



Center for Science and the Imagination

Arizona State University It has been another exciting, occasionally terrifying, but never dull year at the Center for Science and the Imagination. In the second half of 2017 we turned our gaze to the stars with two book-length publications, our NASA-supported science fiction anthology *Visions, Ventures, Escape Velocities: A Collection of Space Futures* and our *Overview* collection of stories about human activity in the stratosphere, plus a regular stream of scholarly articles, short essays, interviews, and other outputs. Many of these publications have earned positive notice: four of the stories from our NASA collection were selected for "year's best" science fiction anthologies, and our new edition of Mary Shelley's novel, *Frankenstein: Annotated for Scientists, Engineers, and Creators of All Kinds*, was reviewed positively by both *Science* and the *New York Review of Books*, along with shorter mentions in the *New Yorker*, the NPR show *On Point*, and *Atlas Obscura*.

Speaking of *Frankenstein*—and sometimes it seems we speak of little else around here—2017-18 marked the culmination of several years of groundwork on the Frankenstein Bicentennial Project. Our NSFfunded transmedia research project, Frankenstein200, rolled out in January with an interactive online story experience at the mysterious L.I.F.E. Laboratory (https://Frankenstein.life) and coordinated activities at 50 partner science centers and museums around the country. The popular blog Boing Boing called Frankenstein200 "an amazing transmedia experience" and the *Washington Post* gave it a glowing review.

Our new edition of *Frankenstein* has also blossomed into an ongoing collaboration with The MIT Press and MIT Media Lab, supported by a grant from the Alfred P. Sloan Foundation, to create an openaccess digital edition of the novel. *Frankenbook* formally launched in June 2017 after several months of beta access. Maria Popova of the highly regarded Brain Pickings blog called our book "the most thrilling science-lensed reading of a literary classic since Lord Byron's *Don Juan* annotated by Isaac Asimov." The book is being taken up by teachers and readers across the country—and around the world, via translations in Spanish and Portuguese.

Our largest event of the year, Emerge, took place in March 2018, when the Tempe campus's Galvin Playhouse was transformed into Luna City in the year 2175. One hundred and eighty faculty, staff, students, and external collaborators worked for months to create this immersive, richly detailed experience of a city on the Moon. The city's lush bamboo, running water, artist's studios, songs, and dances might have surprised visitors expecting something more austere, while the interactive performances of the 20 actors playing out their roles as residents of Luna City drew their audiences into dramas of life and death on the Moon. We hosted science fiction legend and CSI writer at large Kim Stanley Robinson as our keynote speaker at Emerge along with Eric Molinsky, host of the podcast Imaginary Worlds. The experience was so captivating that four different local television stations dispatched crews to cover the project. Luna City will continue to serve as a platform for research and engagement in the coming vear.

Looking forward, we are continuing to explore storytelling and immersive futures as a way to share broader agency and responsibility about the future. Planning is well underway for Emerge 2019, and we are working on developing new partnerships in the entertainment industry, new funded projects with federal agencies, and new questions about the nature and value of the imagination. As ever, we hope you will join us in our adventures—please drop us a line if you have questions, ideas, or dreams we can explore together.

Sincerely,

Ed Finn Director

CSI Publications 2017-18

Books

Augustyn, B. (Editor), Beard, B. & Finn, E. (Executive Producers). (2018). Drawn Futures: Arizona 2045. Tempe, AZ: Center for Science and the Imagination, Arizona State University.

Bennett, M. G., Eschrich, J., & Finn, E. (2017). Overview: Stories in the Stratosphere. Tempe, AZ: Center for Science and the Imagination, Arizona State University.

Finn, E., & Eschrich, J. (2017). Visions, Ventures, Escape Velocities: A Collection of Space Futures, Tempe, AZ: Center for Science and the Imagination, Arizona State University. Supported by a grant from NASA.

Guston, D. H., Finn, E., & Robert, J. S. (2017). Frankenbook. Cambridge, MA: The MIT Press. Free, collaboratively annotated, open-source digital edition, available at frankenbook.org.

Halpern, M., Eschrich, J., & Sadowski, J. (2017). The Rightful Place of Science: Frankenstein. Tempe, AZ and Washington, DC: Consortium for Science, Policy & Outcomes.















Translations

Ed Finn's Frankenstein: Annotated for Scientists, Engineers, and Creators of All Kinds (2017), coedited with David H. Guston and Jason Scott Robert, was translated into Spanish.

Ed Finn's What Algorithms Want: Imagination in the Age of Computing (2017) was translated into Italian and Spanish.

Vandana Singh's story "Entanglement," originally published in our anthology Hieroglyph: Stories and Visions for a Better Future (2014), was translated into Italian.

Scholarly Publications

Chi, M., T. H., Adams, J., Bogusch, E. B., Bruchok, C., Kang, S., Lancaster, M., Levy, R., Li, N., McEldoon, K. L., Stumpt, G. S., Wylie, R., Xu, D., & Yaghmourian, D. (2018). Translating the ICAP Theory of Cognitive Engagement Into Practice. *Cognitive Science*. Forthcoming in print. https://doi.org/10.1111/ cogs.12626.

Eschrich, J. (2017). Unsettling *Frankenstein*. In Halpern, M., Eschrich, J., & Sadowski, J. (Eds.), *The Rightful Place of Science: Frankenstein* (pp. 1-14). Tempe, AZ and Washington, DC: Consortium for Science, Policy & Outcomes.

Finn, E. (2017). Monster Mythos: *Frankenstein* as a Network Text. In Halpern, M., Eschrich, J., & Sadowski, J. (Eds.), *The Rightful Place of Science: Frankenstein* (pp. 81-93). Tempe, AZ and Washington, DC: Consortium for Science, Policy & Outcomes.

Nagy, P., Wylie, R., Eschrich, J., & Finn, E. (2018). The Enduring Influence of a Dangerous Narrative: How Scientists Can Mitigate the Frankenstein Myth. *Journal of Bioethical Inquiry* 15(2), 279-292.

Simeone, M., Koundinya, A. G. V., Kumar, A. R., & Finn, E. (2017). Towards a Poetics of Strangeness: Experiments in Classifying Language of Technological Novelty. *Cultural Analytics.* http:// dx.doi.org/10.7910/DVN/MSXKNB.

Yoo, S., Lemos, J., & Finn, E. (2017). Nellodee 2.0: A Quantified Self Reading App for Tracking Reading Goals. In Zaphiris, P. & Ioannou, A. (Eds.), *International Conference on Learning and Collaboration Technologies* (pp. 488-496). Cham, Switzerland: Springer.

Posters, Presentations, and Exhibits

Beard, B. (2017, September). Frankenstein at 200. Presentation at the Scottsdale Public Library as part of the *Frankenstein in the 21st Century* exhibition.

Beard, B. (2018, January). Frankenstein at 200. Presentation at the Westport Writes workshop.

Beard, B., Eschrich, J., Finn, E., Nagy, P., & Wylie, R. (2018, February). Education@CSI. Poster presented at the 2018 ASU Learning Innovation Showcase.

Beard, B., Eschrich, J., Finn, E., Nagy, P., & Wylie, R. (2018, February). The Frankenstein Bicentennial Project: 1818-2018. Poster presented at the 2018 ASU Learning Innovation Showcase.

Bennett, M. G. (2017, May). Why Lawyers Need to Forget Science Fiction. Plenary presentation at American Bar Association Continuing Legal Education series.

Bennett, M. G. (2017, July). Comparative Copyright Infringement Defenses in the U.S. and Australia. Invited lecture at the School of Law at the University of New England.

Bennett, M. G. (2017, September). A Sustainable Catastrophes Market Forecast. Presentation at the Annual Meeting of the Society for Social Studies of Science.

Bennett, M. G. (2017, November). Experimental Regulatory Futures. Presentation at the Annual Meeting of the Society for Literature, Science, and the Arts.

Bennett, M. G. (2017, December). Ulises I–Una Mision de Arte al Espacio. Invited panel discussion with Juan José Diaz Infante at the International Book Fair of Guadalajara.

Bennett, M. G. (2018, April). Building Desirable Futures for K-12 Education with Artificial Intelligence. Invited keynote presentation at Acer Inc. corporate headquarters.

Bennett, M. G., & Eschrich, J. (2017, October). Creatively Sharing Research with Diverse User-Audiences: A National Science Foundation– Sponsored Workshop. Workshop at the Annual Meeting of the Society for the Study of New and Emerging Technologies.

Posters, Presentations, and Exhibits (Continued)

Eschrich, J. (2018, April). Complicating the Frankenstein Barrier: Science Fiction Futures and Social Transformation. Presentation at the George Slusser Conference on Science Fiction and Fantasy.

Eschrich, J., Finn, E., Nagy, P. & Wylie, R. (2017, November). Using Mary Shelley's *Frankenstein* for Informal Science Education. Presentation at the Annual Meeting of the Society for Literature, Science, and the Arts.

Finn, E. (2017, October). To Every Art Its Autotune: Beauty in the Age of the Algorithm. Presentation at the Association for the Study of the Arts of the Present conference.

Finn, E. (2018, May). Algorithmic Art and Politics. Daylong seminar at the Saas-Fee Summer Institute of Art, *Art and Politics in the Age of Cognitive Capitalism*, at Otis College of Art and Design.

Finn, E., & Simeone, M. (2017, November). Searching for Strangegrams: Using Machine Learning to Understand How Science Fiction Creates Novelty. Presentation at the Annual Meeting of the Society for Literature, Science, and the Arts.

Finn, E., & Weaver-Stoez, P. (2018, February). Emerge: Luna City 2175. Poster presented at the 2018 ASU Learning Innovation Showcase.

Mawasi, A. (2018, April). Examining Individual and Collaborative Interactive Engagement in a Transmedia Storytelling Learning Environment. Graduate Student Poster Competition. The Institute for Social Science Research, Arizona State University. Awarded 3rd Place, Research Proposal Category.

Nagy, P., & Wylie, R. (2018, February). Transmedia Research Project. Poster presented at the 2018 ASU Learning Innovation Showcase.

Nagy, P., Wylie, R., Eschrich, J. & Finn, E. (2017, September). What Can Scientists Learn from Victor Frankenstein? Presentation at the Annual Meeting of the Society for Social Studies of Science.

Ostman, R., & Wylie, R. (2018, April). Frankenstein200: Transmedia Learning in Creativity and Responsible Innovation. Interactive demonstration at the Museums and the Web 2018 conference.

Posters, Presentations, and Exhibits (Continued)

Park, S. H., Lee, J. M., Choo, J. H. J., Okamoto, M., Xiuqing, J., & Yoo, S. H. (2017, November). Campus Asia Korea-China-Japan student open collaboration project: Animation Co-Work and VR Cubic Workshop. In *SIGGRAPH Asia 2017 Symposium on Education*, 12.

Wylie, R., & Finn, E. (2018, February). Educational Technology Campaign. Poster presented at the 2018 ASU Learning Innovation Showcase.

Wylie, R., & Finn, E. (2018, June). Frankenstein Laboratory for Innovation and Fantastical Exploration. Interactive demonstration at the International Conference on Artificial Intelligence in Education.

Popular Media

Beard, B. (2018, February 9). It's Aliiiiiive! Celebrating The 200th Anniversary Of 'Frankenstein' KJZZ 91.5 public radio. http://kjzz. org/content/605202/its-aliiiiive-celebrating-200th-anniversary-frankenstein

Beard, B., & Peters, S. (2018, February 13). Frankenstein L.I.F.E., an ARG to Teach Science. *Transmedia Storytelling* podcast. https://www. stitcher.com/podcast/transmedia-podcast/ transmedia-storytelling/e/53296075

Bennett, M. G. (2017, July 14). Producers Of 'Aladdin' Remake Say They Can't Find Middle Eastern Actors For Roles. KJZZ 91.5 public radio. https://kjzz.org/content/504986/producersaladdin-remake-say-they-cant-find-middleeastern-actors-roles

Bennett, M. G. (2017, November 12). Featured in article "*Black Panther* Isn't Just Another Marvel Movie—It's a Vision of a Future Led by Blackness." *Mic.* https://mic.com/articles/186029/blackpanther-isnt-just-another-marvel-movie-its-avision-of-a-future-led-by-blackness

Bennett, M. G. (2017, November 30). Featured in article "Strangers in the Night: La Historia del Ulises I." *Letras Libres.* http://www.letraslibres. com/mexico/ciencia-y-tecnologia/strangers-nightla-historia-del-ulises-i

Bennett, M. G. (2017, December 11). Artificial Intelligence Is Around the Corner: Educators Should Take Note. *Education Week*. https://www. edweek.org/ew/articles/2017/12/13/artificialintelligence-is-around-the-corner-educators.html

Popular Media (Continued)

Bennett, M. G. (2018, February 20). What Black Panther Could Mean for the Afrofuturism Movement. Slate. https://slate.com/ technology/2018/02/what-black-panther-couldmean-for-the-afrofuturism-movement.html

Bennett, M. G. (2018, March 19). Featured in article "Self-Driving Uber Kills Arizona Woman in First Fatal Crash Involving Pedestrian." *The Guardian*. https:// www.theguardian.com/technology/2018/mar/19/ uber-self-driving-car-kills-woman-arizona-tempe

Bennett, M. G. (2018, March 19). Featured in article "Self-Driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam." *The New York Times.* https://www.nytimes.com/2018/03/19/ technology/uber-driverless-fatality.html

Bennett, M. G. (2018, March 30). How Much Tech Risk Should Be Taken in the Name of Progress? KJZZ 91.5 public radio. http://science.kjzz.org/ content/632840/how-much-tech-risk-should-betaken-name-progress

Eschrich, J. (2017, September 12). Climate Chaos and Real Estate Speculation...in 2140. *ASU Now.* https://asunow.asu.edu/20170912creativity-climate-chaos-and-real-estatespeculation%C2%A0-2140

Eschrich, J. (2017, September 20). The Futurism Industry's Blind Spot. *Slate*. http://www.slate. com/articles/technology/future_tense/2017/09/ futurists_rarely_imagine_a_tomorrow_without_ capitalism.html

Eschrich, J. (2017, October 5). Science Fiction TV Dinner: *Fringe. Future Out Loud* podcast. https:// futureoutloud.org/2017/10/05/fringe

Eschrich, J. (2018, January 16) Frankenstein 200: America's Science Museums Celebrate the Bicentennial of Mary Shelley's *Frankenstein* with a Free, Amazing Transmedia Experience. Boing Boing. https://boingboing.net/2018/01/16/ modern-prometheus.html

Eschrich, J. (2018, February 11). The Climate Fiction Episode. *The Sustainability Review Podcast.* http://www.thesustainabilityreview.org/ podcast/2018/2/11/the-climate-fiction-episode

Finn, E. (2017, September 27). Art by Algorithm. *Aeon.* https://aeon.co/essays/how-algorithms-are-transforming-artistic-creativity

Popular Media (Continued)

Finn, E. (2017, November 29). Robot Collar Jobs. *Imaginary Worlds* podcast. https://www. imaginaryworldspodcast.org/robot-collar-jobs.html

Finn, E. (2018, January 16). ASU's Newly-Published Collection of Sci-Fi Stories Has People Talking About Space. *Arizona Horizon*, Arizona PBS. https://azpbs.org/horizon/2018/01/asucollection-sci-fi-stories

Finn, E. (2018, February 12). It's Alive! Frankenstein at 200. *On Point* public radio program. http://www.wbur.org/ onpoint/2018/02/12/working-in-the-lab-lateone-night

Finn, E. (2018, April 18). Living in Space. *Imaginary Worlds* podcast. https://www. imaginaryworldspodcast.org/living-in-space.html

Finn, E. (2018, April 23) *Frankenstein*: 200 Years Later. *Upfront—The New York Times*. https://upfront.scholastic.com/issues/2017-18/042318. html

Finn, E. (2018, June 26). Phoenix Will No Longer Be Phoenix If Waymo's Driverless-Car Experiment Succeeds. *MIT Technology Review.* https://www. technologyreview.com/s/611420/phoenix-willno-longer-be-phoenix-if-waymos-driverless-carexperiment-succeeds

Finn, E., & Eschrich, J. (2017, December 14). Space Is Not a Void. *Slate.* http://www.slate.com/ articles/technology/future_tense/2017/12/ space_isn_t_a_void_it_s_a_canvas_for_human_ imagination.html

Finn, E., & Guston, D. (2017, December 9). 'Frankenstein' Has Become a True Monster. *The Wall Street Journal.* https://www.wsj.com/ articles/frankenstein-has-become-a-truemonster-1514563511

Singh, V., Cooper, B., & Eschrich, J. (2018, February 7). Interview: Vandana Singh, Brenda Cooper, and Joey Eschrich on "Widdam." *The Magazine of Fantasy & Science Fiction*. https:// www.sfsite.com/fsf/blog/2018/02/07/interviewvandana-singh-brenda-cooper-and-josepheschrich-on-widdam

Wylie, R. (2018, March 16). Technology, Frankenstein, and Failure. TLDCast livestream broadcast. https://media.zencast.fm/tldchat/ guests/ruth-wylie



Frankenstein Bicentennial

Celebrating 200 years of Mary Shelley's Frankenstein.



The Future of Learning

Designing tools to fathom a complex world.



Science & Imagination

New platforms for storytelling and conversation.



Networks of Imagination

A global ecosystem for big ideas.



Tangible Futures

Creating visceral experiences of tomorrow.



Looking Ahead

Frankenstein200 Transmedia Research Frankenbook Frankenstein on the Radio

Unexpected Frankensteins The Rightful Place of Science

Drawn Futures Evoke Grand Challenges Engineering

Visions, Ventures, Escape Velocities Crowd Futures Future Tense Fiction Imagination and Climate Futures

Ulises A Year Without a Winter Overview: Stories in the Stratosphere Solar Futures Workshop

Imaginary College Flights of Imagination Science Fiction TV Dinners Advanced Leadership Initiative Imaginary Papers

Emerge: Luna City 2175 Emerge Gallery Growable Robots Arizona SciTech Festival Kickoff Conference Science Fiction House: SXSW WaR: Wizards and Robots Visitors and Visits

Frankenstein Bicentennial

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

Portrait of Mary Shelley by Reginald Easton, supposedly based on her death mask, painted sometime between 1851 and 1893. Bodleian Library

Center for Science and Imagination



PRAISE FOR THE FRANKENSTEIN BICENTENNIAL PROJECT



"the most thrilling science-lensed reading of a literary classic since Lord Byron's *Don Juan* annotated by Isaac Asimov."

Maria Popova

The Washington Post

"Shelley's tale is more than a scary fable. Thanks to a new interactive online experience, it's also a way to teach kids about science."

Erin Blakemore

Science "a very beneficial project"

Dov Greenbaum

Frankenstein Bicentennial

baingbaing

"a free, amazing transmedia experience"

Cory Doctorow

LOS ANGELES REVIEW OF BOOKS

"a valuable set of approaches to the ethical questions the original *Frankenstein* raises."

Sidney Perkowitz

SLJ School Library Journal

"An engaging, in-depth program"

Alicia Eames

The New York Review of Books

"returns resolutely to the great challenge situated at the heart of the novel, which all 'scientists and engineers' might usefully consider. What is the true nature of Frankenstein's Creature, and what duty of care does Frankenstein owe to it?" Richard Holmes

Frankenstein200 Transmedia Research

To gain a better understanding of how we can nurture people's science self-efficacy and interest in science and ethics issues, we designed Frankenstein200, a transmedia experience combining hands-on science and digital activities.

In collaboration with the transmedia production studio No Mimes Media, our team developed an online story game that challenges participants to complete science activities and conduct thought experiments at the futuristic Laboratory for Innovation and Fantastical Exploration (L.I.F.E.), founded by Victoria "Tori" Frankenstein, a distant descendant of Victor Frankenstein. As participants move deeper into the narrative, they have the opportunity to shape the story line and make choices that affect the fates of the characters.

Building on the world of the interactive story, we invited participants to engage in handson activities in museums, science centers, classrooms, community centers, or at home. We designed the activities to have a positive impact on science self-efficacy and interest. Using simple, affordable components, our participants create miniature robots, patchwork animals, simple electric circuits, and automata.

To assess the effectiveness of these activities, we conducted a study at an elementary school and a middle school in central Arizona. Students participated in both the hands-on science activities and the interactive digital



Still from the Frankenstein200 interactive digital story. In the story, Rose Abdoo (*Gilmore Girls*) plays Dr. Victoria "Tori" Frankenstein, founder of the Laboratory for Innovation and Fantastical Exploration (L.I.F.E.).

frankenstein200.org 🔬

Frankenstein Bicentennial

Students participate in Frankenstein200 tabletop activities, creating their own battery stacks and scribbler bots, at the Creative Discovery Museum in Chattanooga, Tennessee.



story. Data was collected from students before and after the experience. These results helped us improve the activities, create better measures, and learn more about students' preferences and beliefs about science, ethics, and responsibility. We also interviewed students to gain a more nuanced understanding of how they think of and feel about science ethics issues and science professions.

In early 2018, we collaborated with 50 science museums across the United States on Frankensteinian public programs. Our museum partners celebrated the bicentennial of Mary Shelley's *Frankenstein* by using our hands-on activities to facilitate conversations about science and society. We conducted short interviews and observations with museum



visitors to learn about the impact of the activities on people's preferences about and interest in science. Our museum activities reached more than 35,000 people. When we asked for feedback about the hands-on kits, our museum partners had overwhelmingly positive reactions to the activities and found them to be quite useful for engaging audiences. This research will be integrated into manuscripts for peer-reviewed scholarly publications over the next year.



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

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Book Annotation Health & Medicine Finismonts & Workes Miguel Astor-Aguillera	Mary Shelley	2
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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 gives readers the opportunity 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,

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.

> scientists, and ethicists; audio journalism; and original animations and interactives created by partners including Massive Science and The Rosenbach Museum and Library.

Readers can contribute their own text and richmedia 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.

Frankenbook was developed with generous support from the Alfred P. Sloan Foundation.

Frankenstein Bicentennial

Science Friday Book Club

Frankenbook was selected as the official reading version for the book club hosted by public radio's *Science Friday* in January and February 2018. Contributors Elizabeth Bear and Josephine Johnston joined host Ira Flatow and book club captain Christie Taylor for a conversation about the novel's origins, its lasting legacy in science fiction, and what modern monsters we might avoid by learning from Victor's mistakes.

Frankenbook at S.NET

In October 2017, CSI's Ruth Wylie and Joey Eschrich hosted a session at the annual conference for the Society for the Study of New and Emerging Technologies (S.NET), inviting a diverse group of scholars from around the world to contribute annotations to *Frankenbook*. Many of these annotations are featured in the project, with more contributions from this group still in the works!





Reanimation! Video Premiere

In June 2018, *Reanimation! Science Conversations About Frankenstein*, a series of seven short animated films created for *Frankenbook* by our partners at Massive Science, launched publicly at a premiere event at Pioneer Works, a cultural center in Brooklyn, New York. *Reanimation!* is designed to spark conversations about emerging technologies through interviews with scientists and researchers in cutting-edge fields.

Stills from "A Bolt of Lightning," one of the short films in the *ReanimationI* series. The film was directed and animated by Daniela Scherer.



Frankenstein on the Radio

On February 9, 2018, CSI's Bob Beard worked with KJZZ 91.5, Phoenix's public radio station, to bring the Frankenstein200 project to life on the air.

Appearing alongside host Steve Goldstein, Bob walked through several making activities and posed lively questions about the project's themes of scientific and creative responsibility: Who is responsible for creations once they are out in the world? Where does life begin and end? What ethical issues should we consider when making things that have never been made before?

Listeners were also introduced to the interactive elements of the project, as Goldstein answered a phone call from Dr. Tori Frankenstein, head of the fictional Laboratory for Innovation and Fantastical Exploration, and discussed with Bob the strength of transmedia narratives as a tool for informal learning.



Bob Beard and KJZZ 91.5 producer Sarah Ventre make some noise on the radio. Photo by Jackie Hai, KJZZ.



Frankenstein Bicentennial



Unexpected Frankensteins

Mary Shelley's *Frankenstein* has endured for more than 200 years because its themes go a lot deeper than lightning storms and shambling, misanthropic monsters. Building on the success of our History of the Future film series, we partnered again with FilmBar, a local independent cinema, to present a slate of screenings that examined *Frankenstein*'s legacy across disparate pop culture genres.

Facilitated by members of ASU's Frankenstein Bicentennial Project, the series celebrated the staying power of Shelley's novel by following its echoes in stories of body horror, artificially intelligent companions, suburban angst, and vicious high school cliques. Sometimes surprising, always enlightening, Unexpected Frankensteins generated new conversations about human creativity and its broader ramifications.

The series began in January 2017, and comprised seven events in total. This year we hosted the last two screenings: *Her*, the elegiac 2013 look at near-future artificial intelligence from director Spike Jonze, with commentary from CSI director Ed Finn, and *Flatliners*, the bombastic 1990 medical-ethics thriller from director Joel Schumacher, with commentary from CSI's Joey Eschrich.



The Rightful Place of Science: Frankenstein

Two hundred years after its publication, Mary Shelley's *Frankenstein* continues to speak to modern concerns about science, technology, and society. The story of Victor Frankenstein and his creature has become a cultural touchstone through myriad theatrical renditions, movies, and other adaptations and allusions. But Shelley's original tale is richer and more relevant to contemporary issues than the common interpretation of the novel as a warning against scientific hubris.

The Rightful Place of Science: Frankenstein is a collection of essays published by the Consortium for Science, Policy & Outcomes at Arizona State University, examining the roots and origins of Shelley's tragically flawed scientist and his benighted creature. The authors approach *Frankenstein* as a parable of creativity and responsibility that can help us better understand our current creative dilemmas. They show how Shelley's text foreshadows future technological innovations, and the challenges we anticipate from emerging fields such as synthetic biology and artificial intelligence.

The Rightful Place of Science: Frankenstein was edited by CSI's Joey Eschrich, former CSI Imaginary College fellow Megan K. Halpern, and science, technology, and society scholar Jathan Sadowski, postdoctoral research fellow at the University of Sydney and a former graduate assistant for ASU's Frankenstein Bicentennial Project. The collection features essays by Halpern, Eschrich, and Sadowski along with other experts, including:

- Kevin Esvelt, director of the Sculpting Evolution group at the MIT Media Lab
- Ed Finn, founding director of CSI and author of *What Algorithms Want: Imagination in the Age of Computing*
- Charlotte Gordon, literary historian and author of *Romantic Outlaws: The Extraordinary Lives of Mary Wollstonecraft and Her Daughter Mary Shelley*
- David H. Guston, founding director of the School for the Future of Innovation in Society at Arizona State University
- Alyssa Sims, policy analyst with the International Security Program at New America
- Bina Venkataraman, director of global policy initiatives at the Broad Institute of Harvard University and MIT
- Sara Imari Walker, theoretical physicist and astrobiologist and deputy director of the Beyond Center for Fundamental Concepts in Science at Arizona State University

This book is part of the Rightful Place of Science series, edited by former Imaginary College fellow G. Pascal Zachary. The series tackles urgent topics across a range of complex technoscientific subjects, including biofuels, citizen science, and climate change.

csi.asu.edu/books/science-frankenstein

Future of Learning

How can we use shared texts and collective myths to light the spark of imagination and create new opportunities for collaborative, creative learning?

> Participants brainstorm at a narrative hackathon workshop in Bogotá, Colombia for Evoke, our collaboration with the World Bank on storytelling and global challenges.

Center for Science and Imagination





Drawn Futures: Arizona 2045

In an increasingly networked and visual culture, comic books and graphic novels are important tools for bolstering literacy, communicating with diverse audiences, and creating spaces to discuss complex scientific and social topics in meaningful and accessible ways. With these goals in mind, CSI created *Drawn Futures: Arizona 2045*, a science-based comic for students in grades 5-8.

This original story, developed in collaboration with award-winning comics creators and ASU senior sustainability scholar Dr. Paul Hirt, envisions the near future of Arizona's energy systems. Through the eyes of two young protagonists, readers are exposed to cuttingedge technologies created to help the city adapt to persistent temperature increases. As the story progresses, it becomes apparent that there are deep ecological impacts behind even the most elegant solutions and that climate change is a messy, human problem that requires constant mindfulness, evaluation, and deliberation.

csi.asu.edu/books/az2045

Future of Learning





Panels coming together for the *Drawn Futures: Arizona 2045* comic book, showing the artistic process from pencil sketches to full-color art. The comic book was drawn by Mauro Mandalari and colored by C. Edward Sellner.



Drawn Futures: Arizona 2045 is supplemented by two essays on technology and society, aligns to strands 3, 4, and 5 in Arizona's standards for the 6th grade science curriculum, and is available as a free digital download. Later in 2018, we will partner with local educators to incorporate printed copies in formal and informal classroom settings and will translate the story to Spanish for English Language Learners.

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



Evoke

Our collaboration with the World Bank on Evoke continues into its fourth year. Evoke is an online narrative-based experience designed to help young people in developing countries learn 21st century skills and tackle global challenges. Students working as Evoke "agents" engage virtually and in the real world to complete missions designed to improve their communities and the future. The Evoke platform is currently being used as part of a course on social responsibility at UNIMINUTO, a university in Soacha, Colombia, and two pilot programs have launched in South Africa—one in Limpopo and the other in Tembisa.

As part of scaling the program and developing more stories for the Evoke universe, Colombia's Ministry of Information Technologies invited CSI to host a narrative hackathon in Bogotá with local authors, artists, experts, and high school students. Over the course of the three-day event, teams generated story ideas and art, and met with government officials to discuss plans for implementation. One of our goals for Evoke is to reach younger audiences, so inviting high school students to participate in the design process is an important step to develop individual student interest and agency and to ensure that the resulting stories resonate with our target age group.

Participants confer at a narrative hackathon workshop in Bogotá, Colombia for Evoke, our collaboration with the World Bank on storytelling and global challenges.

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 engineering students to solve the most pressing challenges facing society. CSI runs in-class science fiction prototyping 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 at the Grand Challenge Scholars program Summer Institute. Photo by Marco-Alexis Chaira.

Future of Learning



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?

Teams at the Solar Futures Workshop collaborate on visions of the future shaped by clean energy technology in CSI's outdoor space.

Center for Science and Imagination





Front cover image for *Visions, Ventures, Escape Velocities*, created by Maciej Rebisz.

Visions, Ventures, Escape Velocities

Why should we go to space? To learn more about the universe and our place in it? To extract resources and conduct commerce? To demonstrate national primacy and technological prowess? To live and thrive in radically different kinds of human communities? In December 2017, CSI published Visions, Ventures, Escape Velocities: A Collection of Space Futures to explore these questions as part of a NASA-funded research project on the near future of space commercialization and exploration. The book takes on the challenge of imagining new stories at the intersection of public and private-narratives that use the economic and social history of exploration, as well as current technical and scientific research, to inform scenarios for the future of the "new space" era. The collection provides fresh insights into human activity in commercializing Low Earth Orbit, voyaging to Mars, capturing and mining asteroids, and exploring distant exoplanets. Its stories and essays imagine human expansion into space as a kind of domestication-not in the sense of taming nature but in the sense of creating a space for dwelling, a venue for human life and curiosity to unfurl in all their weirdness and complexity.

Visions, Ventures, Escape Velocities includes original stories by Eileen Gunn, Ramez Naam, Madeline Ashby, Karl Schroeder, Vandana Singh, Steven Barnes, and Carter Scholz, and excerpts from acclaimed author Kim Stanley Robinson's novel Red Mars. These narrative projections appear alongside essays by a stellar group of space researchers and social scientists: Jim Bell, Lawrence Dritsas, Linda T. Elkins-Tanton, Emma Frow, Roland Lehoucg, Andrew D. Maynard, Clark A. Miller, Deji Bryce Olukotun, Steve Ruff, William K. Storey, Sara Imari Walker, and G. Pascal Zachary. The collection also boasts a set of stunning original illustrations by space artist Maciej Rebisz. Ed Finn and Joey Eschrich edited the collection in collaboration with guest editor Juliet Ulman, and SFIS Ph.D. students Alissa Haddaji and Mateo Pimentel provided invaluable research and coordination support.

Since its publication in December 2017, *Visions, Ventures, Escape Velocities* has already been downloaded over 20,000 times and is also available at cost in a print-on-demand hard copy. Four stories from the collection were selected for "year's best" science fiction anthologies, and the collection has been nominated for the Eugene M. Emme Astronautical Literature Award.

csi.asu.edu/books/vvev

Crowd Futures

To mark the fifth anniversary of Hieroglyph, CSI's first major project, we embarked on Crowd Futures: a new, imaginative endeavor that combines our narrative hackathon methodology with a series of public deliberations and digital votes. The project, which shares Hieroglyph's goal of creating hopeful, technically grounded visions of the future, invited audiences to read, comment, and choose directions for an unfolding, original science fiction tale written by Hugo and Nebula award–winning author Elizabeth Bear.

Through this process, Bear and the Crowd Futures community learned about the emerging field of virtual reality for empathy; consulted with Dennis Bonilla, a leading creator in the field; collaborated with illustrator Melissa Gay to envision the VR experience; and refined the initial story prompt into a haunting, Gothic-inspired tale about near-future cognitive therapies.

The result, an e-book titled *Crowd Futures: We Have Always Died in the Castle*, reflects a creative process rooted in interaction between a broad community of readers and our talented creative team.





Science and Imagination



A spectral horse charges in an illustration by Melissa Gay for *Crowd Futures: We Have Always Died in the Castle*, a story about virtual reality and empathy written by Elizabeth Bear, with guidance from a community of readers.
Future Tense

Future Tense is the citizen's guide to the future.

A partnership of *Slate*, New America, and Arizona State University, Future Tense explores how emerging technologies will change the way we live.

Future Tense seeks to understand technological breakthroughs and what they mean for our environment, how we relate to one another, and what it means to be human. We also examine whether technology can be governed democratically and ethically. We ask these questions in commentary published on *Slate* and through public events in Washington, D.C., and other major cities in the U.S. and beyond, featuring conversations with scientists, technologists, policymakers, and journalists.

CSI acts as ASU's hub for Future Tense, working to involve more faculty, staff, and students in the partnership and exploring how to connect Future Tense more deeply to the university's research, teaching, and outreach efforts.







Original artwork created for Future Tense Fiction stories. Top: Illustration for Meg Elison's story "Safe Surrender," about genetics, the law, and bias, by Lisa Larson-Walker. Bottom: Illustration for Madeline Ashby's story "Domestic Violence," about smart homes and relationship abuse, by Lisa Larson-Walker.

Science and Imagination

Future Tense Fiction

Future Tense Fiction is a series of original science fiction stories crafted by leading authors. Each story is accompanied by original visual art and a response essay by a researcher or technical expert.

Our stories this year were grouped into two series—one on the theme of "home" and the other on the theme of "memory."

Home

- Charlie Jane Anders, "The Minnesota Diet," about smart cities and food shortages, with a response by food systems expert Christopher Wharton
- Nnedi Okorafor, "Mother of Invention," about smart home technology in Nigeria, with a response by Internet of Things expert Stacey Higginbotham
- Madeline Ashby, "Domestic Violence," about smart homes and relationship violence, with a response by relationship abuse and technology expert lan Harris

Memory

- Mark Oshiro, "No Me Dejas," about transferring memories from mind to mind, with a response by philosophers Jenelle Salisbury and Susan Schneider
- Meg Elison, "Safe Surrender," about DNA, inequality, and human-alien interaction, with a response by technology policy lawyer Laura Moy
- Carmen Maria Machado, "A Brief and Fearful Star," about generational memory and inheritance, with a response by science and environmental policy expert Bina Venkataraman

The History (and Future) of the Future

Past visions of the future provide us invaluable insight about the hopes, values, and anxieties of their creators, and about the times and places from which they sprung. What can kitschy visions of robotic kitchens tell us about how we imagined a post-World War II domestic life? How have film and television influenced our understanding of emerging technologies?

On November 14, 2017 in Washington, D.C., Future Tense hosted "The History of the Future," bringing together a diverse group of experts to discuss past visions of the future of entertainment, labor, domestic life, and transportation. Speakers included CSI's Joey Eschrich, cultural historian Neal Gabler, journalist and editor Katherine Mangu-Ward, Future Tense editorial director Andrés Martinez, *Futurama* writer and producer Patric M. Verrone, and Afrofuturist author and film director Ytasha Womack.

In the runup to the event, Future Tense published an editorial package on *Slate* titled "The Future of the Future," examining all the ways we attempt to plan for things to come. The package features articles on virtual reality, the vicissitudes of weather forecasting, the history and future of time capsules, our unhealthy obsession with predictive analytics, the fallacies and flaws of traditional political polling, the need for greater diversity in the futures industry, and more. Contributors included CSI's Ed Finn, Joey Eschrich, and Brian David Johnson, frequent CSI collaborator Annalee Newitz, and Imaginary College fellow Kevin Bankston.

Imagination and Climate Futures

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. A partnership with the Virginia G. Piper Center for Creative Writing, ICF hosts public events and writing contests and encompasses research projects uniting scholars and practitioners from a broad range of disciplines.



Climate Fiction Contest

In the wake of Earth's hottest year on record, the effects of climate change are more apparent than ever. But how do we come to grips with the consequences on the ground, for actual people in specific places? If our political responses and our empathy for people besieged by environmental chaos fall short, perhaps we need new stories to help us imagine possible futures shaped by climate change and our reactions to it.

In 2018, we hosted the Everything Change Climate Fiction Contest, following our successful inaugural contest in 2016. Once again, we invited writers from around the world to submit stories exploring climate change, dispatches from a world in flux. This time we broadened the scope, inviting submissions from all genres of short fiction—not just science fiction—including speculative, literary, experimental, hybrid forms, and more. Climate change is so massive and sometimes so ineffable that we need all of the tools of narrative to adequately understand it and share stories and experiences about it.

The response was truly global: We were delighted to receive 547 submissions from 66 different countries.

The contest will be judged by science fiction legend Kim Stanley Robinson, award-winning author of many foundational works in climate fiction, along with other experts in climate science and creative writing.

The winning story will receive a \$1,000 prize. Nine finalists will receive \$50 each. The winner and finalists will be published in a digital anthology, which will be published in late 2018 and will be free to download, read, and share.

Annual Lecture

As the creeping destruction wrought by climate chaos escalates and political antagonism and public apathy deepen, finding the right story to catalyze change is more urgent than ever.

Our fourth annual Imagination and Climate Futures Lecture was delivered on September 20, 2017 by *New York Times*—bestselling author and ASU writer at large Kim Stanley Robinson. In his lecture, titled "The Comedy of Coping: Alarm and Resolve in Climate Fiction," Robinson traced the threads of story and science that he wove together in his novel *New York 2140*, a tale of climate chaos, its long aftermath, and the enduring forces of culture and community. He also argued that we need to renounce apocalyptic thinking, even when it feels most irresistible.

During his visit, Robinson led a master class workshop for students and ASU community members on climate fiction, research processes, and the writing life. At the workshop, Robinson shared strategies for using scientific research as an underpinning for convincing narrative structures and lush, believable worlds.

Previous lectures in the Imagination and Climate Futures series have been delivered by 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. Omar El Akkad, journalist and author of the novel *American War,* will deliver the fifth lecture in spring 2018.



Sketches of the Ulises I satellite, from the book *Ulises I, una misión de arte al espacio por el Colectivo Espacial Mexicano.*

Ulises I: An Art Mission to Space

This year marked the culmination of a longrunning collaboration between CSI and Juan José Diaz Infante, founder of the Mexican Space Collective. Juan is the architect of a multiyear project to lead a group of artists and writers in designing a satellite, Ulises I. By reimagining this highly technical process as a creative project, the Ulises team is also reimagining the role of space as a channel for optimism and a canvas for our collective imagination. Ed Finn contributed an essay, alongside Fernando Castro, Omar Gasca, and Antonio Lafuente, to *Ulises I: An Art Mission to Space*, which CSI helped to publish in Spanish and English editions in October 2017. The book release was timed to coincide with a Future Tense event in Washington, D.C. addressing the question, "Does Technology Need the Arts to Build a Better Future?" Our answer: yes.

csi.asu.edu/books/ulises

Science and Imagination

A Year Without a Winter

A Year Without a Winter takes its inspiration from the genesis of Mary Shelley's *Frankenstein*, which was conceived on a dare in 1816 on the shores of Lake Geneva during the "Year Without a Summer." That year, the volcanic eruption of Mount Tambora in Indonesia led to extreme weather, crop failures, and famine worldwide.

We recreated that dare in 2016, the bicentennial of *Frankenstein*'s conception, inviting four science fiction authors to participate in a workshop with experts in climate change, environmental science, literature, and history.

Coming out of the workshop, our authors wrote novelettes set in A Year Without a Winter: a specter of a future where climate chaos causes winter to fall away completely. Each story features a compelling narrative set against the backdrop of climate change and our responses to it. The stories will be collected in a book, titled *A Year Without a Winter*, slated for publication by Columbia University Press in the latter half of 2018.

This year, each of the four novelettes was published in a high-profile science fiction periodical, to ensure that a broad array of readers will encounter these visions of the future.

- Tobias Buckell's "A World to Die For" appeared in *Clarkesworld*
- Nancy Kress's "Cost of Doing Business" appeared in Asimov's Science Fiction
- Nnedi Okorafor's "Mother of Invention" appeared on *Slate*'s Future Tense channel
- Vandana Singh's "Widdam" appeared in The Magazine of Fantasy & Science Fiction





Original artwork by Brian Miller for "High Awareness," a story about national security and data privacy issues in the stratosphere by David Brin and Tobias S. Buckell. The story and illustration appear in *Overview: Stories in the Stratosphere*.

Overview: Stories in the Stratosphere

From *Star Trek* and *2001: A Space Odyssey* to *The Martian*, great science fiction stories have shaped how we think about voyages into deep space. But what kinds of gripping confrontations and adventures might unfold in near space, above the clouds? *Overview: Stories in the Stratosphere* is a collection of science fiction stories, art, and speculative timelines exploring the near future of the stratosphere.

The collection, edited by Michael G. Bennett, Joey Eschrich, and Ed Finn, comes out of a Narrative Hackathon workshop hosted by CSI in May 2017. At the workshop, acclaimed science fiction authors, visual artists, experts in fields ranging from human spaceflight to signal processing, and public communications professionals collaborated to create technically grounded, inspiring visions for our stratospheric future.

Our goals for this project were to establish the stratosphere as an arena for public imagination, and to encourage people—in the aerospace industry and beyond—to think critically and imaginatively about how humans might engage with near space in the future. *Overview* is free to download, read, and share. The book was highlighted in *Locus* magazine's short fiction year-inreview as a notable collection.

csi.asu.edu/books/overview

Solar Futures Workshop



Author Corey Pressman and artist Kirsten Newkirk contemplate works of art during the Solar Futures Workshop. Photo by Clark Miller.

How will energy innovation shape the future? This was the design challenge posed to interdisciplinary collaborative teams at our Solar Futures workshop in May 2018. With support from ASU's Quantum Energy and Sustainable Solar Technologies Engineering Research Center and Center for Energy and Society, we convened four teams, each composed of a science fiction author, a graphic artist, a technical expert, a social scientist, and a student researcher. The workshop was organized as a two-day narrative hackathon, designed to create stories, visual renderings, and essays that make visible, explicate, and open up design variables and design strategies for public dialogue and deliberation.

The purpose of the workshop was not to predict the future design of solar energy systems. Rather, the narratives, art, and essays coming out of the workshop frame solar energy futures as a design problem. We hope that our work will motivate industry, policy, and public stakeholders to incorporate deliberation on design as an element in initiatives to construct renewable energy futures.

We will publish the collection as a free digital book in the latter half of 2018.

Science and Imagination



Solar Futures workshop participants discuss science and story. Photo by Clark Miller.

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?

> Trees in the forest share nutrients via an underground network. Autumn on Waterfall Trail, Fossil Creek. Photo by Deborah Lee Soltesz, courtesy of Coconino National Forest.

Center for Science and Imagination



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 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.



Vandana Singh Michael G. Bennett Elizabeth Bear Kevin Bankston Bruce Sterling Madeline Ashby Corey Pressman Neal Stephenson Kim Stanley Robinson Margaret Atwood

Networks of Imagination

Illustration by Yoorina Seo

☆ csi.asu.edu/imaginary-college



Paolo Bacigalupi Kathryn Cramer Don Marinelli Dennis Bonilla Brenda Cooper Andrew Dana Hudson Suren Jayasuriya Eric Molinsky Deji Bryce Olukotun

Flights of Imagination

To support CSI's mission of engaging the public around issues of science, technology, storytelling, and the future, we launched Flights of Imagination, a twice-monthly email newsletter, in 2017. Curated and penned by our undergraduate student researcher, Joseph Bianchi, Flights of Imagination pairs news and project updates with offbeat cultural recommendations from CSI staff. Sharp-witted and succinct, the newsletter 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.



csi.asu.edu/mailing-list

Networks of Imagination



CSI's Ruth Wylie issues a design challenge about artificial intelligence in higher education to Advanced Leadership Initiative participants. Photo by Maggie Dellow.

Advanced Leadership Initiative

CSI was invited by Arizona State University's Advanced Leadership Initiative to conduct a series of workshops on innovation and collaboration around the theme of artificial intelligence (AI) in education. The initiative is a professional development opportunity for ASU faculty and staff, with the goal of developing the next generation of leaders for the New American University.

At our first workshop in January 2018, we introduced the many ways that AI already influences our work, entertainment, and personal lives, and then conducted a brainstorming session to identify potential applications for AI in higher education (e.g., advising, research, facilities planning). Participants worked in teams to select an application area and drafted project plans for the rest of the semester. At the second meeting in March, teams shared results from expert interviews and drafted short science fiction stories to envision the future of the university with various AI enhancements. At the final meeting in May, teams presented final versions of their stories along with critical reflections on their visions of the future, covering topics like privacy, unintended consequences, and equitable access. Our aim for this workshop series and other professional development activities is to help transform the culture of the university and create a cohort of leaders who are nimble and responsive in the face of technological change.



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.

September 2017: Fringe

Speakers: Science, technology, and society scholars Andrew Maynard and Heather Ross

October 2017: Buffy the Vampire Slayer

Speakers: Media and communications scholar Dawn Gilpin and psychology and communications scholar Peter Nagy

January 2018: The Good Wife

Speakers: Journalist Torie Bosch and digital culture scholar Ed Finn

February 2018: Westworld

Speakers: Content strategist and video game scholar Alice Daer and communications scholar Bob Beard

March 2018: The Jetsons and Other Classic Cartoons

Speakers: Arizona's first Poet Laureate Alberto Ríos and animation scholar Kevin Sandler

April 2018: Star Trek: Deep Space Nine

Speakers: Political scientist Lisa Magaña and astrophysicist Evgenya Shkolnik



Original artwork created for Science Fiction TV Dinner events. Top: *Jetsons and Other Classic Cartoons* by Nina Miller. Bottom: *Star Trek: Deep Space Nine* by Dakota Thompson.

Imaginary Papers

Imaginary Papers is CSI's blog, hosted on the social writing platform Medium and edited by CSI's Joey Eschrich and Corey Pressman, a fellow of the center's Imaginary College.

Imaginary Papers imagines, negotiates, analyzes, and speculates playfully about the relationship between humans and our 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.

IMAGINARY PAPERS

medium.com/imaginary-papers

Science Fiction House: SXSW



At the South by Southwest festival (SXSW) in March 2018, CSI sponsored a Science Fiction House hosted by our futurist in residence Brian David Johnson and Imaginary College fellow Kevin Bankston, director of the Open Technology Institute. At the house, they hosted science fiction authors Madeline Ashby and Ramez Naam along with other SXSW participants for a barbeque and informal discussions about imagination and the future, with over 30 science fiction writers, professional futurists, and tech/policy experts in attendance.

Brian and Kevin also participated in several other science fiction and futurism events occurring around the festival, including a SXSW panel organized by Kevin that included Ashby, Naam, and science fiction legend Bruce Sterling; a futurism workshop hosted by the XPRIZE Foundation; and a two-day training for mayors from across the U.S. in the basics of strategic foresight. Stay tuned for future iterations of the Science Fiction House as Brian and Kevin continue to develop this movable feast.

Networks of Imagination



Arizona SciTech Festival Kickoff Conference

As part of the launch event for the seventh annual Arizona Science and Technology Festival, CSI presented a panel discussion on the use of new and emerging media to encourage critical thinking and meaningful engagement with STEM topics. Titled "Imagined Realities: STEM Learning and New Media," the panel featured Dennis Bonilla, chief technology officer of the virtual reality firm Variable Labs and a fellow of CSI's Imaginary College; Steve Peters, founder and chief creative officer of No Mimes Media, a Hollywoodbased transmedia studio; and Bob Beard, executive producer of CSI's Frankenstein200 project.

In this panel, Bob, Dennis, and Steve discussed the sophisticated media literacies of today's learners—students who can navigate immersive story worlds to evaluate and synthesize information across multiple platforms and texts. The panelists shared helpful advice and tips about how the same tools and mechanics used by mass-market entertainment products can make STEM concepts emotionally resonant and viscerally exciting.

WaR: Wizards and Robots

In January 2018, *WaR: Wizards and Robots,* a young adult science fiction novel by our futurist in residence Brian David Johnson and the acclaimed entertainer and innovator will.i.am, was published by Penguin Books. The novel explores a centuries-old battle between wizards and robots, with a young woman engineer as the main character. The authors consulted with ASU theoretical physicist and cosmologist Paul Davies on the quantum physics and science behind the magic, aliens, and time travel in the story. During the week of its release, the book was first on the *London Times* bestseller list for young adult titles.



Visitors and Visits

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 and panels. Here are a few highlights from the past year.



CSI hosts an evening reception at the Society for Literature, Science and the Arts conference in November 2017.

AUG 2017

Steve Peters, chief creative officer of the immersive entertainment studio No Mimes Media and our collaborator on the Frankenstein200 project, visited to participate in our panel "Imagined Realities: STEM Learning and New Media" at the Arizona SciTech Festival Kickoff Conference, and to give a lecture, "Immersive Entertainment: How the Future Wants to Tell Stories," to ASU's Digital Culture program.

SEP 2017

Ed Finn gave a plenary lecture as part of the University of Indianapolis Communiversity event series titled "Unstoppable Frankenstein: Science, Imagination, and the Next 200 Years."

OCT 2017

Science fiction author and digital rights advocate Deji Bryce Olukotun visited us to give a lecture, "Risk and Promise: Digital Rights, Science Fiction Thinking and a Struggle for the Future," to ASU's Digital Culture program, and to participate in a reading, signing, and conversation for his Philip K. Dick Award–winning novel After the Flare at Changing Hands Bookstore.

Ruth Wylie was an invited speaker to the Program of Interdisciplinary Research at Carnegie Mellon University and gave two lectures, "How Storytelling can Change the World ... or at least improve education" and "How to Predict the Future."

NOV 2017

CSI hosted a well-attended reception for the annual meeting of the Society for Literature, Science and the Arts in Tempe.

Ed Finn spoke about his book *What Algorithms Want* at an evening salon for Virtual Futures, an event series in London.

Networks of Imagination

JAN 2018

Torie Bosch, the editor of *Slate* magazine's Future Tense channel, joined us for a writing workshop at Changing Hands Bookstore, "Writing to Change Minds: Crafting Good Nonfiction in Complicated Times," to launch her coedited book *What Future: The Year's Best Ideas to Reclaim, Reanimate & Reinvent Our Future.*

APR 2018

At the USA Science and Engineering Festival, Bob Beard and Joey Eschrich hosted a booth to promote the Frankenstein200 project.

Alan Gershenfeld, president and co-founder of E-line Media, visited us as part of ASU's Digital Culture speaker series to discuss his award-winning game *Never Alone*.

FEB 2018

Ruth Wylie gave a keynote at the Social Fiction conference hosted by the University of California, Santa Cruz.

Film scholar David Lugowski visited us to give a lecture, "Rummaging through the Queer Closets of James Whale's *Frankenstein* Films," as part of our Frankenstein Bicentennial Project. The lecture was cohosted by ASU's Department of English.

CSI hosted a reception to celebrate the launch of the film *Black Panther*, organized by ASU Ph.D. student Sakena Young-Skaggs.

MAY 2018

Ed Finn joined author Cory Doctorow at Phoenix Comics Fest for a lively session where they discussed the long shadow of *Frankenstein* and the social consequences of emerging technologies.

Ed Finn led a day of seminars on the art and politics of algorithms for the Saas-Fee Summer Institute of Art at the Otis College of Design in Los Angeles.

MAR 2018

Authors Annalee Newitz and Lita Judge (*Autonomous* and *Mary's Monster*, respectively) visited CSI to discuss their new books and the cultural legacy of *Frankenstein*.

Our writer at large, Kim Stanley Robinson, gave a lecture at ASU titled "Galileo and the Invention of the Scientific Method."

JUN 2018

Ed Finn hosted a worldbuilding workshop at Technicolor in Los Angeles for practitioners in the VR and AR entertainment industry.

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?

Many visitors to Emerge 2018's Luna City were surprised by the verdant environment, including a running stream. Photo by Tim Trumble.

Center for Science and Imagination





Visiting children draw with Luna City residents in Neighborhood 83's art studio. Photo by Tim Trumble.

Tangible Futures



Emerge: Luna City 2175

March 2018 marked the seventh annual Emerge event, a festival designed to create visceral, exciting, and thoughtprovoking experiences of the future. This year marked a new high-water mark for Emerge in terms of production quality, narrative development, and cross-university collaboration. We welcomed visitors to Luna City, a city on the Moon in the year 2175. Emerge transformed the state-of-the-art Galvin Playhouse on ASU's Tempe campus into a rich, immersive environment grounded in space-science research and the inspirational vision of our writer at large, Kim Stanley Robinson. One hundred and eighty faculty, students, staff, and external collaborators worked for nine months to create Luna City in the Galvin space. Visitors could speak with 20 performers playing their roles as citizens of Luna City and explore living quarters, an artist's studio, a science lab, and other fully realized spaces in a lunar neighborhood.

During the course of the weekend that Luna City was open for visitors, hundreds of people went on the neighborhood tour and explored installations and performances in the lobby. Kim Stanley Robinson delivered a lecture on the role of the Moon in science fiction and in our collective future, drawing on research and insights he gleaned in the process of writing his forthcoming novel *Red Moon*. Eric Molinsky, host of the *Imaginary Worlds* podcast, moderated a political debate between Luna City citizens that he later aired as part of an episode of his podcast about the challenges and opportunities of living in space.



Luna City: Collaborative Process

Luna City 2175 began as a question: if humans were to live off-Earth, where would we go? How could we build a sustainable community? What would day-to-day life be like? These are questions that cannot be answered through one area of expertise alone, so CSI, along with Arizona State University's Herberger Institute for Design and the Arts, School for the Future of Innovation in Society, and Ira A. Fulton Schools of Engineering, built a collaborative pool of geologists, planetary scientists, engineers, artists, architects, and future thinkers to explore them.

Through two days of creative devising—including discussions, debates, and lots of Lego building we created the idea of Luna City: an industrialhub-turned-research-outpost-turned-artistcommunity nestled in the Shackleton Crater on the south pole of the Moon. Surrounded by the luminous peaks of eternal light (where sunlight falls almost constantly), our community of the future was a beautiful idea, but it needed to be rigorously designed.

Throughout the nine-month building process, almost 200 collaborators added their ideas and expertise into the mix. So you're an architect? What would a community space on the Moon look like? A geologist? Could we build structures out of the materials that make up the surface of the Moon? An actor? Create a character to populate Luna City: a water miner, a renegade scientist, an artist in residence.

As the expert perspectives and concrete ideas came together, writers and performers developed what would become a grand invitation to the audience: come live on the Moon with us.







A year-long worldbuilding process produced maps, timelines, and hundreds of ideas.

Tangible Futures





Visitors to Luna City explore a soil science project (top) and a lunar garden (bottom). Photos by Tim Trumble.

Luna City: Immersive Experience

When audience members reached the front entrance of Emerge 2018, they received a badge denoting their status as a visitor from Earth. As they stepped through the airlock into the lobby, they were greeting by a bustling spaceport filled with the latest virtual reality technology, a real-time Earth Simulator for the homesick, and a local population of artists, miners, researchers, and a few unsavory blackmarket dealers who may sell you some rare goods.

If visitors wanted to truly experience life on the Moon, they lined up for a hyperloop ride to Neighborhood 83: a fully built and immersive slice of life. In Neighborhood 83, they could meet Aisha, the dancer/poet who would lead them in a meditation in the Earthview room. Or Thorium, the singer/scientist who fled Earth to conduct his illegal genetic experiments. Or Jay, the gardener who speaks wistfully of a lover who is stuck back on Earth.

During the tour, visitors were also invited to participate in one of several local rituals. In one ritual, a recently deceased member of the Luna City community was celebrated, and her remains were lovingly given back to the carbon cycle of the system. In another, members of the neighborhood sat in a circle and openly talked about the conflicts they had with one another, seeking reparations and community support. Each tour was an exchange—visitors had the opportunity to ask questions and learn more about Luna City, while they offered their presence and attention during community moments.

Luna City Debate

Living and thriving on the Moon is a difficult proposition. Not only will off-world pioneers face the resource scarcity and physiological deficiencies brought about by the lunar environment, but human desires and foibles will ride along on the rocket ship, no matter how far we go.

This was the focus of the Luna City Town Hall, a signature performance amid the Emerge 2018 experience. Audiences were invited to attend a political debate between representatives of two factions of Luna City residents, moderated by Eric Molinsky, host of the *Imaginary Worlds* podcast. In this stirring, live debate, Eric played a fictional (and future) version of himself and discussed the merits and potential dangers of collectivism versus individualism on the Moon with talented improvisers Camille Hartmetz and Jose Gonzalez.

Eric later published the entire debate as part of a podcast episode on the theme of living in space. The episode can be found at the *Imaginary Worlds* website.

imaginaryworldspodcast.org/living-in-space.html

Tangible Futures



CSI's Ed Finn introduces the participants in a heated political debate about the future of Luna City. Seated, from left: Camille Hartmetz, moderator Eric Molinsky, and Jose Gonzalez. Photo by Tim Trumble.

Emerge Gallery



Visitors make art out of space junk in the Satellite Lounge.

Satellite Lounge

A collaborative art installation using "space junk" by James Rickard, with help from Jean Rickard. *Satellite Lounge* is an interactive space for visitors and residents alike to sit and relax, talk with others, or participate in creating one of the artworks that adorn Luna City.

"Make yourself at home and use the found components to manipulate the work and add your own personal touches. Luna City is generally diligent about recycling items, but the materials here either represent an overload or just seem to hold promise to be upcycled as art, in hopes of making our city a more beautiful place."

James Rickard is a multidisciplinary artist, writer, and art educator in Pennsylvania.

Luna City Ecosystems

A textile workspace and creation led by Megan Driving Hawk. Working with fabric and found materials in values of gray, black, blue, and green, residents and visitors to Luna City create various textures and spaces that visually resemble the Moon, Earth, and areas of habitation. This piece begins the festival in multiple pieces, and in the end the fiber labor of the audience is connected together to express collective views about the mining of Shackleton Crater and the current status of lunar ecological thinking.

"This collaborative textile work has become a ritual for inhabitants of Luna City to recognize where we've been, where we are, how we've lived, and where we are going. It's a history marker written by the people for the people to come after them."



Kim Stanley Robinson joins visitors in the textile workspace.

Megan Driving Hawk is an interdisciplinary artist and art educator with an emphasis on artist-led participatory projects, currently on a long-term residency in Missouri.

Tangible Futures



Anicca

A dance performance choreographed and performed by Meredith Matsen and Miquella Young, with an original score by Jess Matsen. *Anicca* explores the first Buddhist principle of existence: impermanence, the natural tendency towards change. Two dancers represent contrasting experiences of this constant flux; they perform in a circle, delicately shaping patterns with fingers, toes, heels, elbows, and knees that suggest a mandala symbolizing the *Bhavacakra*, or Buddhist wheel of life, the circle of existence. Dancers must first overcome the three inner circles of ignorance, attachment, and aversion.

The score follows a wave-like structure, flowing in and out of harmony and cacophony. In the conclusion, the dancers step outside their circle and stand in connection with the audience, before rejoining at the center of the circle, in peace. At its heart, *Anicca* is about the interaction between humans and their environment.

Meredith Matsen recently graduated from Arizona State University with a BFA in Dance and Dance Education. Miquella Young is a dancer studying Integrative Health at ASU; her work is engaged with explorations of metaphysics. Meredith and Miquella have collaborated on several dance works exploring mindfulness and its future in society.

Emerge Gallery

Luna City residents gather for a reentry ceremony, when a resident who has passed on is reintegrated into the system.



Unique Twists on Uniformity: Fashion of Luna City

Clothing helps tell the story of Luna City residents and is a visual display of their culture. Life in Luna City in the year 2175 is much different than life on Earth: Luna City, though abundant in certain ways, is still a desolate and difficult place to live, and its settlers have abandoned the consumerist mindset and become minimalists.

As residents personalize a uniform suit with unique scarves and shawls, these customizations tell their story and give them personality and dimension within the future world of Luna City.

A Luna City scientist demonstrates his genetic experiments for a visitor.

Melissa Waite is a costume and cosplay artist and designer who works at Arizona State University's School for the Future of Innovation in Society. She assembles her own cosplay costumes from science fiction space worlds, historical fiction, and video games, and consults for cosplayers on inspiration, costume design, and building techniques. Her collaborators on this project were the Luna City costume design team: Jessica Conn, Emily Hasty, and Crystal Heckert.



Ancient Passages: Echoes of Luna City

A textural, narrative soundscape created by Shomit Barua. A multi-narrative, non-linear sound installation: 30 miniature guitar amps on tripods are placed in thematic clusters around the periphery of the main space, in niches, corners, and the ends of hallways. They are unobtrusive, registering more as a layer of whispers, and they form a sonic tapestry that serves as an oral history of the future. The voices in each cluster are first-person monologues from specific points in the 150 years leading up to Luna City 2175. As the monologues play in continuous, asynchronous loops, different perspectives on the events are emphasized. Audience members are both passive and active participants; passive as they listen to the monologues, and active as their own attention and movement curates their experience.

Directed and produced by Shomit Barua. Writing and voice acting by Shomit Barua, Jenna Duncan, Ken Eklund, Jesse Grodman, Sheryl Glubok, Ronnie Gossamer, Ian James, Shannon Luders-Manuel, Dominic Miller, Leah Newsom, Daisy Nolz, Seth Palermo, Dan Piatkowski, Nicole Audrey Spector, Phil Weaver-Stoesz, and Zach Workman.

Fork-Casting: Meeting the Challenge of Space Food Futurism

Food is more than nutrition-it is culture, technology, shared wisdom, and expert practice. Students in the Future of Space Food class in Spring 2018 were challenged to imagine the future of food in a lunar colony in the year 2100. Inspired by the 2018 Emerge Festival theme, the course used narrative elements from Luna City 2175 to speculate about how the first lunar inhabitants, 80 years in the future, would cultivate, prepare, eat, celebrate, and misbehave with regard to food. To grapple with the challenge of imagining how new food cultures would emerge in the harsh early lunar environment, students created artifacts that demonstrated their speculations. These artifacts embody the technological, behavioral, cultural, political, and economic forces that could shape food futures on the Moon. The artifacts were displayed in Grandma's China Cabinet, a historical exhibit in Luna City. While Emerge 2018 visitors saw 2175 Luna City, Future of Food students showed them the rocky, controlled, and, at times, mischievous start to Luna City's world of food.

Led by Lauren Withycombe Keeler, assistant research professor at the School for the Future of Innovation in Society, with contributions from Dominique Browning, Jarrett French, Justin Huxel, Jordan Kari, Connor McDonald, JP Nelson, Pat Pataranutaporn, Jessica Sherman, and Kira Tijerino.

Emerge Gallery

Luna City Hyperloop

Students from the AZLoop club lent their prototype hyperloop pod to Luna City to become part of its Museum of Ancient Technologies. The prototype had traveled to California to compete in the SpaceX Hyperloop Pod Competition, and in Luna City it became a tangible piece of the city's future history. The pod connected the imagined hyperloop network of Luna City to today's emerging technologies. The team includes students from ASU, Embry-Riddle Aeronautical University, and Northern Arizona University.



Digital culture students offer VR tours of a new lunar housing development.

Luna City News



A decommissioned mining robot created by Dakota Thompson greets Luna City visitors.

Students in Ed Finn's "Media Literacies and Composition" course played an important role in the worldbuilding around Emerge 2018. Working from a "story bible" (a set of core narrative facts) about the future reality of Luna City 2175, students identified major events in a timeline of the city's history and created their own news articles, bringing those fictional historical moments to life. News stories from the class were projected onto a wall in the Emerge space under a *Luna City News* banner.

The *Luna City News* logo itself changed based on the date of each story, reflecting the fact that the publication would have evolved over the 150-year span these stories covered, from the early twenty-first century to 2175. CSI intern Dakota Thompson designed the changing *Luna City News* banners and contributed a sculpture to the Emerge lobby commemorating a key historical event in the fictional timeline, a major mining disaster on the Moon.

Tangible Futures







Microbial Cultivation

Electronics Implant

Folded Robot



Microbial celullose could allow a robot to grow en route to a mission, or repair itself.

Growable Robots

CSI undergraduate researcher Pat Pataranutaporn and his colleagues installed an unusual cell culture project in our outdoor space this spring to explore the possibility of growing robots using organic materials. Extending his work at the intersection of digital and biological systems, Pat envisions microbial cellulose functioning as an exoskeleton for a robotic system that could self-renew, self-heal, and change shape over time. The team sees possible applications in space exploration, so for their prototype effort they grew a simple rover inspired by NASA research on folded origami mechanisms. Pat's work with his collaborators has been accepted for the IEEE Flexible Electronics conference in August 2018.
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 we are especially excited about.



Future of Learning Salon

CSI is collaborating with the Joan Ganz Cooney Center at Sesame Workshop and the media company Dubit to organize a Future of Learning Salon on Immersive Media and Child Development. The gathering will take place in November 2018, bringing together industry and research experts in the fields of virtual, augmented, and immersive reality. At the gathering, we will explore the potential for immersive media to transform early childhood education and positively affect the learning and personal development of children.

AI + SF

Working with CSI fellow Kevin Bankston, we are close to finalizing funding for a research project at the intersection of science fiction and artificial intelligence. The project will explore the rich history of AI in science fiction to create a taxonomy of possible AI futures that can inform policy and research decisions today. This new model will draw together leading policy, industry, and creative experts in a process that will include archival research, public events, and original science fiction stories.

The Sound of the Future

Thanks to a generous gift of hardware from smart speaker company Sonos, CSI will be exploring aural futures and the narrative potential of soundscapes in the coming year. A number of our projects have already generated interesting audio, from soundscapes developed for Luna City 2175 to the interviews conducted for our *Reanimation! Science Conversations About Frankenstein* video series. All we can say for now is... stay tuned!

Dr. You

We're looking forward to partnering with Bioscience High School and Mayo Clinic to create an interdisciplinary internship program designed to motivate high school students to think creatively and ambitiously about their own futures and future of bioscience. Students will receive mentorship from a physician or researcher at the Mayo Clinic and collaborate with a science fiction author to compose optimistic, technically grounded stories about the future of health in which they appear as characters.

Imagining Veteran Stories

Over the past several years, we've used imagination and storytelling as tools for strengthening a sense of individual and collective agency about the future across a variety of intellectual domains and groups of people. As we continue to hone this process, we will seek to apply these methods to new projects and communities, including the military veteran population. We believe that involving military veterans directly in the process of telling stories about the future of conflict, peace, and public service will give agency to an often-overlooked population and add new voices to the conversation about technology, society, and our shared future.

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.

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
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- Conduct research at the intersection of the sciences, humanities, and arts

Build a future that is for everyone!

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Visitors build their own creatures during a Frankenstein200 education event at Pennypickle's Workshop, a children's museum in Temecula, California.

Center for Science and Imagination

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