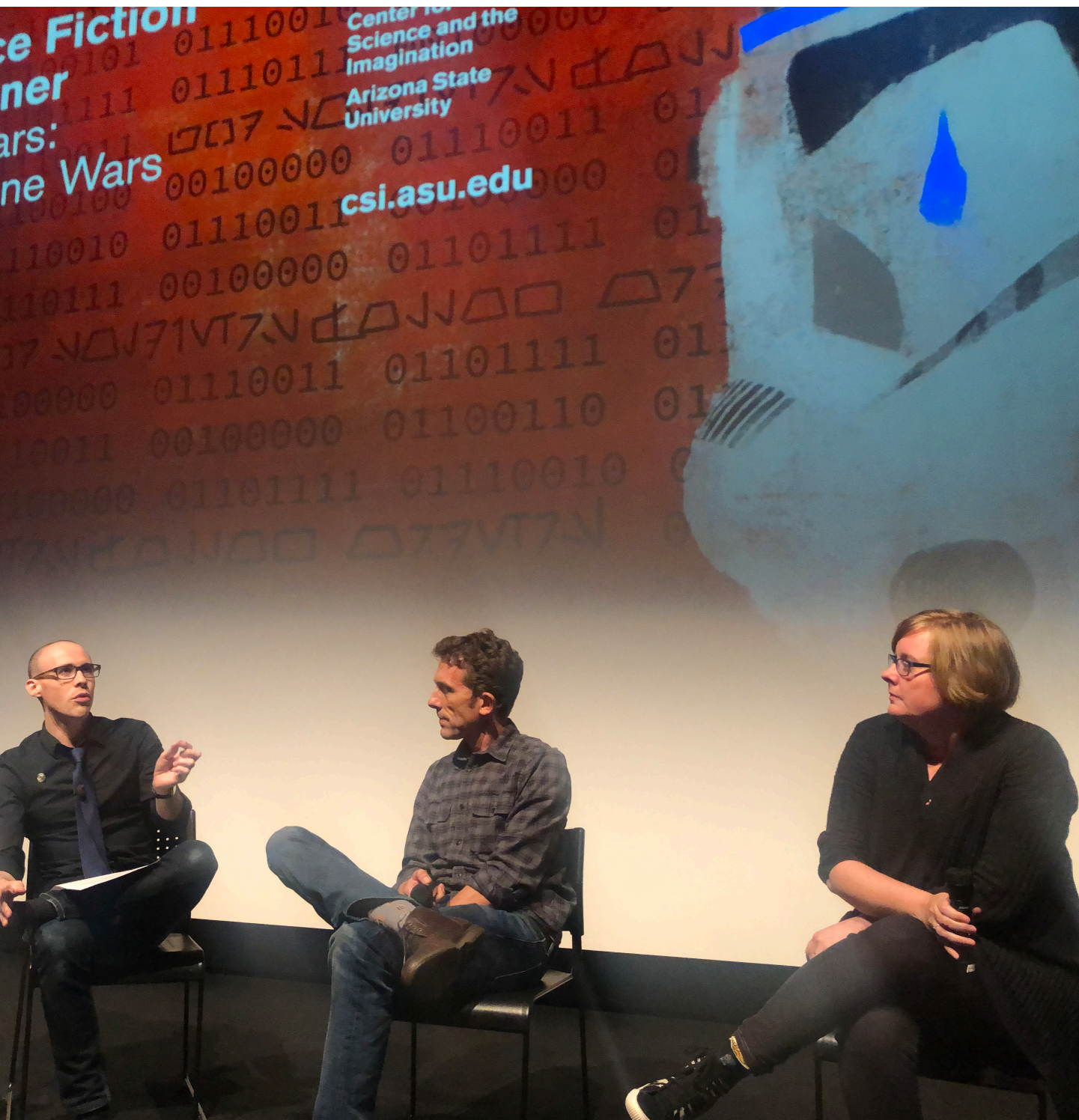
Networks of Imagination

How can we bring together the world's most imaginative and ambitious thinkers about the future? How do we invite everyone into those conversations?

Panel conversation at the Science Fiction TV Dinner with *Star Wars: The Clone Wars*. From left to right: Joey Eschrich, Bob Beard, Nina Miller.



Center for Science and Imagination





Dave Guston addresses the Future of Childhood Salon, while Elmo and Ernie relax.

Future of Childhood Salon

On November 7 and 8, 2018, we partnered with the Joan Ganz Cooney Center at Sesame Workshop, the learning technology company Dubit, and ASU's School for the Future of Innovation in Society to convene 60 experts at the inaugural Future of Childhood Salon on Immersive Media and Child Development. These leaders in education, research, pediatric medicine, technology policy, content creation, software development, and hardware engineering came together to contemplate the potential benefits and risks of immersive media (augmented, virtual, mixed, and cross reality) to young children. This salon comes at a pivotal time when immersive media are becoming more affordable and accessible to consumers, yet different hardware manufacturers and software companies still recommend that children under age 13 avoid using their systems and content. The purpose of the gathering was to plan, envision, and think deeply about immersive media and child development before these media become ubiquitous in children's lives.

CSI's Ruth Wylie and Ed Finn facilitated the small-group interactive sessions at the summit. During this time, groups of five participants imagined future roles for immersive media, grounded in unique child profiles assigned to each group. Each profile was based on a real child whom one or more of the salon organizers had encountered in their research or lived experiences. These children varied in age, gender, interest, socioeconomic status, ethnicity/race, culture, community setting, and cognitive, motor, communication, and social interaction skills. By building on the information about their assigned children's lives, personalities, and development, groups created narratives about these children's experiences with immersive media. The process revealed positive, negative, intended, and unintended consequences of the media on children, and helped to identify any research, policies, and practices that would need to be explored in each imagined future. In turn, this narrative method acted as a basis for discussions about the futures for which we need to prepare.

To learn more, read the white paper at joanganzcooneycenter.org/publications 

Science Fiction TV Dinners

The Science Fiction TV Dinner series is a launch pad for imaginative, engaging conversations about science, technology, and society. We use science fiction as an inclusive meeting ground where people from diverse professional and intellectual backgrounds—from artists, writers, and historians to scientists, engineers, and fan scholars—can bring their expertise and knowledge to the conversation.

Since 2012, Science Fiction TV Dinners have developed an enthusiastic following on and off campus, providing an opportunity for people of all ages and backgrounds to come together, learn, and explore visions of the future in an entertaining, informal setting.

At each event, we serve dinner, screen an episode of a classic or contemporary science fiction television show, and discuss key themes, debates, and ethical quandaries. Science Fiction TV Dinners bring science, art, and storytelling into dialogue and provide a platform for collectively exploring a diverse array of future visions.

October 2018: Battlestar Galactica

Speakers: Digital culture scholar Ed Finn, *Battlestar* writer and story editor Anne Cofell Saunders, and science, technology, and society scholar Michael G. Bennett

November 2018: Torchwood

Speakers: Planetary scientist Lindy Elkins-Tanton and film and media studies scholar Julia Himberg

February 2019: Person of Interest

Speakers: Human systems engineer Erin Chiou and sustainability researcher Andrew Dana Hudson

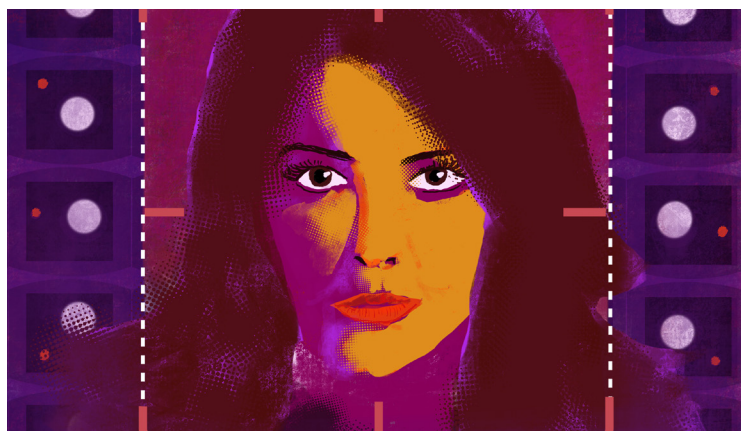
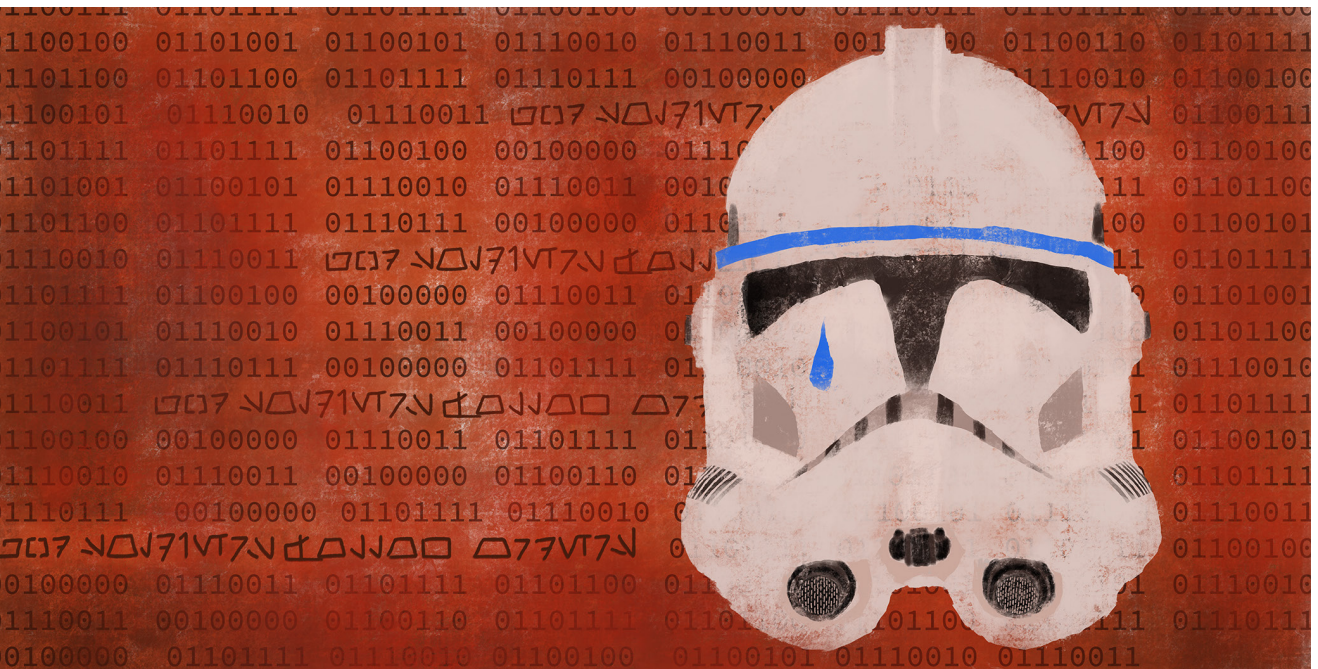
April 2019: Star Wars: The Clone Wars

Speakers: Visual communications designer Nina Miller and communications scholar Bob Beard

csi.asu.edu/events 

TV Dinner art by Nina Miller. Photo: Panel conversation at the *Battlestar Galactica* event, featuring Anne Cofell Saunders (center), a writer and story editor for the series, along with CSI's Michael G. Bennett and Ed Finn.

Networks of Imagination





Art for the *Blade* screening at FilmBar, by Nina Miller.

Black History Month

Afrofuturism is a cultural and aesthetic movement that foregrounds black culture alongside technoscience, with roots in the speculative fiction of Samuel R. Delaney, Octavia Butler, and W. E. B. Du Bois. In the past few years, the concept has expanded and entered the mainstream through blockbuster films like *Black Panther* and *Get Out* and the music of Beyoncé and Janelle Monáe. In celebration of Black History Month 2019, CSI presented two events examining Afrofuturism through the lens of today's popular media.

On February 12, we partnered with the local, independent movie house FilmBar to host a screening of the 1998 action-horror-superhero film *Blade*, starring Wesley Snipes. Presented by CSI's Michael G. Bennett, the event focused on *Blade* as a groundbreaking Afrofuturist work that laid the foundation for the paradigm-shifting media we're seeing today.

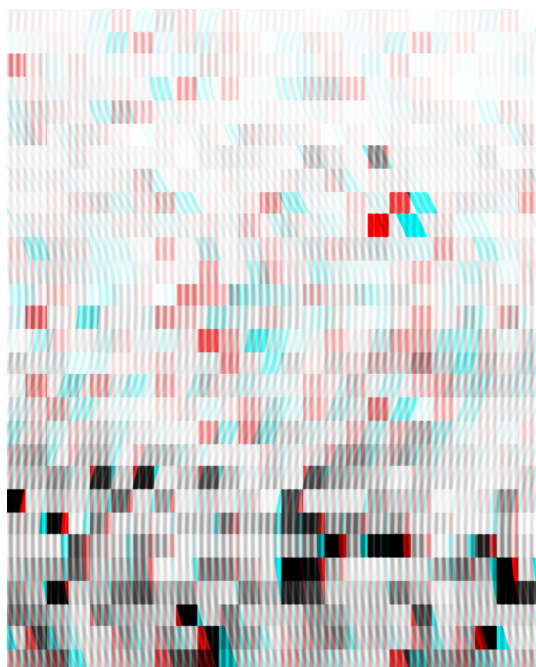
The following afternoon, we joined with ASU's Institute for Humanities Research and School for the Future of Innovation in Society to host a lecture by film critic and philosopher Steven Shaviro. In his talk, titled "Ancient to the Future: Afrofuturism, Cyborgs, and the Posthuman," Shaviro explored how women and people of color use the expressive tools of science fiction and music videos to present visions of the future that are just, inclusive, and inspiring.

Imaginary Papers

Imaginary Papers is CSI's blog, hosted on the social writing platform Medium. Imaginary Papers imagines, negotiates, analyzes, and speculates playfully about the relationship between humans and technology. We're interested in the ways that past and present inform our visions of the future. We explore our relationship with technology from the beginning of history to the most distant horizon of what might come.

We've published pieces by neuroscientists, ecologists, poets, sustainability researchers, cybersecurity experts, science fiction authors, technology journalists, museum curators, and more. Next year, we will transition Imaginary Papers to a new platform and publishing schedule, bring in a panoply of new voices, and try some exciting experiments at the nexus of storytelling, futures, and imagination. Stay tuned!

medium.com/imaginary-papers 



Flights of Imagination

Staff Picks
Recommending the people, ideas, and play that inspire our imaginations

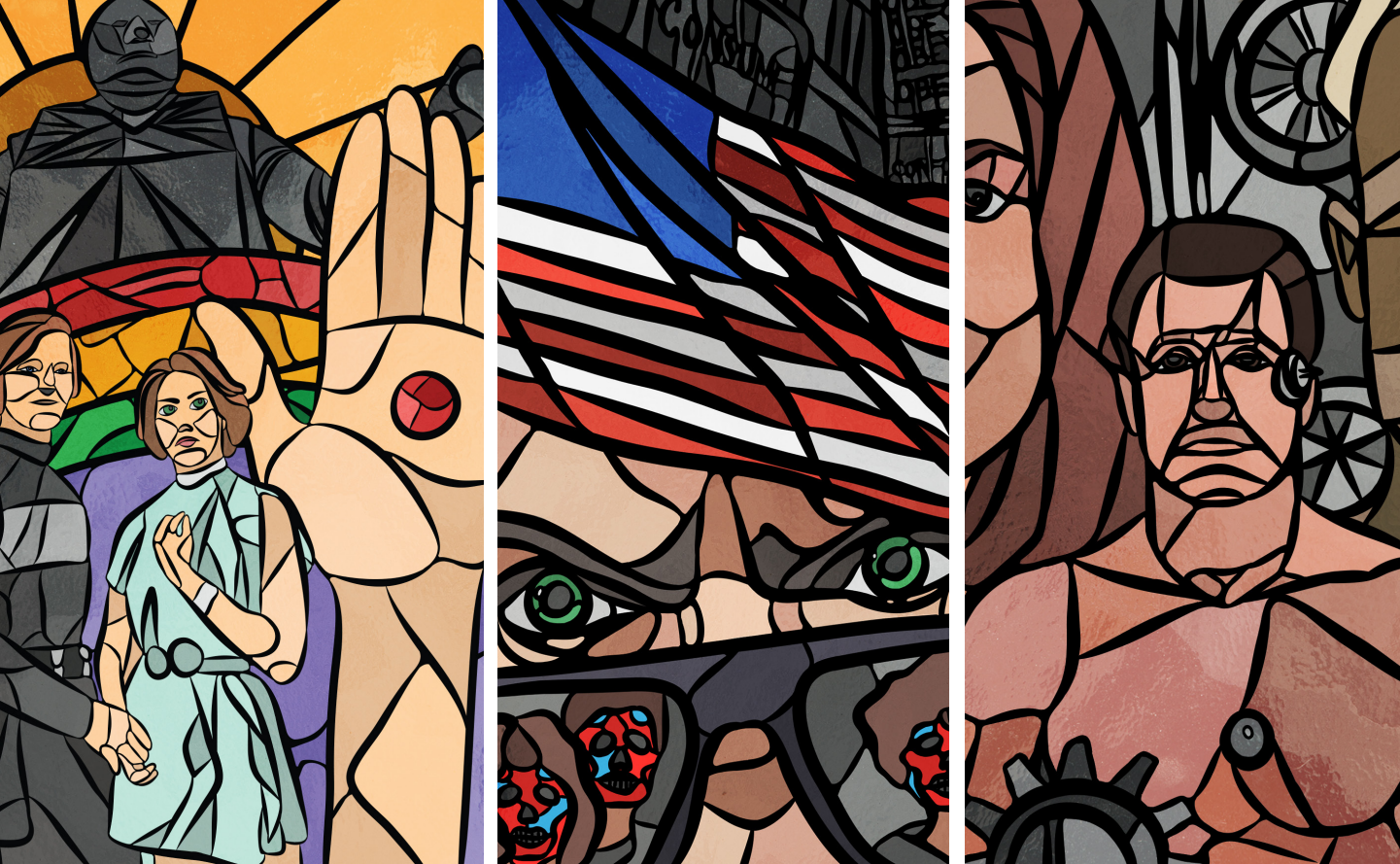
Ruth recommends *Current Futures: A Sci-Fi Ocean Anthology*, published by XPRIZE. The book, which features short stories from CSI Imaginary College fellows and collaborators like Madeline Ashby, Elizabeth Bear, Brenda Cooper, Malka Older, and Vandana Singh, imagines how emerging technologies might help improve the health of the oceans, from regrowing coral reefs and using augmented reality for deep-sea exploration to communicating with dolphins.





Andrew recommends *The Training Commission*, a policy-focused science fiction story told through emails that come straight to your inbox each week. After a toxic mix of tech-platform capitalism and long-brewing culture war reaches Civil War levels, American governance is handed over to a post-democratic machine learning algorithm, trained with surveillance data and a truth-and-reconciliation process. That alone is a fascinating conceit, but the story uses that as the backdrop for a twistier tale of family drama, architectural critique, political intrigue, and amateur journalistic sleuthing. You can read the first chapter and sign up [here](#).

Looking to catch up on various goings-on at CSI and find a new bit of internet arcana to obsess over? Look no further than our Flights of Imagination newsletter. Delivered to email inboxes twice monthly, this dispatch features project updates, news, and offbeat cultural recommendations from the CSI staff. Sharp-witted and succinct, Flights of Imagination provides a glimpse into the creative alchemy that powers our work and serves as an entry point for new collaborators and curious members of the public. Subscribe at csi.asu.edu. 



Art by Dakota Thompson for the History of the Future series.

History of the Future

In the summer of 2018, we continued our ongoing partnership with FilmBar, an independent movie house in downtown Phoenix, for the History of the Future film series. For this second installment of the series, we drew on another batch of classic, sometimes schlocky science fiction films from the 1970s, 1980s, and 1990s to examine values, worldviews, and visions of the future from decades past.

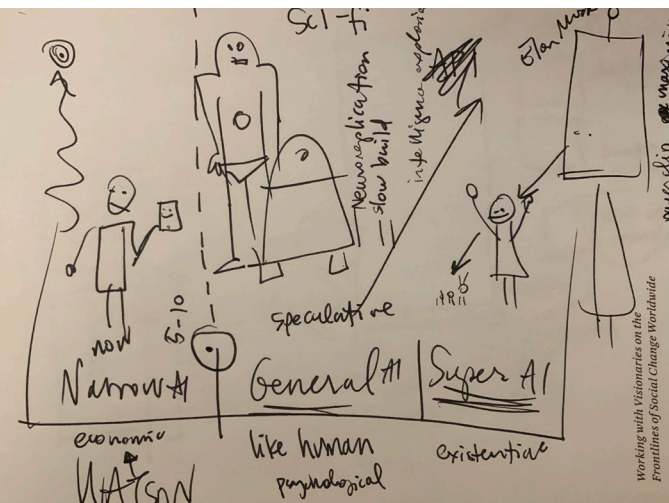
The film series expanded the reach of CSI's public engagement, facilitating conversations between the public and scholars to understand how audiences of the past anticipated and discussed technologies that we're grappling with today.

This year's History of the Future series featured:

June 2018: *Logan's Run* (1976), introduced by young adult fiction author Amy K. Nichols

July 2018: *They Live* (1988), introduced by science, technology, and society scholar Michael G. Bennett

August 2018: *Demolition Man* (1993), introduced by CSI's Joey Eschrich



Sci-Fi House

Each year, SXSW gathers thousands in Austin, Texas for a festival of bleeding-edge technology, culture, and politics. In 2019, CSI teamed up with the Open Technology Institute at New America and the Partnership on AI for the second year of Sci-Fi House, an outpost of speculative thinking adjacent to SXSW. At Sci-Fi House, science fiction authors share a roof and swap ideas throughout the festival, this year with a focus on the future of artificial intelligence.

Sci-Fi House residents included science fiction authors and futurists Malka Older, Eliot Peper, Kevin Bankston, Brian David Johnson, Chris Noessel, and Andrew Dana Hudson. Sci-Fi House put on two fascinating SXSW panels: “Sci-Fi CEOs: How Fictional Futures Influence Tech” and “Untold AI: Is Sci-Fi Telling Us the Right Stories?” We capped off the weekend with a backyard barbecue attended by dozens of AI and science fiction luminaries, including Bruce Sterling, Cory Doctorow, and Tim O’Reilly.

Sci-Fi House also pursued an ambitious podcast project, *Imagining Intelligence*. ASU futurist in residence Brian David Johnson recorded dozens of interviews with authors like Sterling and Doctorow, tech leaders like Craig Newmark (the founder of Craigslist), AI ethicists and activists, and others. Barbecue attendees also stepped into the house to record conversations, with topics ranging from the challenges of autonomous weapons to the vegetarian future of space travel. We plan to produce and release *Imagining Intelligence* within the next year as a limited series.



Top: An impromptu sketch illustrating the near future of artificial intelligence, by Chris Noessel.

Middle: Sci-Fi House, where friends and colleagues share passionate thoughts on AI and BBQ. From left to right: Andrew Hudson, Mo Johnson, Malka Older.

Bottom: CSI Futurist-in-Residence Brian David Johnson interviews author and activist Cory Doctorow.

Networks of Imagination

Tesla Road Trip



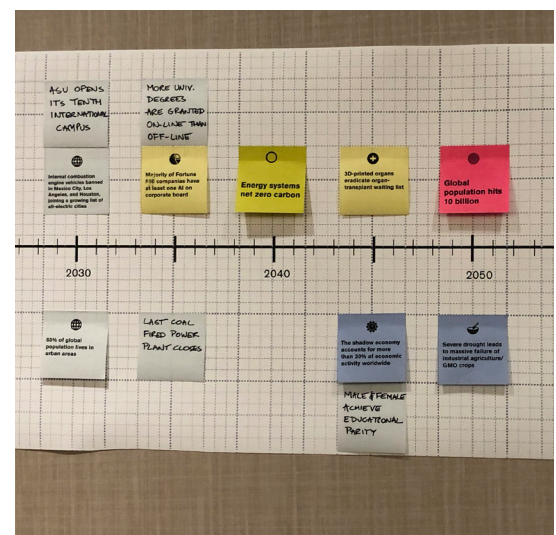
"Watts Her Name" on Icefields Parkway, Alberta, Canada.
Photo courtesy of John Martinson.

In the summer of 2018, CSI, along with ASU's School of Sustainability and the Rocky Mountain Institute, supported John Martinson's Tesla Road Trip. In this 6,000-mile carbon-neutral adventure, Martinson and his son embarked on a cross-county road trip in their high-performance electric car, aiming to demonstrate the range, capability, and excitement of these vehicles for sustainable vacationing, and to begin to forge the kind of mystique and culture of the road that makes internal combustion engine vehicles so appealing.

Martinson, an alumnus of the School of Sustainability and regular CSI collaborator, made several presentations on sustainability during his monthlong expedition across 10 Western U.S. states and two Canadian provinces, and distributed copies of CSI's *Drawn Futures: Arizona 2045* comic book at multiple stops along the way.

Wells Fargo Sustainability

In April 2019, Ed Finn and Ruth Wylie ran an imagination workshop for sustainability leaders at Wells Fargo, inviting them to create timelines charting the course of humanity over the next 50 years. The exercise asked participants to contend with the world-shaping and unpredictable forces of climate chaos, population fluctuations, and technological change. Through this exercise, we challenged these executives to explore the broad possibility space for human activity in the 21st century and to consider possible paths forward to more equitable, sustainable, and hopeful futures.



A timeline for the future, 2030-2050, created at the Wells Fargo imagination workshop.

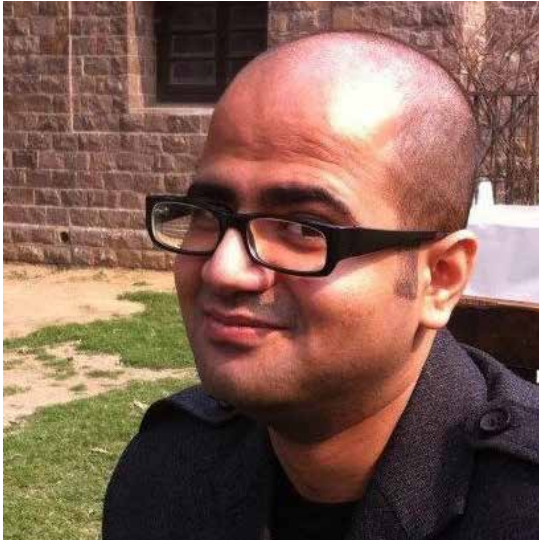
Imaginary College

The Imaginary College is a group of outstanding creative thinkers, researchers, practitioners, and mad geniuses that represents one of the core missions of the Center for Science and the Imagination: to seek out intelligent life wherever it resides in the universe and get it on our side. Through the Imaginary College, CSI partners with and celebrates individuals and groups who are already advancing our mission of fresh, creative, and ambitious thinking about the future. This year, we welcomed three new members to the Imaginary College: Bodhisattva Chattopadhyay, Cory Doctorow, and Sherri Wasserman.

csi.asu.edu/imaginary-college 

Cory Doctorow, science fiction author, activist, journalist and blogger; co-editor, *Boing Boing*; special consultant, Electronic Frontier Foundation; co-founder, UK Open Rights Group

Networks of Imagination



Bodhisattva Chattopadhyay, senior researcher, Department of Culture Studies and Oriental Languages, University of Oslo; founding editor, *Studies in Global Genre Fiction*; editor-in-chief, *Fafnir: Nordic Journal of Science Fiction and Fantasy Research*; editor, *Journal of Science Fiction*



Sherri Wasserman, artist and designer; PhD student, School for the Future of Innovation in Society, Arizona State University; designer-in-residence, metaLAB, Harvard University



Visits and Conversations

One of our great pleasures is sharing ideas and engaging with our community, both by welcoming artists, writers, researchers, and other collaborators and by participating in public lectures, interviews, and panels. Here are a few highlights from the past year.

JUL 2018

Ed Finn presents (via video) the outputs of ASU's Frankenstein Bicentennial Project at the University of Notre Dame's Operation Frankenstein conference in Rome.

SEP 2018

Bob Beard and Joey Eschrich take part in the ASU Library's Banned Books Week Read Out, reading aloud from Mary Shelley's *Frankenstein* and Aldous Huxley's *Brave New World*, which have both been repeatedly banned or challenged.

Ed Finn joins host Chris Richardson on *This Is Not A Pipe*, a podcast about critical theory, cultural studies, and philosophy, for a conversation about computational culture and his book *What Algorithms Want*.

Joey Eschrich delivers a guest lecture on utopian city designs from science fiction in Daniel Piatkowski's "The Community and the Future" course at the University of Nebraska – Lincoln.

OCT 2018

Ed Finn is interviewed as part of "Frankenstein at 200," a *New York Times* feature about the bicentennial of the publication of Mary Shelley's novel, and its undimmed cultural relevance today.

Ed Finn joins Travis Rich, our collaborator on *Frankenbook*, on an episode of the *MIT Press Podcast*, as part of a series on open-access publishing.

Max Brooks, author of *World War Z*, *The Zombie Survival Guide*, and *Minecraft: The Island: The Novel*, visits to discuss the zombie apocalypse and its relevance for current world affairs as part of the culmination of the Frankenstein Bicentennial Project.

Ed Finn, Ruth Wylie, Peter Nagy, Emily Zarka, and Ben Hurlbut speak at the Zombie Apocalypse Medicine Meeting (ZAMM 2018) on "Haunted Science: Frankenstein, Zombies, and Our Obsession with the Monstrous."

Ruth Wylie visits the University of Arizona's OLLI Science Fiction course to discuss science fiction as a method for futures thinking.

NOV 2018

Ed Finn writes "A Smarter Way to Think About Intelligent Machines," an op-ed for the *New York Times*, as part of the launch of the AI Policy Futures project.

Ed Finn delivers a lecture as part of the Digital Studies Speaker Series at the University of Kentucky.

Andrew Hageman, associate professor of English at Luther College, visits CSI to deliver a lecture, "Chinese Science Fiction and Speculative Infrastructure."

Bob Beard joins the Plurality University Founder's Meeting in Paris and participates in a panel discussion on the theme of "technosocial" with Geoffrey Delcroix of the Innovation Lab of the French Data Protection Authority (CNIL), Orit Halpern of Concordia University, and Chris Julien of Waag.

OpenMind, an international publication of BBVA (Banco Bilbao Vizcaya Argentaria), publishes "The Scientific Origins of Frankenstein," an article featuring our *Frankenstein: Annotated* volume and an interview with Frankenstein Bicentennial Project co-director Dave Guston.

Networks of Imagination

FEB 2019

Ed Finn and Ruth Wylie attend the Advancing Informal STEM Learning PI meeting in Washington, DC to share updates on the Frankenstein project.

Ed Finn delivers "Science and Imagination: A Blueprint for Better Futures," a plenary lecture for the NISE (National Informal STEM Education) Network Earth & Space Partner Meeting at ASU.

Joey Eschrich delivers a presentation to ASU graduate students at the Publishing Beyond Academia professional development workshop, hosted by ASU's Graduate College.

Ed Finn and Ruth Wylie run an interactive futures session at the Julie Ann Wrigley Global Institute of Sustainability board meeting, encouraging members to reflect on how major and minor decisions affect global sustainability.



Students in Ed Finn's "Approaches to Light" course survey James Turrell's Roden Crater. Photo by Jordan Neel.

MAR 2019

CSI hosts a delegation of visiting futures researchers from several universities in Japan: Miwa Nishinaka, associate professor at The Graduate Institute for Advanced Studies; Kunio Shirahada, associate professor at the Japan Advanced Institute of Science and Technology; Yusuke Kishita, lecturer at the University of Tokyo; Hideaki Takeda, professor at the National Institute of Informatics; and Hisashi Masuda, senior lecturer at Kyoto University.

Steven Weiner, an ASU University Innovation Fellow and graduate student in the School for the Future of Innovation in Society, hosts a student workshop at CSI to explore innovation from various disciplinary perspectives.

APR 2019

Students in Ed Finn's "Approaches to Light" course exhibit their artistic work at the Roden Crater Student Showcase, part of ASU's partnership with artist James Turrell. CSI publishes an art book, *Approaches to Light*, featuring the students' projects and writing.

Joey Eschrich and Imaginary College Fellow Brenda Cooper write "From Guilt to Hope: Why We Write Climate Fiction," a post on *Locus* magazine's "Roundtable" channel, as part of the *A Year Without a Winter* book launch.

Ed Finn delivers a lecture, "The Algorithmic Imagination," as part of the Center for Values in Medicine, Science and Technology Lecture Series at the University of Texas at Dallas.

Jonathan Alexander, Chancellor's Professor of English and Informatics at the University of California, Irvine, visits to deliver a lecture, "Pop Culture and the Future," as part of the Digital Culture Speaker Series.

Matthew Derby, a writer, game designer, and podcaster, visits CSI to deliver a lecture, "Creative Work in a Post-Auteur World."

MAY 2019

Our Future Tense Fiction project hosts a reception in Woodland Hills, California, to connect with science fiction authors, critics, and publishers immediately following the 2019 Nebula Awards and Conference.

Ed Finn is featured in a one-minute video about imagination as part of ASU's "Got a Minute" series.

Ed Finn writes "The Black Box of the Present: Time in the Age of Algorithms," an essay for *Social Research*, an international quarterly journal published by The New School for Social Research and Johns Hopkins University Press.

JUN 2019

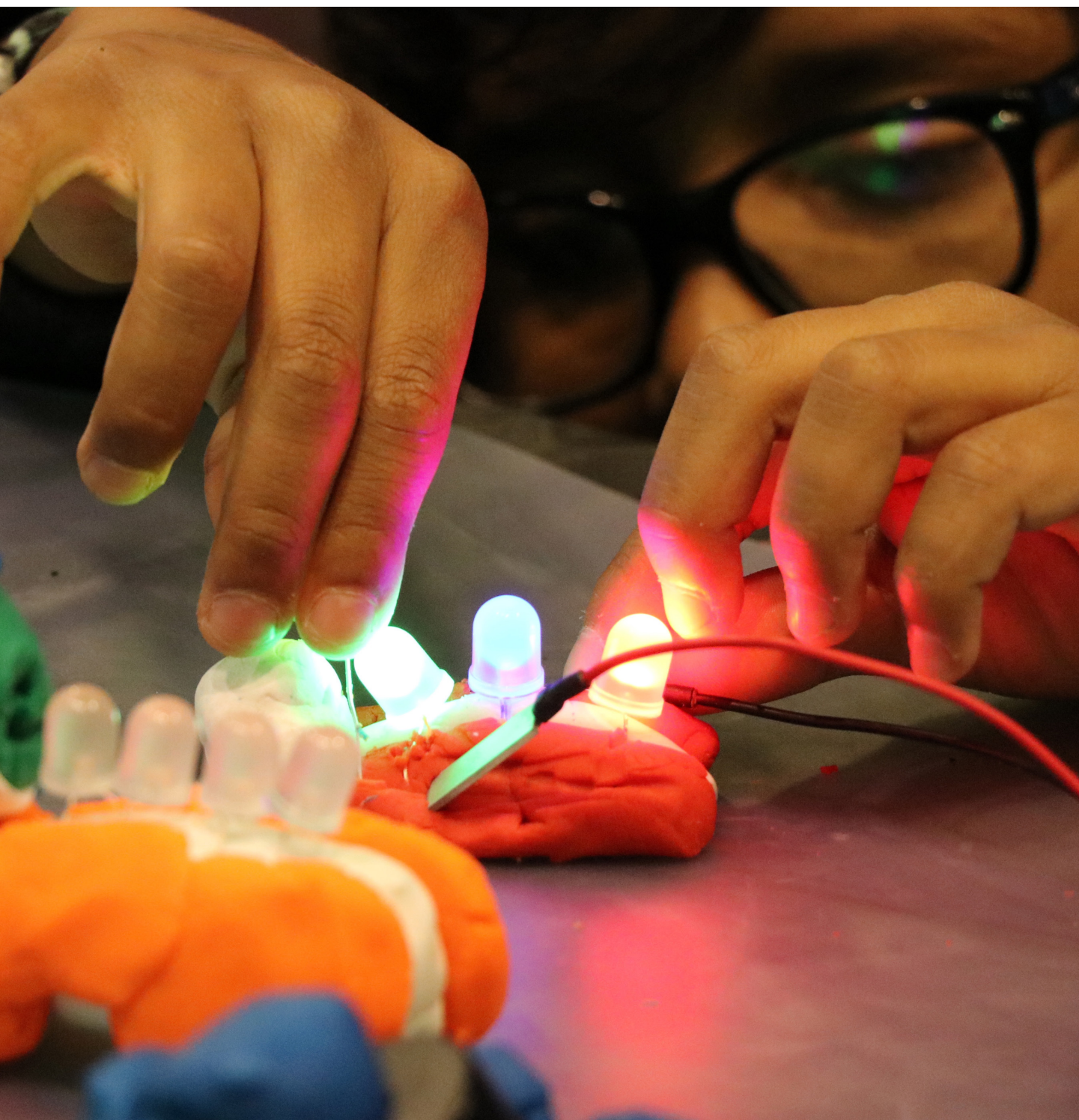
Ruth Wylie visits Stanford University for two events. The first, Machine Learning President, was an immersive scenario planning experience designed to probe, explore, and make visible the systems of influence, power, and impact at play in the 2020 U.S. presidential election. The second, Designing with Machine Learning, was a collaboration between Common Sense Media and Stanford's d.school where participants learned how to use algorithms when tackling design challenges.

Frankenstein Bicentennial

How can Mary Shelley's tale of scientific creativity and responsibility help us prepare for the next 200 years?

A young museum visitor provides the spark of life to a creature of their own making during a Frankenstein200 event.





Book Annotation

Mary Shelley Philosophy & Politics Science Technology

- Dehlia Hannah:** Dramatic encounters with natural phenomena are inspirations for scientific as well as literary imagination. This passage reconstructs the way that the philosopher Francis Bacon (1561–1626) thought ...

Book Annotation

Equity & Inclusion Philosophy & Politics

- Sara Brownell:** Accepting the failure to learn as the student's responsibility can be described as a student-deficit model of instruction, where any gap in learning is the student's fault and instructors are presu...

Book Annotation

Science

- Allison Kavey:** Cornelius Agrippa remains among the most intellectually compelling magical theologians and natural philosophers of his time. His magnum opus, *De occulta philosophia libri tres* (Three books of occul...

Book Annotation

Equity & Inclusion Philosophy & Politics

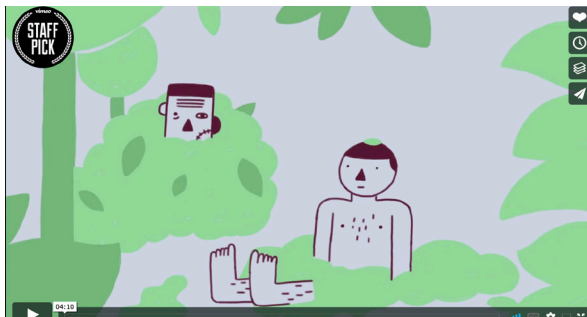
- Sara Brownell:** This passage implies that formal education is superior to being self-educated. Further, there is a sentiment that formal schooling can ground someone in truth and that a person trying to learn on h...

Screenshot from the "Discussions" section of *Frankenbook*. Annotations in this digital edition of the 1818 text of *Frankenstein* can be filtered by topic to customize the reading experience.

Reanimation! Science Conversations About Frankenstein

The short animated films created for *Frankenbook* have taken on lives of their own, sparking conversations about the ethics of emerging technologies at events and film festivals across the nation.

In July 2018, episode 2 of the series was screened at the 27th Annual Woods Hole Film Festival in Cape Cod, Massachusetts.



In August 2018, episodes 2, 3, and 7 were selected to screen as part of a group show alongside the Los Angeles premiere of the documentary *Donna Haraway: Story Telling for Earthly Survival*.

In October 2018, episodes 4 and 5 were selected to screen at the 11th Imagine Science Film Festival in New York City.

Episodes 1 and 5 were selected as Vimeo Staff Picks, which showcased the project broadly across the video sharing platform.

Frankenstein Bicentennial



Frankenbook

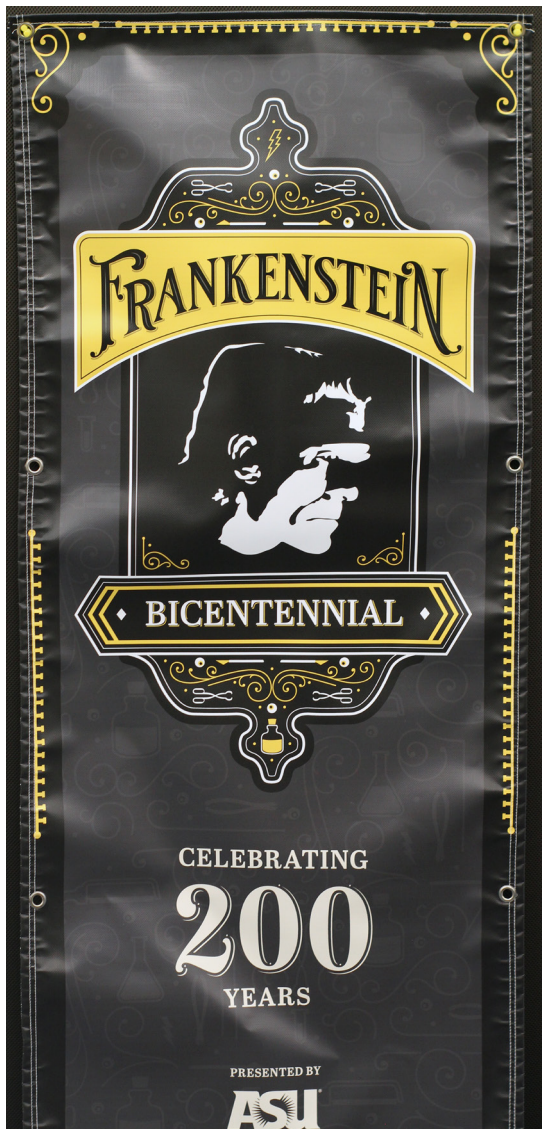
Frankenbook turns the original 1818 text of Mary Shelley's *Frankenstein; or, The Modern Prometheus* into a collective reading and collaborative annotation experience. Built on the foundation of our 2017 book *Frankenstein: Annotated for Scientists, Engineers, and Creators of All Kinds* and created in partnership with The MIT Press and MIT Media Lab, *Frankenbook* invites readers to trace the scientific, technological, political, and ethical dimensions of the novel, and to learn more about its historical context and enduring legacy.

Frankenbook features annotations from more than 80 experts in disciplines ranging from philosophy and literature to astrobiology and neuroscience; essays by science fiction authors, scientists, and ethicists; audio journalism; and original animations and interactives created by partners including Massive Science and The Rosenbach.

Readers can contribute their own text and rich-media annotations to the book and customize their reading experience by turning on and off a variety of themes that filter annotations by topic. Themes range from literary history and political theory to health, technology, and equity and inclusion. *Frankenbook* is free to use, open to everyone, and built using the open-source PubPub platform for collaborative community publishing.

This year, we relaunched *Frankenbook* with a cleaner look, improved navigation and stability, and deeper integration with other texts and publications hosted on the PubPub platform. We also began strategizing about helping the book reach new audiences in formal and informal education settings, especially at the college and high school levels.

Frankenstein Bicentennial Concert



Amid the many, many *Frankenstein* adaptations we've watched, the song and dance sequence of Mel Brooks's *Young Frankenstein* remains one of our favorites. To culminate the Frankenstein Bicentennial Project, we staged two concert events of our own with the ASU Chamber Orchestra on October 20 and 21, 2018, at ASU's Gammage Auditorium and the Mesa Arts Center.

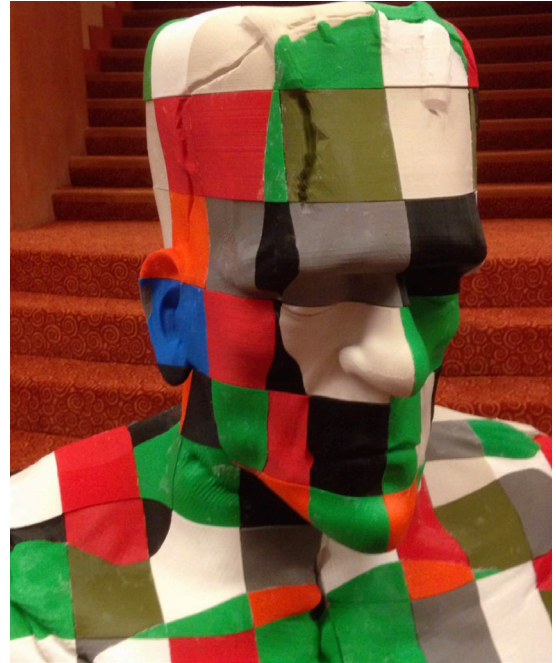
Reflecting the comic, macabre, and popular interpretations of the Frankenstein story, conductor Jeffrey Myer led the ASU Chamber Orchestra through pieces from HK Gruber's composition "Frankenstein!!" The second half of the concert, featuring an original score by Michael Shapiro, was played live alongside a screening of the classic 1931 Universal Pictures *Frankenstein*. This performance provided a new element to the classic creature feature, which was originally released without music.

In December 2018, Myer presented the same work with The St. Petersburg Chamber Philharmonic in Russia, where he is the conductor.

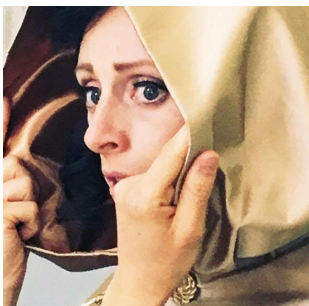
In addition to the dulcet tones of the monstrous melodies, we welcomed our fellow creature creators from around the university to showcase the outputs of their small-grants projects. Across a variety of domains and disciplines, our colleagues breathed new life into the Frankenstein story with four creative, surprising, and poignant reflections on this centuries-old tale:

Frankenstein Bicentennial

- Ben Hurlbut and Gaymon Bennett's project "What Makes a Monster?" hosted a salon to discuss bioengineering, the notion of monstrosity in the public imagination, and new approaches to the study of religion, science, and technology in public life.
- Micah Lande explored distributed, crowdsourced 3-D printing with "A Really Modern-Day Prometheus: Collaborative 3-D Printed Bust of the Creature."
- Karla Moeller developed "Building Frankenstein: A Physiology Game," an interactive online activity that uses the Frankenstein story to engage younger audiences around the topic of comparative animal physiology.
- Pamela Winfrey, Carlo Maley, and Athena Aktipis created a permanent on-campus exhibition, "This Beautiful Monster: Cancer Across Life," featuring a garden filled with cacti beautifully altered by genetic mutations.



"A Really Modern-Day Prometheus," by Micah Lande—a crowdsourced, 3-D printed sculpture. Photo courtesy of Micah Lande.



Kim Stephenson Smith as Elizabeth Lavenza in Southwest Shakespeare Company's production of *Frankenstein*.

Frankenstein on Stage

For their 25th season, Arizona's Southwest Shakespeare Company created a new version of *Frankenstein*, adapted from our own edition of the novel, *Frankenstein: Annotated for Scientists, Engineers, and Creators of All Kinds*. The troupe debuted the production at the Frankenstein Bicentennial Concert, with actors Jesse James Kamps and Joshua Murphy performing key scenes alongside commentary and an audience talkback with playwright Quinn Mattfield, artistic director Patrick Walsh, and Frankenstein Bicentennial Project co-director Dave Guston. The company's rendition of *Frankenstein* continued through Halloween and into November, bringing a new take on this timeless tale to curious audiences.

Frankenstein200 Updates

Our Frankenstein200 transmedia project, supported by the National Science Foundation, continues to be a vibrant space for research, writing, and thinking. As the project nears its close, we're focused on synthesizing our research at schools, museums, and online, on gleaning insights about the effectiveness of our project and transmedia learning more generally, and on sharing our results with colleagues.

NSF Evaluation Meeting

Our Frankenstein200 evaluation committee joined us on February 6-7, 2019 to discuss the data collection efforts that our team made in 2018. At the meeting, we presented the preliminary findings of our museum and classroom studies, and the committee members provided valuable feedback on these results and their educational implications. We also discussed strategies for presenting and sharing our findings with professionals, other researchers, and practitioners in a variety of related fields, from education and museum studies to science, technology, and society.

NSF Showcase

Our team prepared a video presentation for NSF's STEM for All Video Showcase: Innovations in STEM Education, which took place as an online event on May 13-20, 2019. More than 800 educators contributed, sharing their projects and ideas with each other. Our video gave a general overview of the Frankenstein200 project by describing the benefits of transmedia storytelling for STEM education. A highlight of the showcase was the way that the NSF's online system facilitated conversations, enabling virtual visitors to ask questions and leave comments for the research teams.



This research is funded by the National Science Foundation under Grant No. 1516684.



Still from the Frankenstein200 interactive digital story. In the story, Nikki Soohoo (MTV's *Heathers*) and Jeremy Howard (*Teenage Mutant Ninja Turtles*) play researchers at the Laboratory for Innovation and Fantastical Exploration (L.I.F.E.).

frankenstein.asu.edu 

Frankenstein Bicentennial

Chatbot Café

In the fall 2018 semester, Ed Finn and CSI Imaginary College Fellow Suren Jayasuriya co-taught AME 130: Prototyping Dreams, a course in the Digital Culture curriculum in the School of Arts, Media and Engineering. The course culminated with a unique end-of-semester showcase, when students gathered at the Tempe Center for the Arts on December 7, 2018 to share their final projects. After reading about cognition in the works of philosophers including René Descartes and John Searle, not to mention Mary Shelley's *Frankenstein*, students programmed their own chatbots in the Python programming language and offered them for public conversation in TCA's beautiful gallery. Each chatbot was designed as a prospective college freshman from a not-so-distant future when ASU might consider accepting intelligent machines ready to do university-level work.

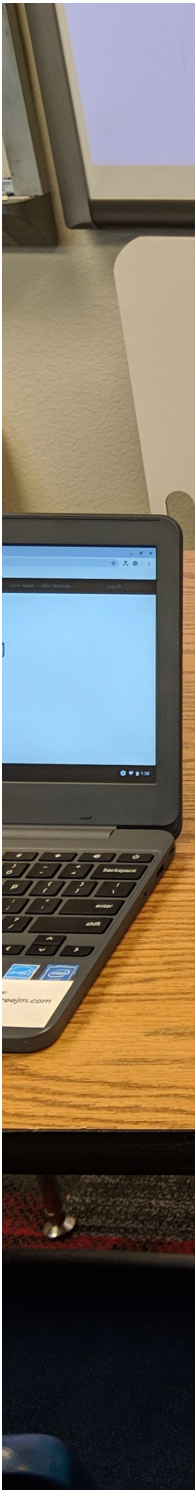


Visitors to the Chatbot Café interacted with a panoply of bots, each with their own unique personality and backstory, at the Tempe Center for the Arts.

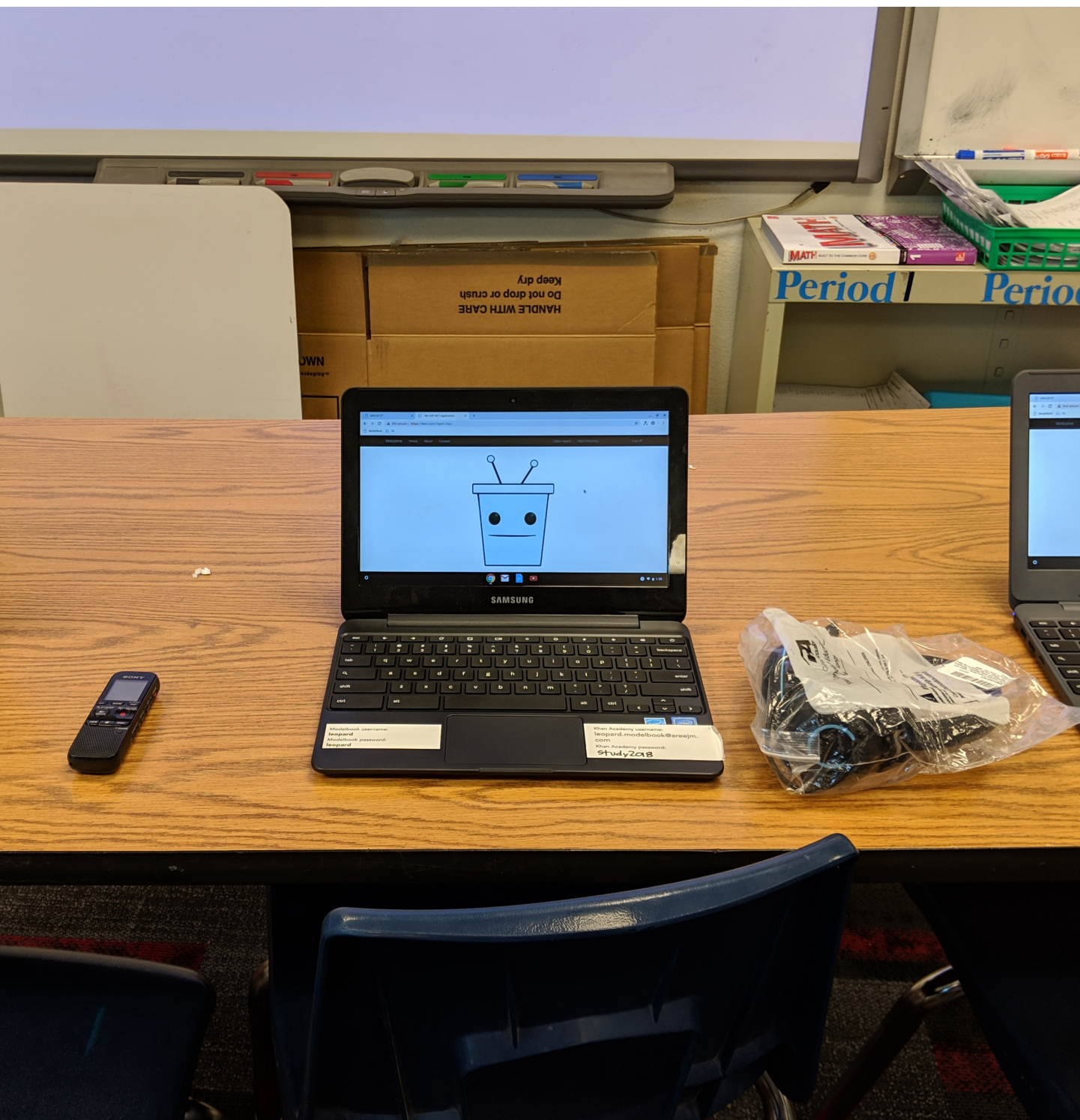
Future of Learning

How can we light the spark of imagination
to create new opportunities for collaborative,
creative learning?

Students work with Cobi, a teachable agent, to improve
their help-giving skills as part of the UbiCoS project.
Photo by Areej Mawasi.



Center for Science and Imagination





A young student reads from *Drawn Futures: Arizona 2045*.

Drawn Futures: Arizona 2045

In an increasingly networked and visual culture, comic books and graphic novels are important tools for boosting literacy, communicating with diverse audiences, and creating new spaces to discuss complex scientific and social topics. This was the impetus for *Drawn Futures: Arizona 2045*, a science-based comic book for young people, designed around the themes of sustainability and systems thinking.

Aligned to Arizona's standards for the 6th grade science curriculum, *Drawn Futures* was distributed to educators in 10 schools around the state in the fall of 2018. The comic was used as a supplement to classroom lessons on ecosystems, energy storage, and science-in-society, and for use in after-school STEM programs and engineering-focused service learning projects. The schools that piloted *Drawn Futures* are:

- Agua Caliente Elementary School, Tucson
- Col. Smith Middle School, Fort Huachuca
- Desert Oasis Elementary, Phoenix
- Echo Mountain Intermediate School, Phoenix
- H. L. Suverkrup Elementary School, Yuma
- Maie Bartlett Heard Elementary School, Phoenix
- South Valley Junior High School, Gilbert
- Tartesso Elementary School, Buckeye
- Tonalea K-8 School, Scottsdale
- Walker Elementary School, Tucson

This year, we also completed a Spanish translation of the comic, to enable greater adoption for English Language Learners in school settings, and to help *Drawn Futures* reach new non-English-speaking audiences in our community and beyond.

Drawn Futures: Arizona 2045 was made possible by generous support from John Martinson and Eric Rudney.

Grand Challenges Engineering

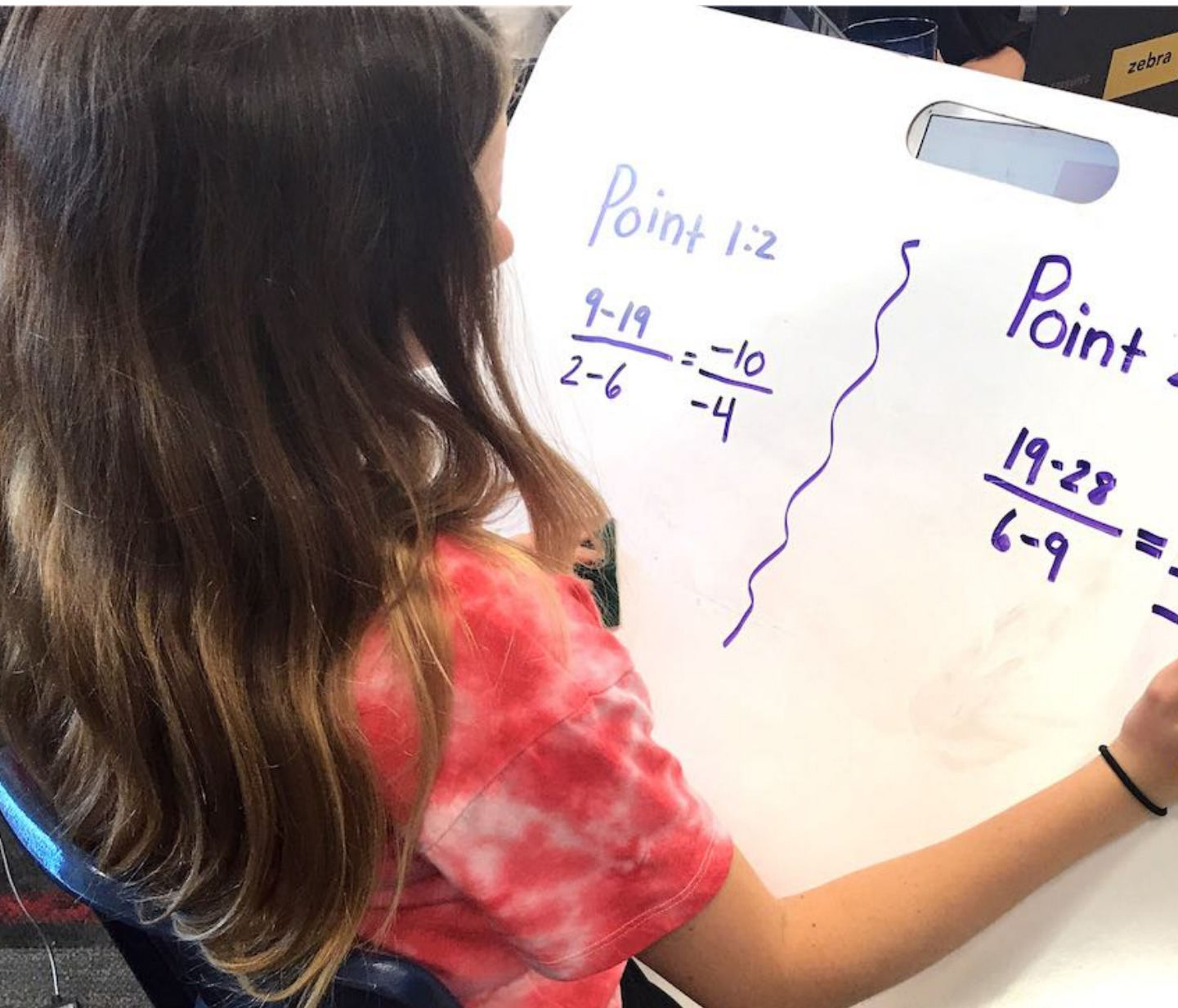
ASU's Fulton Grand Challenge Scholars program, part of an initiative from the National Academy of Engineering, combines inventive courses, mentorship, and cutting-edge research experiences to prepare students to solve the most pressing challenges facing society. CSI runs in-class science fiction exercises for first-year Grand Challenge Scholars in the fall and spring semesters, helping students grapple with the social, cultural, and psychological implications of their applied technology projects by creating their own narratives about the future. We also present a lecture and activity in the annual Grand Challenge summer program, where we investigate the feedback loop between science fiction and real-world technological innovation and introduce tools for brainstorming and low-fidelity prototyping.

Engineering students work in teams to complete a science fiction design challenge issued by CSI's Joey Eschrich (far right) at the Grand Challenge Scholars program Summer Institute. Photo courtesy of the Ira A. Fulton Schools of Engineering.



Future of Learning





A middle school student, participating in a UbiCoS classroom study, prepares to collaborate with her classmates.

Ubiquitous Collaboration Support (UbiCoS)

CSI's Ruth Wylie and graduate research assistant Areej Mawasi of the Mary Lou Fulton Teachers College are collaborating with Erin Walker of the University of Pittsburgh on a National Science Foundation-funded project aimed at improving middle school students' help-giving skills. Previous research shows that students benefit cognitively and emotionally when they help one another with learning and schoolwork; however, they often need support to learn the best ways to provide that help. We're developing a new technology, Ubiquitous Collaboration Support (UbiCoS), which tracks help-giving across multiple tasks and automatically provides support to allow students to give better help to each other.

The project brings together learning scientists, computer scientists, statisticians, teachers, and students to develop the software. This year, we conducted five co-design sessions where middle school students worked with the research team to devise how the UbiCoS system functions and behaves. We also collaborated with a local middle school to run three weeklong pilot studies to test a new mathematics curriculum, the software, and our measures. The results from these studies will inform the next stage of development, and have been presented at the International Conference on Computer Supported Collaborative Learning and the International Conference on Artificial Intelligence in Education.



This research is funded by the National Science Foundation under Grant No. 1736103.

Hermanas Conference and TEC is for Girls

This year, Ruth Wylie spoke at two events hosted by Phoenix College in February 2019, both aimed at increasing the number of women from underrepresented groups in science, technology, engineering, and mathematics. The Hermanas Conference was designed to reach high school women, and the TEC (Technology, Engineering, Computer Science) is for Girls! Conference welcomed middle school students.

Each one-day conference consisted of multiple sessions where young women were introduced to STEM concepts and received information on technical careers, encouragement to attend college, and resources to help them identify and pursue their goals. Ruth used activities from our Frankenstein200 project to illustrate the interdisciplinary nature of STEM inquiry and to invite the students to consider the ethics of technology and innovation.

The Hermanas Conference aims to increase the number of underrepresented female students pursuing engineering and science degrees.
Photo courtesy of Hermanas Conference.



Future of Learning





Mary Lou Fulton Teachers College STEM Camp

Each summer, the Mary Lou Fulton Teachers College at ASU hosts a STEM Camp, as a professional development opportunity for Arizona educators to develop knowledge and skills in the areas of science, engineering, technology, and math. The 2019 camp focused on STEM education for diverse learners, including English Language Learners—students for whom English is not a first language. CSI's Ruth Wylie, along with Bob Beard and Joey Eschrich, designed and ran a session at the camp, modeling a variety of ways to use the center's science and technology ethics, science-in-society, and futures thinking tools and methods to embed creative and critical thinking with STEM learning for student populations ranging from elementary to high school.

Bespoke emoji dice designed for a science fiction prototyping activity at the Mary Lou Fulton Teachers College STEM Camp.

Tangible Futures

How can we create visceral, immersive experiences of the future? How can we think critically and push the bounds of the possible through making and doing?

Emerge 2019 guests participate in “Inventing in the Spirit of Leonardo,” designing da Vinci-esque machines to solve present-day problems. The activity, and the wooden building materials, were designed by award-winning educational kit designer Derek Wulff. Photo by Tim Trumble.



Center for Science and Imagination





The main thoroughfare of Emerge 2019, featuring a plethora of hands-on activities, performances, and conversations unfolding in inflatable domes on ASU's Old Main Lawn. Photo by Tim Trumble.

Emerge: Invention!



Emerge is an annual festival of art, science, and technology, devoted to creative imagination and experiences of tomorrow. Our theme for the eighth annual Emerge festival in March 2019 was invention, marking the 500th anniversary of the passing of Leonardo da Vinci by celebrating human ingenuity. The festival, which took place on the historic Old Main Lawn at ASU's Tempe campus, offered imaginative and hands-on experiences of the future—exposing the latest inventions from ASU and beyond, and asking how we might shape and adapt them in surprising ways.

Bringing together artists, scientists, humanists, designers, and other performers and scholars, Emerge 2019 showcased the many twists along the road to innovation: unbridled imagination, exquisite observation, epic and mundane failure, surprise and serendipity.

Emerge unites ASU's diverse ecology of world-renowned researchers and its culture of interdisciplinary exchange to create vibrant portraits of alternative futures. Honoring the legacy of Leonardo and all those devoted to exuberant, unconventional invention, Emerge 2019 highlighted uncommon futures for the common good.

Emerge Gallery



Left: An Emerge guest connects the dots in "Geodesic Radio," an interactive future story.
Right: Participants ponder "When Mental Walls Lead to Physical Walls," an exhibition about the political nature of engineering. Photos by Tim Trumble.



Theoretical physicist Paul Davies and sustainability scientist Gary Dirks lead a dialogue on innovation and discovery in the "Inventors' Speakeasy." Photos by Tim Trumble.



Performers from "Eden," created by Rachel Bowditch of the Vessel project, lead visitors from the Tempe Festival of the Arts to Emerge 2019.

Emerge Gallery



Emerge co-director Dave Guston rides a model of Leonardo da Vinci's Ornithopter, created by Derek Wulff.
Photo by Tim Trumble.



Left: An Emerge visitor tests her flying machine at the "Playing with the Future" exhibit.
Right: Mona Lisa, created by Walter Productions, was inspired by Leonardo da Vinci's 16th century tank design.
Photos by Tim Trumble.



"Traces of Imagination (After Leonardo's Notebooks)," shining with nighttime LED brightness. Photo courtesy of Hilary Harp.

The Sculpture Garden

This year we experimented with transforming CSI's outdoor office space into a sculpture garden, exhibiting pieces created by students at ASU's School of Art.

We worked with sculptor and associate professor Hilary Harp to plan and select works, including an otherworldly metallic plant by Marisa Bentley and "Traces of Imagination (After Leonardo's Notebooks)," a multipart piece inspired by Leonardo da Vinci, in conjunction with the 2019 Emerge festival. The da Vinci piece was created by a team of ASU students: Rebecca Del Rincon, Indigo Harman, Elora Mastison, Sarah McBryan, and Francis Taguinod.

Looking Ahead

The year ahead will be filled with new research opportunities and publication milestones, some of which we can already glimpse on the horizon. Here are a few that we're especially excited about.

Veterans Imagination Project

We often talk about stories as machines that generate empathy (a nod to the late, great Roger Ebert), and to science fiction as a tool for access and engagement in technical or specialized industries. In the coming year, CSI will work alongside public libraries and Arizona-based veterans service organizations to apply our methods to address the needs of military members transitioning to civilian careers. The Veterans Imagination Project will use the tools of speculative fiction to create veteran-authored narratives of individual and collective achievement, and bolster competencies for workforce readiness. We hope that giving veterans the opportunity to create narratives of their own post-service success will positively influence their creative, personal, and career development, and that their stories will be a springboard for engagement and understanding between the general public and veterans seeking work.

Future Tense Fiction Book

In October 2019, Unnamed Press will publish *Future Tense Fiction: Stories of Tomorrow*, collecting the first 14 short stories published as part of our Future Tense Fiction project. The collection will feature pieces by Nnedi Okorafor, Emily St. John Mandel, Hannu Rajaniemi, Deji Bryce Olukotun, Paolo Bacigalupi, Carmen Maria Machado, Charlie Jane Anders, and others. We'll launch the book with several public events, taking the release as an opportunity to consider how science fiction can help us think more critically and creatively about living with scientific and technological change.

Imaginary Papers Redux

Our blog, Imaginary Papers, has provided wonderful opportunities to think carefully and occasionally whimsically about technology and culture. This year, we will transition Imaginary Papers to a quarterly publication, delivered as an email newsletter, featuring vibrant, unexpected perspectives on the same themes, with a renewed focus on the intersection of storytelling, futures thinking, and imagination. Stay tuned, and pre-subscribe today at bit.ly/imaginarypapers-register.

Imagining Intelligence Podcast

As an outgrowth of our Sci-Fi House gathering in the spring of 2019, we plan to produce and release CSI's first podcast, *Imagining Intelligence*. The podcast tracks our expanding interest in possible futures shaped by artificial intelligence, which is fast becoming a pervasive part of everyday life. In this limited series, futurist Brian David Johnson will talk with science fiction authors, researchers, technologists, activists, and policymakers about the human dimensions of machine intelligence.

Speculative Journalism

Journalism, which is historically concerned with the reportage of past events, is in a crucial moment of transition. With the immediacy of today's technology and networked communities, journalism must find new ways to serve the needs of the public and become better at reporting on the future.

In the coming year, we will work with award-winning journalists (including Sam Greenspan, formerly of the hit podcast *99% Invisible*), producers, media executives, futurists, and science fiction authors to explore the topic of speculative journalism. Creating a framework to assess present phenomena and prepare people for a range of possible outcomes will help journalists continue to inform, advocate, and hold those in power accountable in the future.

Climate Justice

We're working with two of our Imaginary College Fellows—fiction author, physicist, and climate-change scholar Vandana Singh and science fiction scholar and editor Bodhisattva Chattopadhyay of the University of Oslo—on a book of fiction and nonfiction about climate justice, with a focus on India. The project will shed light on ways of thinking about climate change and human responses from the perspective of historically marginalized and oppressed communities, especially those in rural areas. We'll team up fiction authors from the region with experts, environmental activists, and other incisive thinkers on climate, equity, and society. We'll publish the results as an ebook that will be free to read, download, and share, and hold launch events at ASU and in Norway.



You can change the future!

Your decisions today shape the world your children and grandchildren will be living in, so consider making an investment in their name for their future.

Become a futurist! We need your enthusiasm and your ideas. Join our mailing list, attend an event, or contact us directly and join a community dedicated to building a future that is for everyone.

csi.asu.edu/donate

All funds will be deposited with the ASU Foundation for A New American University, a nonprofit organization that exists to support Arizona State University (ASU). Gifts in support of ASU are subject to foundation policies and fees. Your gift may be considered a charitable contribution. Please consult your tax advisor regarding the deductibility of charitable contributions.

Support the Center for Science and the Imagination and help us explore more ambitious and challenging questions. Your gift will help to:

- Create research opportunities for students
- Welcome new and underrepresented communities into our work
- Study and perform imaginative thinking
- Conduct research at the intersection of the sciences, humanities, and arts

Build a future that is for everyone!

Bob Beard demonstrates a hands-on activity to a young dinosaur at Tempe Center for the Arts.
Photo by Scott T. Baxter.

Center for Science and Imagination

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Everyone

has the right to

imagine

their own

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