

WORKING GROUP WHITE PAPERS

DRAFT VERSIONS

Informal Learning And Scholarship In Science And Society:
A Multi-Disciplinary Workshop On Scientific Creativity And Societal
Responsibility

April 28 – 30, 2014

Arizona State University
Tempe, AZ

EXHIBITS AND INSTALLATIONS: FRANKENSTEIN AND THE CREATION OF LIFE

Group members: Marc Audetat, Université de Lausanne; Juliet Burba, The Bakken Museum; Kelly Finnerty, The Bakken Museum; Renée Fox, University of Miami; Susan Lederer, University of Wisconsin; Heather Lineberry, Arizona State University; Paul Martin, Science Museum of Minnesota; Karrie Porter Brace, Arizona State University

OVERVIEW

The Exhibits and Installations working group believes that a small exhibition would be a great addition to the overall Frankenstein Bicentennial Project. Based on early conversations between Arizona State University (ASU) and the Science Museum of Minnesota (SMM) about the Frankenstein initiative, SMM conducted audience research to determine the viability of a large-scale exhibition with *Frankenstein* as the hook. The results of the audience research were surprising and indicate a low level of interest in and knowledge about *Frankenstein* among the general public. These results suggest that the most effective use of an exhibit will be in smaller venues or to compliment events, activities, and existing exhibits in larger venues. The small touring exhibit *Frankenstein: Penetrating the Secrets of Nature* (<http://www.nlm.nih.gov/frankenstein>) along with The Bakken Museum's *Frankenstein's Laboratory* object theater and proposed Mary Shelley exhibit are great resources to work from in developing an exhibit to accompany the initiative.

EXISTING AND PARALLEL PROJECTS

The *Frankenstein: Penetrating the Secrets of Nature* exhibit is a terrific resource to build from in thinking about a small-scale exhibit to accompany the Frankenstein initiative. *Frankenstein: Penetrating the Secrets of Nature* was a small-scale graphic panel show developed by our group member Susan Lederer of the University of Wisconsin for the National Institutes of Health U.S. National Library of Medicine in the late 1990s (<http://www.nlm.nih.gov/frankenstein>). It traveled to libraries and small museums. The structure of the exhibit could be used as the starting point for developing a flexible set of materials that could be used to create small exhibits customized for particular venues. There are specific additions and updates that Susan would recommend, including more content in the area of secrecy as it pertains to historic and current scientific research.

Another terrific resource is the work that has been done and is being done by The Bakken Museum in Minneapolis. They currently have a *Frankenstein's Laboratory* "Object Theater" that tells the story of the creation of the monster through an engaging automated theatrical presentation. You never see the monster, but it's implied through a bloody sheet and shadows. Juliet Burba and Kelly Finnerty from The Bakken, who are also group members,

are currently working on a Mary Shelley exhibit to accompany *Frankenstein's Laboratory*. The Bakken is currently seeking funding to produce the Mary Shelley exhibit.

Another resource that influenced our thinking about a *Frankenstein* exhibit is the audience research done by the Science Museum of Minnesota to determine the public awareness and appeal of *Frankenstein* as an exhibit topic. Two types of audience research were conducted. The first was qualitative focus group topic testing conducted as part of the Science Museum Exhibit Collaborative (SMEC) and the second was quantitative online topic testing. The results of the audience research indicate that the topic of *Frankenstein* on its own will not likely generate enough attendance to museums to justify the creation of a major touring exhibit. The results of the topic testing are attached at the end of this report.

Also mentioned as resources were (1) the work of Dr. Robert Bud at the Science Museum, London (<http://www.sciencemuseum.org.uk>) and (2) *Shelley's Ghost: The Afterlife of a Poet*, copresented by The New York Public Library and the Bodleian Library at the University of Oxford (<http://www.nypl.org/events/exhibitions/shelley's-ghost-afterlife-poet>). *Shelley's Ghost* explores the literary and cultural legacy of Percy Bysshe Shelley, his wife, Mary Shelley, and her parents, William Godwin and Mary Wollstonecraft. The exhibition presents wild romances, tragic deaths, exile, revolution, and landmark literary accomplishments through rarely seen manuscripts, paintings, and relics.

ONGOING COLLABORATION

Although none of the members of the exhibits working group or our organizations have the capacity to take on the role of champion for this project, we would all be willing collaborators. If there is interest on the part of the larger Frankenstein Bicentennial Project in pursuing the development and distribution of exhibitions we can recommend a freelance exhibition developer and grant writer to move the project forward. This would require funding to develop concepts and write proposals.

PROPOSED ACTIVITY

- **Brief Description:** A kit of resources that can be used to create customized small-footprint exhibits.
- **Details:** The exhibit kit would be a set of templates for creating your own exhibition and would include text, images, design drawings, and ready-to-print graphic layout files. The idea is these materials could be used in a variety of ways in a variety of locations from libraries and bookstores to events, festivals, and museums. The size and footprint could vary depending on the specific use, from a tabletop poster-type set up to a set of panels hanging on walls to a freestanding exhibit. In small venues the exhibit could act as a special feature tied to the anniversary of the writing and publication of *Frankenstein*. In larger venues it could be used as a small standalone exhibit or to augment existing exhibits on the human body, biotechnology, science

and society, etc. The distribution of these kits would be timed to coincide with the overall ASU Frankenstein Bicentennial Project.

The kits would consist of multidisciplinary templates that could change in emphasis depending on the venue. Some examples include:

- An exhibition taken from history, the arts, and literature
- Scientific responsibility and creativity
- The birth of science fiction
- An exhibition using pop culture around *Frankenstein* as the entry point or organizing feature
- Frankenstein and the monster as cultural icons
- The human body
 - Definitions of life and death (ethics)
 - Definitions of the human
 - Tinkering Lab (connections to other groups, esp. the Engineering Life group)
 - Transhumanism
- Reproduction
 - Regeneration
 - Cloning
 - Neanderthal DNA and the possibility of a human woman volunteering to be a “host” for a Neanderthal fetus
 - Aesthetic dimensions of reproduction (art)

The kits could also include programming materials and educator guides for undergraduates, high school, and middle school students.

- Resources and Potential Collaborators: Resources include the members of the Exhibit and Installations working group, who represent a good cross-section of museums of various scale and focus, as well as academics representing various university-related interests and uses. All members of the working group expressed an interest in being involved in the further development of the exhibit concept but none have the current capacity to take the lead. If funding were to be secured, this could increase the capacity of a number of the organizations represented by the working group members to take on a lead role.

As mentioned earlier, Susan Lederer and her work on the *Frankenstein: Penetrating the Secrets of Nature* exhibit is a terrific starting point, and much of the research and conceptual organization of the exhibit can be revisited and reused. It is possible that The Bakken Museum’s Mary Shelley exhibit, linked with ASU’s efforts, could produce funding opportunities that neither project could do on their own.

Additional potential collaborators include the Minnesota Center for Book Arts and the History of Science and Medical Museums in Geneva. Various professional meetings such as the American Alliance of Museums, the Association of Science-

Technology Centers, and others can be used to cultivate interest and secure additional partners.

- **Connection to STEM Topics and Areas:** The proposed topics in the “Details” section, above, address numerous STEM disciplines with an integrated and interdisciplinary approach. In addition to STEM, arts and humanities are also integrated into the proposed interdisciplinary approach.
- **Broader Impact:** Exhibits are by nature accessible without facilitation or any special circumstances, so they have the potential to reach a much broader and larger audience than programs or events. The broader impact of the Frankenstein Bicentennial Project will be greatly increased by adding an exhibit to the mix of public engagement offerings.
- **Intended Audience:** As proposed, an exhibit kit that can be used to create exhibits in a multitude of ways in a multitude of venues, creating very broad audience engagement, from use at events and gatherings to longer-term installations in libraries and museums. A series of exhibits has the potential to reach hundreds of thousands of visitors over their effective lifetime of several years. A proposal to develop the kits should also contain a strategy for outreach that includes geographically diverse locations including rural locations; large, medium, and small museums; libraries; bookstores; classrooms; and public spaces on university campuses.
- **Plan for Underrepresented Groups:** As part of the development of funding proposals, partners will be identified that have the capacity to reach underserved audiences. Examples include some comprehensive distribution into libraries, or working with existing youth groups within museums.
- **Funding:** Fundraising efforts should be coordinated with the larger Frankenstein Bicentennial Project. A good first step would be for ASU and The Bakken Museum to apply to the National Endowment for the Humanities (or to ASU’s own Lincoln Center for Applied Ethics) for a summer institute. The institute would involve college teachers and museum staff in an interdisciplinary approach to integrating exhibits into a higher education environment, helping students develop curatorial skills, and helping museum staff develop an exhibit. The Bakken Museum has submitted a proposal to the Institute of Museum and Library Services, and if it is successful, the exhibit The Bakken will develop on Mary Shelley can be used as a template for exhibits in other locations. Some additional funding sources for a larger, more comprehensive development and distribution of kits may include: American Council of Learning Societies, Sloan Foundation, and a National Endowment for the Arts, National Endowment for the Humanities, and National Science Foundation joint proposal.
- **What would success look like?**
 - Encourage people to read the novel and learn
 - Understand the origin of the *Frankenstein* mythos and its metaphors of creature and creator

- Think more critically about scientific research
- Insight into creativity and responsibility using a combination of disciplinary frameworks
- New thinking about social issues through the lenses of humanities and arts
- Guests to the exhibit take action: for example, a teenage girl might decide that she could write a story about contemporary scientific and technological issues
- Explore how literature and culture provide a “soul” for science
- Get Oprah’s Book Club involved and start a nationwide “Big Read” of *Frankenstein*
- Enhance the *Frankenstein: Penetrating the Secrets of Nature* exhibit with additional content on science and secrecy

FRANKENSTEIN: A CRITICAL EDITION FOR SCIENTISTS AND ENGINEERS

Group members: Cajsa Baldini, Arizona State University; Joe Buenker, Arizona State University; Deedee Falls, Arizona State University; Catherine O'Donnell, Arizona State University; Jason Robert, Arizona State University

OVERVIEW

This group is tasked with producing an annotated edition of Mary Shelley's novel *Frankenstein; or, The Modern Prometheus* (1818) to engage the historical, ethical, and societal aspects of literature. The term "science" is meant to reflect a comprehensive interpretation based on the etymological and historical roots of the term, connoting the pursuit of knowledge, and subsequently, its evaluation, interpretation, and praxis (cfr. "conscience").

EXISTING AND PARALLEL PROJECTS

- The three day pluridisciplinary "Workshop on Scientific Creativity and Societal Responsibility" (hereafter referred to as WSCSR) provides an excellent framework for situating and developing this critical edition.
- The work group "MOOCenstein: Frankenstein Goes Global" has proposed the construction of a dynamic learning framework which will integrate the critical edition as a starting/end point for exploration of a vast variety of subjects and issues of a transdisciplinary nature, ranging from core STEM subjects to ethics, arts, and theoretical aesthetics.
- The work group "Bringing Nonfiction to Life: *Frankenstein* and Science Writing" (WSCSR) led by Professor Lee Gutkind (Editor, *Creative Nonfiction Magazine*, Distinguished Writer in Residence at Arizona State University's Consortium for Science, Policy and Outcomes, Professor at ASU's Hugh Downs School of Human Communication) will be producing a number of creative texts/publications, ranging from a travelogue to a cookbook, which will provide a publication collection/context within which the critical edition may serve as a core text. The output of the Nonfiction group will provide a contemporary, dynamic reflection on the original text that will offset and highlight the implications of Shelley's 1818 novel.

ONGOING COLLABORATION

Multiple ASU units will be able to support this project. The originating units for the entire Bicentennial Project, the Center for Science and Imagination (headed by Professor Ed Finn) and the Center for Nanotechnology in Science (lead by Professor David Guston); as well as the College of Liberal Arts and Sciences (Humanities Dean George Justice); the Department

of English (Chair Professor Mark Lussier). In addition, faculty and resource staff from numerous other units such as the ASU Libraries are invested in the project. The Lincoln Center for Ethics (Chair Professor Jason Robert) is providing subject matter expertise as well as potential funding, grant writing, and publication support.

Affiliated units external to Arizona State University are the Science Museum of Minnesota, the University of Lausanne, Exprima Media, the Bioscience High School (Phoenix, AZ), and the New York Public Library.

The editorial board (group members listed above) will continue developing this project according to the time line stated under “Prospective Activities.” Cajsa Baldini will coordinate the project in advisement with other editorial board members. The work group is currently collaborating on textual resources and documents on Google Docs. In addition, the workshop at large will be consulted throughout the project. Key units (above) will be apprised as needed and requested.

PROPOSED ACTIVITY

This group proposes one major project: producing a critical annotated edition of Mary Shelley’s novel *Frankenstein; or, The Modern Prometheus* (1818) with a broad scientific scope for educational usage.

- Indexing copy text (ongoing): May 2014
- Rating index terms for significance: May – June 2014
- Publication prospectus: July 2014
- Commission annotations, brief subject essays, and art: Fall 2015
- Explore digital companion resources/MOOC integration: Spring 2015
- Assemble materials/Creature: Fall 2015
- Publication: Summer 2016

“IT’S ALIVE!”: FRANKENSTEIN ON FILM

Group members: Aaron Baker, Arizona State University; Julie Codell, Arizona State University; Joey Eschrich, Arizona State University; Gretchen Gano, Amherst College; Alberto Garcia Jr., University of California, San Diego; Joel Garreau, Arizona State University; Peter Lehman, Arizona State University; Devi Snively, Screenwriter and Filmmaker; Sidney Perkowitz, Emory University; Susan Stryker, University of Arizona

OVERVIEW

The Film group’s conversation throughout the three days was relatively focused on a core set of eight projects. However, we believe that film is an excellent medium to get broad swaths of the public involved with thinking about science, technology, societal consequences and creativity through *Frankenstein*’s lens. As such, we have a number of additional ideas that we did not develop in as much depth, but are also excited about working on.

Our main set of eight ideas are meant to be ambitious and diverse, and we focused on developing activities that would take place in a variety of locations, ranging from movie theaters and museums to television channels, film archives and the living room.

1. The Hoax will be a short film, distributed digitally through public channels like YouTube and Vimeo, and on social networks and press releases. The hoax would be a film about a radical leap forward in the science of creating new life in the lab (similar to this April Fools’ Day joke from the University of Michigan about an invisibility spray: <http://www.engin.umich.edu/college/about/news/stories/2014/april/cloaking-paint>). The hoax gives us an opportunity to engage people’s imaginations and activate their anxieties about synthetic life and the human power to create. We would deploy the hoax video through the popular scientific press, as well as in classrooms and research focus groups along with a curriculum and/or research protocol. The hoax will excite the public about the Frankenstein Bicentennial Project and encourage reflexive and deliberative thinking about the benefits and pitfalls of creating new life.

2. The Archive will be a massive archive of *Frankenstein* films, possibly assembled in collaboration with the American Film Institute (one of our group members has a film archivist contact there) and/or the Internet Archive. The archive will be a resource for scholars – *Frankenstein* is one of the most prevalent characters in the history of film – and a platform for public conversations, lectures, movie nights and festivals.

3. Frankenstein – The Club is based on the work of our group member Susan Stryker of the University of Arizona. It is an immersive, kinesthetic experience of the

visual culture and imagery associated with *Frankenstein* that could be deployed in a gallery, science center, black box theater or nightclub. It involves harvesting fragments of key thematic, scientific, philosophical, technical and artistic moments from the hundreds of *Frankenstein* film adaptations and *Frankenstein*-inspired films throughout history and cutting them together in interesting ways to encourage audiences to make new connections and think about the novel and its cultural and scientific resonances in new ways.

4. Crowdsourced Documentary: This project will challenge people all over the world to find and document *Frankenstein*-related phenomena, from scientific research and literary culture to artistic practice and technological change, in their corner of the world. A central team of filmmakers will manage a digital platform to collect these short film snippets and combine them with interviews and reportage that they complete themselves to create a feature-length film representing perspectives on *Frankenstein*, science, research and culture worldwide.

5. Short Film Competition: In partnership with a television challenge like IFC, PBS, SyFy or Sundance. Winning films would be screening in a 24-hour block on January 1, 2018, the bicentennial of the novel's publication.

6. Audio-Video Book: Many people are familiar with the *Frankenstein* mythos primarily through film and other visual culture, and have not actually read the original novel. We will work with a cast of actors to record a full reading of *Frankenstein*, accompanied by visual imagery (photographs of setting and landscape, drawings of characters, technological diagrams, etc.) to create an immersive audiovisual experience of the novel. The visual imagery will be assembled with "bits and pieces," like Frankenstein's creature, collected from collaborators worldwide.

Other major projects our group discussed, but did not develop in detail, include the following:

1. Deliberative Platform: We believe that the working groups should come together around a digital platform that will enable thoughtful conversations about *Frankenstein* from a variety of disciplinary perspectives, from science and engineering to arts, humanities and social sciences. This platform could be used to pose major questions about *Frankenstein*, scientific progress and creating new life to the public, to begin conversations about these rich and sometimes contentious issues. It could also be used to run competitions, collect short films, essays, stories, photos, visual art, etc. It could also be a place for people to debrief after attending Frankenstein Bicentennial events and continue the conversations started at those events. It would serve as a hub for the project that invited students, educators,

science professionals, scholars and especially the broad public to participate actively in the Frankenstein Bicentennial Project.

2. Discussion Guides and Curricula: We had a number of ideas to develop discussion guides, “curriculum in a box” products, packages of films and other formal and informal learning materials that could be used in classrooms as well as in science centers, science cafes, science taverns, community groups, book clubs, and so forth.

3. Larger Projects: We had two large, ambitious project ideas that we did not discuss in much depth during the workshop. First, to work with a film production company to recruit top filmmakers to participate in a compilation film comprised of short films on a specific aspect of the *Frankenstein* phenomenon. Recent examples of these types of films include *Paris, je t'aime* (2006) and *New York, I Love You* (2008), which focus on the unique culture and character of two iconic cities. Second, to create a *Mystery Science Theater 3000*-style film (or series of films) that adds clever “interrupting” comedy from a small cast of hecklers to classic (or particularly schlocky) *Frankenstein* cinema.

4. Research: Group members introduced a panoply of possible research projects around *Frankenstein* and film. Most of our group members were humanists or social scientists, so the projects tended to skew towards cultural history, critique and interpretation, but the field is very open for scientific and technological research as well, especially in the area of the history of technology. Projects proposed and discussed in our group included: the roles of women in early *Frankenstein* films, the fascination of early cinema with the animated human body, *Frankenstein* as a forerunner to the steampunk culture and aesthetic, a study of *Frankenstein* films’ treatment of the male body, and *Frankenstein* viewed through the lens of queer theory. Finally, we propose to create a definitive high-quality filmography featuring film adaptations of *Frankenstein* and notable films inspired by *Frankenstein*, as a resource for scholars, teachers, film festival programmers, students and science center staff.

5. Book Projects: First, a scholarly edited volume featuring scientific, technical, artistic, humanistic and social science perspectives on *Frankenstein*, its cultural legacy and its scientific and technological futures. Second, a Taschen-style (<http://www.taschen.com/>) art book featuring stills from *Frankenstein* films along with analysis of *Frankenstein*’s scientific, technological, artistic and cultural legacies.

Our group is excited to tackle some of these projects, and we hope that other working groups, other scholars and institutions, and members of the public will take up some of these ideas and help us make them a reality.

A major challenge for the Film Archive project, but also many of our other projects, is making sure that we are in compliance with copyright and intellectual property law. For some of these projects, purchasing licenses and screening rights might become quite expensive. We will need to find support for resolving intellectual property issues, and possibly funding for acquiring licenses and screening rights. The best solution is to build partnerships with film studios, archives and other content creators and curators to gain access to *Frankenstein* film material free of charge, because of the project's impact for informal science and ethics education.

EXISTING AND PARALLEL PROJECTS

- The SymbioticA Lab at the University of Western Australia (<http://www.symbiotica.uwa.edu.au/>) blends biological sciences with artistic exploration, including making films and creating interactive mediated environments.
- Future Tense, a partnership of Arizona State University, the New America Foundation and Slate magazine, holds a “My Favorite Movie” night with scientists, scholars, journalists and policymakers several times per year. This could be an excellent opportunity to do a highly visible public film event in Washington, DC.
- Our group member Susan Stryker is interested in helping us create special issues devoted to *Frankenstein* and monsters in any of the following journals: *GLQ: A Journal of Lesbian and Gay Studies*; *Somatechnics*; and *Transgender Studies Quarterly*.
- The Waag Society in the Netherlands (<https://waag.org/en>) is an institute for art, science and technology. The society develops creative technology for social innovation, including conducting research, developing concepts, pilots and prototypes, and acting as an intermediary among the arts, science and the media.
- In 2014, the city of South Bend, Indiana (home of Notre Dame University) designated *Frankenstein* its “One Book” that many community members will encounter in various formal and informal educational and social settings. Activities included panels, film screenings and performance festivals.
- Our group member Devi Snively suggests tapping into a number of horror film festivals that are quite popular with the U.S. film community throughout the country. We may be able to plan panels, screenings and series in conjunction with these already-extant festivals.
- Other festivals we should consider include Sci-Fi-London, Fantasia Film Festival (Montreal), and the Beijing Normal University Film Festival (our group member Peter Lehman is helping us with connections on this one).
- The Museo Nazionale del Cinema in Turin, Italy has an innovative approach of organizing screenings for classic films in rooms decorated to look like the sets of those films. This could be very evocative in the case of *Frankenstein*, with scientific and technological artifacts creating a backdrop for film screenings.

- Our group member Sidney Perkowitz is reaching out to his contacts at the Science and Entertainment Exchange (<http://www.scienceandentertainmentexchange.org/>, connects scientists, engineers and filmmakers to create a synergy between accurate science and engaging storylines in film and TV) and Imagine Science Films (<http://www.imaginesciencefilms.com/>), a nonprofit organization that uses film to draw attention to scientific knowledge and discovery. These organizations run festivals, film labs, residency programs, lectures, workshops and other outreach and network-building programs.

ONGOING COLLABORATION

Our group will use the forums on the Frankenstein Bicentennial Project website (<http://frankenstein.asu.edu>) as a way to communicate moving forward. We are also in contact via email about moving various projects we have discussed forward. Many of the projects could be supported by stakeholders and resources identified above, including the American Film Institute, the Science and Entertainment Exchange, Imagine Science Films, Future Tense, and television networks like IFC, PBS, SyFy and Sundance.

Additional sources of support could include:

- The John Templeton Foundation – our group member Devi Snively’s partner has a grant from the foundation and might be able to allocate some funds from his award to support development work on the crowdsourced documentary project.
- Devi’s partner is also a National Geographic Explorer, and might be able to help our group make connections to see if National Geographic would be interested in supporting various projects designed by our group.
- The Sundance Institute’s Documentary Fund (<https://www.sundance.org/programs/documentary-fund/>) could also be a source of support for the crowdsourced documentary project.
- The Coolidge Corner Theatre Foundation and the Alfred P. Sloan Foundation run the *Science on Screen* grant program (<http://www.coolidge.org/sloan>) to bring science programming to theatres all over the country. We could work with a local theatre in Arizona (like the Harkins chain, or the IMAX theatre at the Arizona Science Center) to apply for a grant to do a *Frankenstein* film series.
- Arizona State University’s Emerge: Artists + Scientists Redesign the Future, an annual informal education festival that brings together people from across the disciplines to create tangible visions of the future based on emerging technology, is willing to provide support for a host of *Frankenstein* activities in 2017. This could include film screenings and conversations, as well as a launch pad for organizing film competitions and premiering winning films. It would also be an ideal venue to stage the “Frankenstein – The Club” experience.

LIST OF PROSPECTIVE ACTIVITIES

The Hoax

- **Brief Description:** A short film, produced in collaboration with scientists and/or engineers, featuring a fictional breakthrough in the area of creating new life. The film will be distributed to the press and to classrooms and focus groups, and serve as a springboard for conversations about scientific discovery, ethics and possible consequences. Inspired by this April Fools' Day stunt by the University of Michigan: <http://goo.gl/NWG1L1>.
- **Details:** The film could be produced at Arizona State University, hopefully in the Biodesign Institute, which is at the forefront of cutting-edge medical and biological research. The goal would be to produce the film in 2015 and deploy it to the media and in classrooms/focus groups in 2016 to build buzz for the Frankenstein Bicentennial from 2016-2018.
- **Resources and Potential Collaborators:** We hope to work with colleagues at Arizona State University's School of Life Sciences and Biodesign Institute, as well as students and faculty from the School of Film, Dance and Theatre and the Walter Cronkite School of Journalism and Mass Communication that can help with filmmaking, editing and post-production and writing press releases. We would also like to work with faculty and graduate students in Social Psychology to conduct research on the hoax and its effects on cognition and critical thinking about scientific and ethical issues. We will also connect with Arizona State University's Office of Public Affairs to help build connections with local, regional, national and global press outlets.
- **Connection to STEM Topics and Areas:** The hoax will encourage critical thinking and learning about biology (esp. synthetic biology), ethics and the social implications of scientific discoveries. It will also engage social psychology through focus groups and classroom research.
- **Broader Impact:** We will make connections with popular media outlets like Slate magazine, the Huffington Post, Popular Science and io9.com to deliver the hoax video to millions of people worldwide. The engaging hoax video and the "reveal" that it is fake will give people an opportunity to examine their reactions and assumptions critically and have new kinds of conversations about synthetic biology and creating new life.
- **Intended Audience:** For classroom deployments, ranging from middle school through higher education audiences. For focus groups, focusing on college-age students. For the broad public deployment, the audience will include millions of readers who get science and technology news from the mass media.
- **Plan for Underrepresented Groups:** For the classroom deployments, we will focus specifically on schools in under-resourced areas in Arizona, working in consultation with Arizona State University's Mary Lou Fulton Teachers College. For research, sampling will strive for diversity in terms of racial, ethnic, religious and class

background – this will be necessary for a thorough and rigorous study of reactions to the hoax.

- **Funding:** Funding needs are minimal for this project. We may seek seed funding and in-kind support from partners at Arizona State University including the School of Life Sciences, the Center for Biology and Society, the Biodesign Institute and the Lincoln Center for Applied Ethics.

The Archive

- **Brief Description:** A massive, publicly-accessible archive of film adaptations of *Frankenstein* and films inspired by the *Frankenstein* mythos. The archive will be a platform for exciting public events, competitions and research projects.
- **Details:** Ideally the archive would be located in Los Angeles, CA at the American Film Institute (AFI), which has an ideal mix of exhibit space, research space and public event space for the project. Another possible partner is the Internet Archive, for a digital archive project. We would like to aim to have the archiving project significantly underway by 2016, to be launched publicly with a public event in 2017.
- **Resources and Potential Collaborators:** One of our working group members, Joel Garreau, has started to talk with Michael Jeck, an archivist at the AFI, about the project. Support from AFI would be enormously helpful. We would also seek a connection with the Internet Archive for a digital exhibit. Additional funding might be sought from the National Endowments for the Arts and Humanities, or perhaps through interagency funding that would involve the National Science Foundation.
- **Connection to STEM Topics and Areas:** Once assembled, the archive would become a highly public media story, and would be launched at the highly-visible AFI. We envision the archive being a marquee platform for events that bring together artists, humanists and filmmakers with scientists and engineers to discuss scientific creativity and its societal implications. The archive could also be used by scholars to conduct interdisciplinary research; for example, a scholar could track the representation of scientific instruments and of scientists as characters throughout the history of *Frankenstein* cinema.
- **Broader Impact:** The archive will provide a highly visible and culturally recognized focal point through the AFI partnership, and will be an ideal place to work with groups like the Science and Entertainment Exchange and Imagine Science Films on programming that bridges art and humanities with conversations and deliberation about science and technology.
- **Intended Audience:** The archive will have multiple audiences. The archive itself will be a resource for students and scholars, as well as for filmmakers doing work on *Frankenstein* in the future. The events and outreach that take place around the archive will have a broad public audience, while some specific events will focus on fostering networks among scientists and engineers and members of the arts and entertainment industries.

- **Plan for Underrepresented Groups:** In the composition of the archive we plan to include a diversity of films, including entries from non-U.S. filmmakers, women and filmmakers of color, and LGBTQ filmmakers. The archive could have an advisory board of scholars who are attentive not only to aesthetic quality and intellectual value, but also to issues of diversity and representation. If the AFI is our partner, Los Angeles is a city with significant racial and ethnic diversity, so we will work with local partners to extend communications and outreach to communities of color in the area.
- **Funding:** Staff and logistical support from the AFI, the Internet Archive, and/or other groups will be necessary to complete this project. We might also seek funding from the National Endowments for the Humanities and Arts, and/or funding from the National Science Foundation to support STEM-focused public events with an informal learning component. We will try to work with filmmakers, producers and content providers to secure free permissions to archive, preserve and present the films in the archive.

Frankenstein – The Club

- **Brief Description:** *Frankenstein – The Club* is based on the work of our group member Susan Stryker of the University of Arizona. It is an immersive, kinesthetic experience of the visual culture and imagery associated with *Frankenstein* that could be deployed in a gallery, science center, black box theater or nightclub. It involves harvesting fragments of key thematic, scientific, philosophical, technical and artistic moments from the hundreds of *Frankenstein* film adaptations and *Frankenstein*-inspired films throughout history and cutting them together in interesting ways to encourage audiences to make new connections and think about the novel and its cultural and scientific resonances in new ways.
- **Details:** The project is relatively simple and inexpensive to produce, and it would be free to show in an educational context – we can probably justify the use of short clips of a wide range of *Frankenstein* films in a multimedia montage as fair use as long as it falls under the umbrella of “commentary and critique.” As such, the project could be started as soon as 2015, and would be ready for public exhibition and performance throughout the Frankenstein Bicentennial celebration in 2016-2018. In terms of venues, we could offer up pre-created “mixes” of clips to various groups, including museums, galleries and science centers as well as nightclubs.
- **Resources and Potential Collaborators:** The project could be exhibited at local museums in the Phoenix area, such as the Phoenix Art Museum, Scottsdale Museum of Contemporary Art and ASU Art Museum. Susan Stryker can help with making connections in the Tucson, AZ area. Museums of digital art such as the Austin Museum of Digital Art, or museums with a strong video art component, might be interested in helping support and exhibit the work.
- **Connection to STEM Topics and Areas:** The intellectual work of this project is to survey the massive quantity of visual culture around *Frankenstein* to look for

patterns, common tropes and clues about various historical and cultural frames for understanding scientific and technological research, discovery and invention. The project would make clear just how powerful a force *Frankenstein* is in shaping our understanding of science, scientists and the ethical and societal dilemmas around scientific creativity.

- **Broader Impact:** We see *Frankenstein – The Club* as a way to reach groups of people who would not otherwise experience Frankenstein Bicentennial content. Perhaps these people are adults who spend more of their free time in clubs and bars than in museums. Or perhaps they are ardent horror or science fiction film fans, or people intensely interested in modern and postmodern art. This project has a significant physical, psychological and emotional impact on viewers that other proposed projects from our group will not have. It captures the deep, almost unconscious connections that we form over time with cultural myths and archetypes that shape our thinking.
- **Intended Audience:** Adults who may not be interested in traditional educational content; people who are interested in digital art, immersive media and video art; people who are dedicated genre film fans in horror and science fiction. Reaching this group would involve advertising in nightlife venues as well as arts websites and newsletters. To reach film audiences, we could work with independent movie theaters that often show art films.
- **Plan for Underrepresented Groups:** The nightclub venue potential of this project makes it easy to reach a diverse range of people. The concept for the project is based on similar work that Susan Stryker has done with visual culture around Christine Jorgenson, the first transgender movie star. The Jorgenson “club” experience has been set up in clubs with a significant LGBTQ clientele. We will work with Susan to plan an outreach strategy focused on reaching diverse groups.
- **Funding:** Significant funding is not needed for this project. Setups at specific venues might be involved or costly, but the basic work requires off-the-shelf computer hardware and software and can be completed with relatively minimal training.

Crowdsourced Documentary

- **Brief Description:** This project challenges people all over the world to find and document *Frankenstein*-related phenomena, from scientific research and literary culture to artistic practice and technological change, in their corner of the world. A central team of filmmakers manages a digital platform to collect these short film snippets and combine them with interviews and reportage that they complete themselves to create a feature-length film representing perspectives on *Frankenstein*, science, research and culture worldwide.
- **Details:** Filming and information collection would begin in 2016; the announcement of the crowdsourcing project would be part of the launch of the Frankenstein Bicentennial. The final film would be released in 2018. Our group member Devi

Snively, an independent filmmaker and instructor at Notre Dame University, would be instrumental in coordinating the project.

- **Resources and Potential Collaborators:** Devi Snively's partner has an existing grant from The John Templeton Foundation, and he might be able to allocate some of his grant funds for development on this project. He is also a National Geographic Explorer, and might be able to help us secure support for the project from National Geographic. We might also work with groups like the USA Science and Engineering Festival, which regularly runs film competitions, and Intel's Tomorrow Project, which has a record of success working with Arizona State University and the Society for Science & the Public on multimedia competitions focused on science fiction.
- **Connection to STEM Topics and Areas:** In our call for broad participation, we will ask people all over the world to submit a variety of types of film content, ranging from short films focused on art, literature and culture to those focused on STEM topics. A significant element of the film will be exploring the scientific and technological legacy of *Frankenstein* and consider how humans continue to grapple with the challenges of creating new life.
- **Broader Impact:** We imagine that this crowdsourced documentary could be a public centerpiece for the entire Frankenstein Bicentennial Project. It has the potential to be distributed in movie theaters, and/or screened on television channels focused on documentary and independent film, such as IFC, SyFy, Sundance and Current TV. The film could engage millions of people in thinking critically about how *Frankenstein* has shaped our public conversations about science, technology, innovation and ethics.
- **Intended Audience:** We imagine the intended audience for the film being quite broad, from high school and college classrooms to documentary fans and perhaps the filmgoing public, who will be intrigued by the concept of exploring *Frankenstein* in all of its complexities.
- **Plan for Underrepresented Groups:** We will send out calls for participation to organizations for underrepresented groups in science, engineering and technology fields (e.g., Association for Women in Science, Society of Women Engineers, American Indian Science and Engineering Society) and organizations for underrepresented groups in the film industry (e.g. Women in Film and the National Organization of Black Directors).
- **Funding:** Our group member Devi Snively's partner has an existing grant from The John Templeton Foundation, and he might be able to allocate some of his grant funds for development on this project. He is also a National Geographic Explorer, and might be able to help us secure support for the project from National Geographic. Other potential sponsors include PBS, A&E, the Sundance Foundation, the Sloan Foundation and the SyFy network.

Short Film Competition

- **Brief Description:** Mary Shelley conceived and wrote *Frankenstein* on a dare, and we can revive this dare in a highly public way with a global challenge to makers of short films, both fictional and documentary/educational. The winning films will be shown on a 24 loop on a partner television channel on January 1, 2018 – the bicentennial of the publication of the novel.
- **Details:** The call to filmmakers would go out in mid-2016, and entries would be due by mid-2017, so judges have sufficient time to select the winning entries for the January 1, 2018 event.
- **Resources and Potential Collaborators:** We will seek support from organizations like the American Film Institute and PBS to spread the word about the competition, and professional organizations for filmmakers could help spread the word as well. Other valuable partners include science centers and museums, university film departments, film festivals, and science festivals such as the USA Science and Engineering Festival, which runs film competitions of its own. We will also reach out to Imagine Science Films and the Science & Entertainment Exchange through our group member Sidney Perkowitz. Organizations such as the American Film Institute and Sundance might help with judging and competition management. A key partner for this activity is a television channel that will air the winning entries, such as PBS, A&E, Sundance, IFC or SyFy.
- **Connection to STEM Topics and Areas:** The film competition will include a number of sub-competitions, including competitions on films focused on the future of engineered life, films focused on current synthetic biology, and films that explore the ethics of scientific and technological innovation. The winning short films, distributed through high-profile partners, will have a major impact on informal STEM learning, reaching many thousands of people nationwide and internationally.
- **Broader Impact:** The competition will be a highly visible platform for exploring science, technology, culture, art, literature and ethics, will engage hundreds of professional and amateur filmmakers, and will capture the imagination of the public. The winning short films, distributed through high-profile partners, will have a major impact on informal STEM learning, reaching many thousands of people nationwide and internationally.
- **Intended Audience:** The competition will appeal to professional and aspiring filmmakers, including students in college and high school, as well as science programs at science centers, museums, and universities seeking a highly public platform to share their work. The winning short films will be aimed at the broad filmgoing public, and will be especially attractive to fans of documentaries and the horror and science fiction genres.
- **Plan for Underrepresented Groups:** We will send out calls for participation to organizations for underrepresented groups in science, engineering and technology fields (e.g., Association for Women in Science, Society of Women Engineers, American Indian Science and Engineering Society) and organizations for

underrepresented groups in the film industry (e.g. Women in Film and the National Organization of Black Directors).

- **Funding:** Our group member Devi Snively's partner has an existing grant from The John Templeton Foundation, and he might be able to allocate some of his grant funds for development on this project. He is also a National Geographic Explorer, and might be able to help us secure support for the project from National Geographic. Most importantly, major funding and support will come from the television channel airing the winning films – prospects include PBS, A&E, Sundance, IFC and SyFy.

Audio-Video Book

- **Brief Description:** *Frankenstein* is enmeshed in our global culture and incessantly referenced in art, science, politics, and academia, but relatively few people have read the actual novel. This project aims to return our attention to the original source of this cultural and scientific phenomenon by giving people the opportunity to experience the original text through an audiovisual medium. We will work with a cast of actors to record a full reading of *Frankenstein*, accompanied by visual imagery (photographs of setting and landscape, drawings of characters, technological diagrams, etc.). The visual imagery will be assembled with “bits and pieces,” like Frankenstein's creature, collected from collaborators worldwide.
- **Details:** The project will launch on June 16, 2016, the bicentennial of Shelley's famed conception of the *Frankenstein* story at Lake Geneva, with a release of an entire audio track of the novel. We would invite people to contribute video footage to begin visually narrating the story in bits and pieces with their own original contributions. There will be a review process to ensure that clips contributed are appropriate and do not violate copyright. The goal is to have an entire curated “video track” to accompany our full audio reading of the book by January 1, 2018, the bicentennial of the novel's publication. We envision the audio-video book running on a loop in a dedicated room as part of a *Frankenstein* museum exhibit.
- **Resources and Collaborators:** A broad range of collaborators will be needed to publicize this opportunity, from universities and science centers to television networks, magazines, libraries and film organizations.
- **Connection to STEM Topics and Areas:** Special energy on the part of the organizers will be put into highlighting the sections of the book that are most directly related to science and technology, and curating contributions to ensure that those sections are compelling, as well as educational and informative about the scientific, technological, and history-of-science issues brought up by the novel. The film is designed to be both a literary experience and a long-form platform for informal science education, embedding scientific fact, historical information, and explanation into a reading of the novel's full text.
- **Broader Impact:** We hope that the audio-video book project will draw increased attention to Shelley's original text, and enable more robust discussions of science,

technology, culture, and ethics grounded in the source text that started it all. The audio-video book will engage people more deeply in the entire Frankenstein Bicentennial Project by providing an immersive experience of the source text, and an intellectual platform for experiencing other activities, events, and conversations.

- **Intended Audience:** This project is especially aimed at young people and adults who are engaged in books and literature, but have not actually read *Frankenstein*. The novel's cultural saturation through science culture, films, cartoons, etc. seems to actually drive people away from reading the novel by giving them the sense that they "already know the story." The audio-video book aims to provide a unique experience that will interest these readers in Shelley's original work.
- **Plan for Underrepresented Groups:** We will send out calls for participation to organizations for underrepresented groups in science, engineering and technology fields (e.g., Association for Women in Science, Society of Women Engineers, American Indian Science and Engineering Society) and organizations for underrepresented groups in the film industry (e.g. Women in Film and the National Organization of Black Directors). We would like to make the audio-video book widely available for free through online platforms such as YouTube and Vimeo, which will make the book a resource for under-resourced schools.
- **Funding:** An interesting source of funding might be the American Library Association, or a science center or museum (in the sciences or the arts) that would be interested in exhibiting the audio-video book. The National Endowment for the Humanities is another potential source of funding for this endeavor to bring increased attention to the original *Frankenstein* text, present it in an innovative digital and crowdsourced format, and catalyze new conversations that cross the humanities, sciences, and arts.

MONSTERS ON STAGE: FRANKENSTEIN IN THEATER AND PERFORMANCE

Group members: Erik Fisher, Arizona State University; Lance Gharavi, Arizona State University; Manfred Laubichler, Arizona State University; Dawn Krykowski-Brodey, Actor and Writer; Stephanie Long, Science Museum of Minnesota; Christopher Norby, Composer; Ioanna Solidaki, Lunafilm; Hava Tirosh-Samuelson, Arizona State University

OVERVIEW

The theatrical possibilities for *Frankenstein*-inspired pieces are endless. The novel's conflicts, emotional tensions and the various themes are ripe for the dramatic arts. Furthermore, the scientific questions raised in the novel are securely grounded in humanitarian questions that beg to be dramatized. Live performances are essential to the science narrative. It is imperative that we include theatrical expression in the project to ensure that the idea of responsible innovation is delivered in a digestible form for the general public.

While *Frankenstein* theatrical pieces exist, few truly explore the connection between scientific responsibility and current innovation in an in-depth manner. Theatre, specifically science museum theatre, is perfectly suited for posing these questions and for inspiring the public to examine past, current and future issues. It is the perfect vehicle for creating a safe space for the public to examine, discuss and honor myriad opinions on scientific issues through the characters and dramatic action.

Other forms of performance art also fit beautifully into the social and scientific explorations of the novel and this project. Not only should new performance works be created and disseminated, a large festival, "FrankenFest," would encapsulate many mediums of art providing an entry point for those who do not identify as science seekers. These forms of "in the moment" art, such as a live orchestral performance to the 1931 film, will entice different demographics of the public and in turn introduce them to some of the scientific subject matter. A festival is also a wonderful opportunity to capitalize on existing works, such as the Bakken Museum's "Mary Shelley" monologue. Readers' theatre or staged readings of published works are also an option, as is a playwriting competition. It is important to note that "FrankenFest" is a multidisciplinary festival, not just an art festival, serving as a platform for other fields to showcase their products and ideas. It also involves collaboration from and with the other *Frankenstein* working groups.

As mentioned at the start of this paper, there are a plethora of options for the performing arts with this project, so our group has identified five components to explore in more detail. We came to these decisions by focusing on the talent, experience and infrastructure present in our working group. With that said, other ideas should still be given more consideration,

especially if a funding source is easily identified. The proposed programming ideas below are in no specific order.

LIST OF PROSPECTIVE ACTIVITIES

Museum Theatre Production

- **Brief Description:** The strength of a science museum theatre piece is that the scientific questions are central to the plot. All the characters actions are motivated by the potential impact of the innovation in question. This places the idea of creative responsibility at the core of the piece.
 - Exploring ideas around engineering the human body
 - Examining creative responsibility
 - Possible plot line: “Designer Babies.” A couple grapples with the decision to engineer their unborn child.
- **Details:** The Science Museum of Minnesota can commit to creating a fifteen-minute play for museum settings and a filmed version of the play for museums without theatre programs. The ideal time for preproduction would be the fall of 2015. The play would run from 2016-2018 at the Science Museum of Minnesota with additional performances at other museums, festivals and venues.
- **Resources and Potential Collaborators:** Other museums, the International Museum Theatre Alliance
- **Connection to STEM Topics and Areas:** Nature of science, biology, creative responsibility and engineering
- **Broader Impact:**
 - Film version could live online
 - Play could travel to FrankenFest
 - The script or a DVD of a filmed version could be included in the “Engineering Life” group’s Frankenstein’s Footlocker kits.
 - At Science Museum of Minnesota 40,000 people would experience the show live. The audience impact will be even higher if we pursue festival performances and dissemination of the piece.
- **Intended Audience:** General museum theatre audiences and students
- **Funding:** There is a need for funding preproduction work, dissemination and for securing buy-in from other museums. Additional travel funding would need to be sought. Without travel, a rough estimate would be \$15,000 with and an additional \$10,000 for a filmed version. The National Science Foundation and corporate sponsors (perhaps in the bioscience and biotechnology industries) are potential sources of funding.

Orchestral Soundtrack for 1931 *Frankenstein* film

- Brief Description: Create an orchestral soundtrack for the iconic 1931 film *Frankenstein*, produced by Universal Pictures and starring Boris Karloff as the creature.
- Details:
 - Performed live to picture initially at the Tempe Center for the Arts
 - The live show could travel during the Bicentennial period
 - The film could be distributed with the new soundtrack on DVD
 - It would take approximately six months to create the full score
 - The orchestra would need two weeks of rehearsal time
 - Our group member Christopher Norby has the professional experience and ability to compose the score.
- Resources and Potential Collaborators:
 - Utilize the Arizona Pro Arte Orchestra for the initial performance. Christopher is a composer in residence and on the board.
 - Christopher has connections with orchestras in the UK and Ireland.
 - Christopher composed a soundtrack for *Nosferatu* at the Tempe Center for the Arts. It was performed live on Halloween night and attracted a large crowd and a varied demographic.
- Connection to STEM Topics and Areas: This is primarily an artistic contribution and is a perfect fit for the FrankenFest. But drawing new audience members for the film will expose them to the *Frankenstein* myth's deliberations about scientific creativity and its consequences. The film could be followed by a panel discussion among scientists, film historians and ethicists to clarify these issues and provide an arena for conversation and deliberation.
- Broader Impact: This project has touring potential, and could possibly reach many thousands of people. A DVD version of the project would further amplify the project's reach and impact. Reaching the audience will require marketing and public outreach.
- Plan for Underrepresented Groups:
 - Christopher has experience teaching workshops in film scoring/composing at high schools.
 - We could offer a free matinee of live orchestration to film for children.
 - Orchestral musicians could run a "create a score through dramatic suggestions" workshop
- Funding:
 - Needs:
 - Composition fee
 - Musicians' fees
 - Copyright fees to project the movie
 - Venue costs
 - Recording fee to produce high quality soundtrack

- Ideas for Sources:
 - Selling the soundtrack
 - Arizona Commission on the Arts may be able to offer a development fee
 - Private contributions
 - National Endowment for the Arts grant to support the school workshops

FrankenFest

- Brief Description: FrankenFest is a multidisciplinary festival that explores all facets of the intersection of science, humanities and artistic expressions of the “*Frankenstein* phenomenon.” The goal is to develop all those sections at an equal level. This originality will be the master argument for funding. For this reason it is important to invite people from different countries and fields.
- Details: In the spring of 2016 (around the bicentennial of the novel’s original conception at the Villa Diodati on the shores of Lake Geneva), the FrankenFest will take place at The Glaciers, Geneva, Lausanne, Switzerland, and at the University of Lausanne near Lake Geneva, during the annual event “Mysteries of the University.” In January 2018 (the bicentennial of the novel’s publication), the event will move to Arizona State University in Tempe, Arizona. FrankenFest will include a week of the following:
 - Literary criticism
 - Historical reflections
 - Scientific concerns
 - Philosophical and religious panels on ethics
 - Gender dimensions
 - Live performances
 - Films historical and new (collaboration with the Film working group)
 - Playwriting and short film competitions
 - A trial at the end of the week (would need funding for a theatre company or museum theatre company to develop)
 - Theatrical performance
- Resources and Potential Collaborators:
 - University of Geneva, Private Foundations like Georges Soros or Steiner Foundation, Banks, Film Library/ Cinémathèque Suisse, Théâtre de Vidy, Théâtre de la Grange at UNIL, Aniquon Museum
 - The cities of Lausanne and Geneva
 - International Society for the Performing Arts
 - International Museum Theatre Alliance
- Connection to STEM Topics and Areas:
 - Creative responsibility (on part of scientists, engineers, technologists)
 - Provide humanistic background for STEM

- Put humanities on the same level as science and art
 - Biology, nature of science, history of science and medicine
- **Broader Impact:** The FrankenFest will reach a large audience. Since the festival is multidisciplinary and includes a variety of performance style, it would reach a diverse global audience.
- **Intended Audience:** All ages, all minority groups. We would ensure a variety of topics and performances, so there is something for every age group. The festival will need a designated marketing and event coordinator. Our group members Ioanna Solidaki and her husband Marc Audetat (a professor at the University of Lausanne) are working as a team to help reach audiences in Switzerland.
- **Plan for Underrepresented Groups:** FrankenFest will be priced to serve all income levels, and some festival events will be free and open to all audiences.
- **Funding:** Each festival would need an event coordinator; there will also be location and venue costs to account for. Ioanna and Marc are doing research to estimate total costs. Possible sources of funding include the Swiss arts council Pro Helvetia, other local foundations in Switzerland, local banks and the government of Lausanne and Geneva.

Frankenstein Theatrical Experience

- **Brief Description:** An immersive or non-immersive theatrical experience bridging the *Frankenstein* myth with emerging technologies.
- **Details:** Created by faculty and students at Arizona State University in Tempe, Arizona.
- **Resources and Potential Collaborators:** The project will be led by professors from ASU's Herberger Institute for Design and the Arts, in collaboration with professional artists.
- **Connection to STEM Topics and Areas:** The performance will deal with the theme of responsible innovation, and will address (and possibly involve as part of the performance) current research into robotics, artificial intelligence, synthetic biology and other technologies.
- **Broader Impact:** The performance will reach thousands of people through the FrankenFest (see above).
- **Intended Audience:** Adults and high school students.
- **Plan for Underrepresented Groups:** The experience could be silent or a spoken word opera with the text of the lines projected, allowing it to be adapted for international audiences in different languages. We will plan free or inexpensive matinee performances for high school students in under-resourced areas.
- **Funding:** Arizona State University can fund some development on the project, but will need assistance with costs for travel to Geneva and hiring designers and artists to collaborate. Possible sources of funding include internal Arizona State University grants, a National Science Foundation grant, and/or funding from the National Endowment for the Arts.

Capitalize on Existing *Frankenstein* Work

- **Brief Description:** Capitalize on existing theatrical and performance work related to *Frankenstein*.
- **Details:** The goal would be to expand and amplify existing work, including bringing Dawn Krykowski-Brodey's "Mary Shelley" one-woman piece to festivals, and identifying theatrical companies already doing *Frankenstein*-themed work, published scripts related to the topic, and other existing and relevant museum theatre pieces.
- **Resources and Potential Collaborators:** Nanoscale Informal Science Education Network, International Museum Theatre Alliance, Association of Science-Technology Centers, American Alliance of Museums, Association for Computing Machinery, The Playwrights' Center. Our group member Stephanie Long has experience working with all of the above groups, but we could seek out other organizations and form new relationships as well.
- **Connection to STEM Topics and Areas:** STEM areas would be relevant in all cases, but would vary depending on the specific partner organizations involved.
- **Intended Audience:** Audience would be different for each existing work and organization.
- **Plan for Underrepresented Groups:** Use the partner organizations' existing plans for reaching diverse audiences.
- **Funding:** Salary relief would be needed for Stephanie Long (of the Science Museum of Minnesota) or someone else to serve as the lead to coordinate this theatrical network. This would cost approximately \$20,000 over two years to create a large network.
- Would be different for each existing work and organization
- Salary relief is needed for Stephanie or someone else to serve as the lead to coordinate this theatrical network. Rough estimate is \$20,000 over two years if we create a large network. One possible source of funding is the Jerome Foundation in Minnesota (<http://www.jeromefdn.org/>).

MOOCENSTEIN: FRANKENSTEIN GOES GLOBAL

Group members: Kathlyn Bradshaw, Algonquin College; Elizabeth Denlinger, New York Public Library; Steve Gano, Object Cult, LLC; Ryan Heisel, Bioscience High School (Phoenix); Mark Lussier, Arizona State University; Bruce Matsunaga, Arizona State University; Katie Peige, Arizona State University; Corey Pressman, Exprima Media

OVERVIEW

This working group will discuss the development of a Massive Open Online Course (MOOC) to be produced by an interdisciplinary group of scholars across a range of institutions, and to be offered during the 2016-2018 bicentennial celebration and beyond. The MOOC will use the novel *Frankenstein* as a gateway for connecting STEM content with humanities, social sciences, and arts, and it will create an international community of thinkers critically engaged with the ethical, legal, and societal issues raised by *Frankenstein* beyond traditional college and university environments. The group will also advance efforts to establish *Frankenstein* as a “One Book” that is simultaneously enjoyed and discussed around the world during the multi-year bicentennial celebration. This collective reading experiment will invite a diverse public into a dialogue that models the freewheeling intellectual discourse of Mary Shelley’s day, mixing chemistry, poetry, biology, and other subjects with the urgent ethical concerns of a world where artificial life is not a dream but, increasingly, a reality.

From the onset of our discussions, our working group was deeply dissatisfied with the current state of both xMOOCs (proprietary platforms, restricted licensing) and cMOOCs (multiple platforms, open license). Over the next three days, we began the task of teasing out a wish list of features that we would want in a MOOC centered on *Frankenstein*; or, *The Modern Prometheus*. Our notes are viewable at: <http://bit.ly/1uaN35p>

Wish List

- Collection of deep links that allows the reader to deep dive to other courses and course content while allowing a seamless reading experience with VIC³ (Vertical Inline Conversation / Collaboration / Community)
- Dynamic content – not just supplemental text and pictures but interactive modules that could gamify learning (examples: content from Exprima Media and Inkling)
- Ability to return to precise reading location
- Constellation of Digital Objects (CDO)
- “Intertwined” courses and texts
- Ability for instructors to turn on/off facets of CDO based on tags and Natural Language Processing

- Efficient social aspects within the system (solves the chaos of using third-party platforms for social features, which is common for cMOOCs)
- Discussion boards
- Shared notes system
- Allow users to select privacy
- Ability to follow / hide other users
- Allow discrete groups for classes
- Avatars and gamification of social in the MOOC
- Readers get a personal blog area
- Real-time, reading-location based chat for impromptu discussions about content
- Use the other working groups as themes to structure supplementary content
- Curate supplementary content scraped from the other working groups

EXISTING AND PARALLEL PROJECTS

The events around the Frankenstein Bicentennial Project provide opportunities to cross-fertilize in terms of both content generation and advertisement. Our group spoke with other working group members about this integration and we have positive impressions for future collaboration.

ONGOING COLLABORATION

The entire group has committed to continue working together on this project, as evidenced in our to-do list (see below).

LIST OF PROSPECTIVE ACTIVITIES

Our list is different from the other groups who were planning events. Our list is more of a to-do list:

- Establish a flowchart for technical implementation – (Bruce Matsunaga, Corey Pressman, and Steve Gano)
- Establish a list of prospective funding sources – (Mark Lussier, Kathlyn Bradshaw, Elizabeth Denlinger)
- Coordinate a list of FrankenFest connections (see the “Theater and Performance” group report for more details) that we would partner with to launch and publicize the MOOC (full group)
- Create a final implementation plan (full group)

ENGINEERING LIFE: DISTRIBUTED DEMONSTRATIONS

Group members: D. Vaughn Becker, Arizona State University; Ira Bennett, Arizona State University; Prasad Boradkar, Arizona State University; Tirupalavanam Ganesh, Arizona State University; Karmella Haynes, Arizona State University; Steve Helms Tillery, Arizona State University; Micah Lande, Arizona State University; David Sittenfeld, Museum of Science - Boston; Sara Walker, Arizona State University

OVERVIEW

At any given time, scientific and technological possibilities influence both society's capacity for imagination and the range of societal norms and expectations that societies establish with regard to new technologies. The long-term implications of socio-technical systems can be difficult to foresee for the very people who are envisioning, implementing, and evaluating those innovations, both because of the inherent uncertainties and because of differing perspectives, skills, and values. The "Engineering Life: Distributed Demonstrations" group will work as a team to create an array of varied and effective educational products that will engage diverse publics in better understanding the way living systems and biological engineering works, in an effort to foster deeper consideration and imagination around the unique possibilities and societal implications that biological engineering and other transformative technologies present for society. Although we describe particular target audiences for each of these projects, we feel that we can adapt many of these products for different kinds of audiences and participants.

Major educational objectives will address the following three primary thrusts:

- ***What is life?*** How have our understanding and our definitions of life changed over time, and how have science and technologies enabled these changes? How have living systems and organisms inspired humans in their engineering throughout history, and how does this continue today? What are the essential elements and consideration for something to be considered "alive," and are there lessons from history we should apply to the innovations of today and tomorrow? Demonstrations and activities will deconstruct and inspire visitors in learning about and considering concepts such as genetic coding, biomimicry, genetic and biological engineering, robotics, and artificial intelligence.
- ***How can/do humans change living organisms and systems?*** How have humans altered living organisms in the past (knowingly and unknowingly), and how have these practices influenced our visions and directions now and in the future? How are new techniques and ideas stretching the bounds of what is possible in this realm, and how can diverse publics separate science "fact" from science fiction in a rapidly changing world? Demonstrations and activities will highlight and explain

historical and emerging examples such as selective breeding, recombinant DNA, physical and cognitive enhancement, life extension, gene therapy, and synthetic biology.

- ***How can we make the most responsible decisions about engineering life?***

Scientific and technological capabilities to transform living systems have outpaced societal awareness and deliberation around these issues. Engaging and fun hands-on activities, combined with deliberation and discussion, will bring scientists and everyday citizens together to share perspectives and consider together how biological engineering and other associated technologies can help to address some of society's most pressing problems and enable new kinds of innovation, while minimizing unanticipated negative impacts.

Our overarching objective is to spark imagination, scientific curiosity and systems thinking while engaging diverse publics and the scientific community in conversations around the societal implications of issues such as synthetic biology, artificial intelligence, physical and cognitive enhancement, robotics, and life extension.

EXISTING AND PARALLEL PROJECTS

- Arizona State University's status as a new kind of interdisciplinary American university provides good footing for ASU as a convening entity in this work.
- We will build upon strong existing relationships and public engagement collaborations between the Center for Nanotechnology in Society at Arizona State University and science center networks around emerging technologies. Examples are connections with Nanoscale Informal Science Education Network, Arizona Science Center, the Museum of Science-Boston and [Expert and Citizen Assessment of Science and Technology](#). We also have connections with children's museums and discovery museums.
- Social Action for a Grassroots Astrobiology Network (SAGAN, <http://saganet.org>) is an ASU-created virtual network for discussions around astrobiology and provides a template for continuing and documenting outcomes for elements we will create in these activities.
- Synthetic biology networks and collaborative projects such as SynBERC, iGEM, BioBricks, and the Biobus project will be highly important to leverage and build upon in these efforts as well. SynBERC and iGEM are starting to cultivate relationships with science centers as well, particularly with the Museum of Science - Boston.

- ASU's Office of Knowledge Enterprise Development and Quanta, an educational outreach and research platform for middle and high school students, can be ways of disseminating the products that we create.

ONGOING COLLABORATION

We have a number of existing resources and outstanding proposals that could be applied for certain parts of these ideas. However, we hope to collaborate as a group to make these efforts happen in the absence of these resources. We constrained our ideas to things that seemed possible. However, we really want to explore wackier ideas that may stem out of these and try to prototype them using existing resources.

LIST OF PROSPECTIVE ACTIVITIES

Engineering Life Presentation

- **Brief Description:** A 20-minute presentation on innovations and changes to living systems throughout history, from deep past to future.
- **Details:**
 - Will provide basic script and materials for demonstrations and presentation around the history of life and its responses to changes.
 - How has life changed in the past (tour of history into the future)? Examples of where people have explored/tinkered with living organisms
 - Mendel / Darwin / rDNA (How is this affected? How we talk about changing creating life – ideas such as selective breeding, etc.)
 - How to deal with uncertainty and potential of the future?
 - History of pathogens, similar to virologist Nathan Wolfe's cancer seminar: how we use pathogens to advance scientific understanding of life. Viruses and bacteria as a way for innovations in basic and applied science.
 - How have major societal problems such as aging, disease, famine shaped societal norms and helped to drive the research agenda and spur innovation
 - Systems thinking – how to talk about history of life and earth – epigenetics. How do living things respond to their environment? Technological innovations in the context of the billions of years of earth's history – thinking about potential solutions to problems.
 - Window into emerging techniques, fields, and therapies - consideration of uncertainty and potential for future kinds of work.
- **Intended Audience:** Standard museum visitorship, but could be used in formal settings as well.
- **Needs:** Program materials, training videos, scientists to provide feedback
- **Funding:** NSF, Foundations, Biogen Idec

Frankenstein's Footlocker

- Brief Description: Kits of activities that people can do in science centers and public spaces.
- Details: Similar to NanoDays events sponsored by the Nanoscale Informal Science Education Network. PIs come to museum to engage broader publics around issues of synthetic life. These boxes would include everything needed to put on an event with scientists for the general public at a science center, and would include Spanish language translations.
 - Activities could include:
 - Zapping frog legs
 - Turing Test for artificial intelligence
 - Biocircuits and gene activation
 - Gene activation (how to turn genes on and off) – genetic switch
 - Canned synthetic biology stuff
 - Genetic transformation
 - Difficulties of freezing things/cryonics
 - Inducible genes in yeast that cause changes in color
 - Bacterial resistance: 50/50 mix of microbes that have/don't have plasmid, then kill with antibiotics. How do you deal with changes in populations over time? Watch the decline in the number of bacteria, then see colonies climb back up. Envision solutions to the problem and directions for future innovation.
 - Engineered yeast: Blobs of them next to one another – interdependence of living organisms, chain reaction – where could this go? This would lead to discussions of biocontainment and biosafety.
 - Running Miller-Urey Experiment about the origin of life (http://people.chem.duke.edu/~jds/cruise_chem/Exobiology/miller.html) as a catalyst for discussion
- Intended Audience: General museum audiences, but also adaptable for universities and school settings. Other audiences include graduate students and DIY biobuilders.
- Needs: Training seminars, virtual home for the activities, resources for creating and disseminating the kits, staff time for participating educators at museums for holding the events, and scientists to run the sessions.
- Training: There would be a preliminary workshop around science communication and public engagement to help prepare participating students and scientist for work with the Frankenstein's Footlocker kits. The workshop would include thinking about diversity and equity issues and opportunities for mutual learning and societal implications.
- Funding: Support for the workshop, especially, would come from partnerships between a number of research institutions and local science centers with the idea of the science center as a convener for the events and skill-building. The idea is to try

and build something that would be a shared resource and cultivate skills among science educators, scientists, and the public that they would apply in future work.

Frankenstein's Workbench: Design Challenges For Engineering Life

- Brief Description: Engineering design challenges leading to open-ended collaborative problem solving and open competitions around computer science, biology, engineering, and robotics.
- Details: Groups will receive a challenge and a box of raw materials to build/create something out of biological materials. At culminating events, teams test and share their designs with one another and the general public at science centers – this could happen on the “FrankenFest” day described by some of the other groups. At the end of the time, the teams present their creations to one another and the general public, considering the following questions:
 - How would it be used?
 - Who gets to use it?
 - What does it need to work?
 - What would it cost?
 - What could it lead to?

We would need to build a community through virtual activities and crowd-sourced outcomes with participation from some kind of science celebrity and faces that people recognize. This could connect to marketing with projects such as iGEM and BioBuilder and build upon professional development activities being done by these groups. We would establish a virtual community and home for these products to share, get feedback, and continue collaborations and discussions between participants.

- Intended Audience: Middle and high school students and interested DIY enthusiasts (in separate categories for competition).
- Needs: Funding for staff time to create activities, infrastructure for data and virtual conversations. The project would also benefit from intellectual material and physical materials from sponsors.
- Funding: Lemelson Center for the Study of Invention and Innovation (<http://invention.smithsonian.org>)

From Pipet to Public Dialogues

- Brief Description: Exercises and lab programs with societal discussions embedded.
- Details: These would be open wetware activities and modeling exercises to unpack understanding of the kinds of concepts brought up in the ASU workshop with societal conversations. Examples include the golden bread lab from Biobuilder.org; gaming exercises that use population dynamics around mutation rates, resistance, etc.; and using game theory to model protein folding, bacterial population, and chemical evolution and allowing participants to play around with biological

simulations. These activities would provide a window into conversations around societal tradeoffs and decision-making.

- Intended Audience: Preregistered public or school groups.
- Needs: Materials, space, and staff time.

Tours of Innovation Spaces with Societal Discussions

- Brief Description: Tours of labs, factories, farms, etc., paired with discussions about societal impacts.
- Details: Participants would go into innovation spaces where people are transforming life and experimenting with new ways to learn more about life, explore these technologies, meet the scientists and engineers who are making these innovations come to life. Then they would discuss hopes/fears/dreams and recommend future areas for innovation and exploration.
- Intended Audience: Engaged public audiences with a particular focus on seniors, elderhostels, families, and school audiences.
- Needs: Spaces to bring people to, funding for transportation, snacks, and staff time for participating educators.

REINVENTING THE DARE: FRANKENSTEIN, SCIENCE FICTION, AND THE CULTURE OF SCIENCE

Group members: Gregory Benford, University of California, Irvine / Science fiction author; Michael Bennett, Northeastern University; Angie Dell, Arizona State University; Aileen Farrar, University of Louisiana; Ed Finn, Arizona State University; Ben Hurlbut, Arizona State University; Adriene Jenik, Arizona State University; George Justice, Arizona State University; Sally Kitch, Arizona State University; Gloria Lubkin, *Physics Today*; Manjana Milkoreit, Arizona State University; Gregg Zachary, Arizona State University

OVERVIEW

Over the course of the workshop this panel addressed a number of key questions related to the core creative myth of *Frankenstein; or, the Modern Prometheus*: the nature of the dare. The story of the *Frankenstein* dare is well-known by scholars of the era. Mary Shelley spent the cold summer of 1816 in the Swiss Alps with her husband Percy Shelley, the poet Lord Byron and his physician John William Polidori. To pass the time, the party challenged one another to create ghost stories (they had been reading some dark Germanic fairy tales for inspiration) and Mary Shelley won, hands down, with her gripping tale of scientific creativity and responsibility. Her bolt of inspiration that one night gradually expanded to become the novel we know today, and its synthesis of cutting-edge contemporary science (Galvanism, natural philosophy, political economics, etc.) led to a book that many regard as the first science fiction novel.

What is a dare? The dare is both an intellectual provocation and a statement about the future. It implies creative disruption as well as an implicit call for change. Literature, and especially science fiction, is a dare inviting the reader to see the world in a different way. *Frankenstein* pushes readers to grapple with the nature of human identity, our responsibilities as intellectual and biological creators, and with the role of language in defining reality. For Shelley, the spark came with “acute mental vision—I saw the pale student of unhallowed arts kneeling beside the thing he had put together” (Shelley 24). Her novel is itself a network of dares: a female author in a male literary world; a scientist crossing the moral and intellectual boundaries of his era; a creature coming to life and asserting its existence in the world; the intellectual and political revolutions racking European culture; the creation of a modern myth that continues to assert itself in popular culture and intellectual history.

A dare makes an assertion in the present that must be met or ignored in the future. It immediately foregrounds the question of our relationship with the future, which was a second major topic of discussion in our working group. The *Frankenstein* narrative is a way to engage with a broad set of challenges in contemporary scientific research that Michael Bennett helpfully identified under the rubric of *chronopolitics*: the ways in which our

relationship with time reconfigures everything from literary research to scientific policy. Dares allow us to explore adjacent possible realities and to push for specific forms of innovation and technosocial change. The Apollo Missions were a response to John F. Kennedy's famous dare. Tesla Motors recently shared all of its patents as a dare to the global auto industry.

Dares also force us to ask who we want to be as researchers, as participants in public discourses about innovation and the future. The Frankenstein Bicentennial presents a major opportunity to engage the public imagination in new configurations of the myth, from global climate change to synthetic biology. As Sally Kitch and others suggested, the dare allows us to explore in a proactive, highly compelling way, what exactly we mean by "future" and how we might achieve those visions. In this context the workshop began discussing dares as a pathway or invitation to productive forms of intellectual risk. How could we structure a set of dares that would invite new forms of inquiry, that might push established professionals and younger generations to challenge themselves to become more thoughtful, responsible creators?

As we turned to a concrete discussion of how we might implement these objectives, we closed our overview discussions by considering the role of the things we *can't* see, the impediments to achieving our dares. Viktor Frankenstein is both blind to the potential consequences of his actions and haunted by his resulting creation—his life is filled with the ghosts and specters of missing knowledge and bad assumptions. What specters lurk within the known spectrum of sociotechnical knowledge? How can we use dares to illuminate, to push researchers, artists and others from a wide range of fields to identify the blanks and silences in their own disciplinary world-views?

Before diving into specific details, our general response centered on the role of choreography and improvisation in structuring the kind of disruptive dares and challenges we will need to foster in the Frankenstein Bicentennial Project.

Works Cited

Shelley, Mary. *Frankenstein*. Ed. Johanna M. Smith. 2nd Ed. Bedford/St. Martins, 2000.

EXISTING AND PARALLEL PROJECTS

The Center for Science and the Imagination (CSI) at Arizona State University and the Consortium for Science, Policy and Outcomes (CSPO) engage in a number of activities relevant to the notion of the dare. In many ways both entities already function as institutional dare factories, challenging conventional thinking in public discussion and policy discourse of contemporary scientific issues.

Project Hieroglyph at CSI explicitly challenges well-known science fiction writers, scientists and engineers to work together on ambitious, techno-optimistic visions of the near future that are closely grounded in real research. The project's first anthology of fiction from this process is forthcoming from HarperCollins in September 2014. However, the most significant output of the project is the community of participants who have engaged in Hieroglyph's "moonshot ecosystem"—a supportive network of diverse experts who explore radical, ambitious ideas for innovation across a huge range of fields.

CSI hosts a second dare, an annual writing competition open to anyone aged 13-25, anywhere in the world, with submissions allowed in any language. The Tomorrow Project, a collaboration with Intel Corporation and the Society for Science and the Public, is an effort to spur broad public dialog about the future we want to live in (and those we might wish to avoid).

One of CSI's more recent efforts is a new science fiction writing competition hosted by *Issues in Science and Technology*, a flagship publication of the National Academies. The contest itself is a challenge to science fiction writers interested in engaging a highly influential technical audience. But it is also a dare to the readers of *Issues*, asking them how fiction might reframe major debates about our collective future and offering visions of how technical innovations and "wicked hard" problems will impact humans in local and global ways.

CSPO, too, has many dare-like activities but one particular example highlights the expertise already present in the Frankenstein Bicentennial Project community. To Think, to Write, to Publish challenges early-career science and innovation policy scholars and creative nonfiction writers to write true stories that communicate important science policy issues to a broad general audience.

Related Projects - Dare 1: Existing retreats, seminars, working groups

- Aspen Institute for Physics
- Asilomar
- JASON groups
- Headland Center, Banff Center for the Arts, Montavo (potential cosponsors who already have the infrastructure)
- University with housing (e.g. Santa Cruz—Asilomar)
- American Association for the Advancement of Science (AAAS) – potential cosponsor
- Breakthrough Institute
- Stewart Brand / The Long Now Foundation
- Rhizome
- Leonardo: Scientific delirium, madness (6 artists and 6 scientists)
- CultureLab: Art + Science Incubator (Grin City Collective)
- Arctic Circle Residency

- Djerassi Residency

Related Projects - Dare 2

- Maker Movement and Intel's Jimmy the 21st Century Robot
- Joseph Gordon-Levitt's *HitRecord on TV* crowdsourced variety show
- Virtual Choirs and massive online musical collaboration (example: Eric Whitacre's Virtual Choir, <http://ericwhitacre.com/the-virtual-choir>)
- Jake Pinholster and Lance Gharavi's science-based theatrical work at ASU's School of Film, Dance and Theatre (e.g., *A Brief Anniversary of Time*)
- Generative poetry and text—human/technology collaborative writing (e.g., John Sparrow)
- Enterprise Poetry Competition for Imagining a Future at the Massachusetts Institute of Technology (http://shass.mit.edu/undergraduates/enterprise_awards)

ONGOING COLLABORATION

Michael Bennett of Northeastern University and Aileen Farrar of the University of Louisiana are interested in being significantly involved with Dare 1, but are also excited about Dare 2

Angie Dell and her employer, ASU's Virginia G. Piper Center for Creative Writing, see potential for financial support; Angie would like to stay involved. One possibility: extending a poetry contest idea, possibly with John Sparrow's involvement. The Piper Center's Science Fiction/Fantasy Certificate Program could potentially be tied in. Or a Piper Studio Course could be involved. And Angie has a strong interest in residency programs, as part of Dare 1.

Gregg Zachary of ASU's Walter Cronkite School of Journalism and Mass Communication and Consortium for Science, Policy and Outcomes is interested in creating a dare around the future role of humans. How do you keep humans involved in complex systems? Are we heading towards mass leisure or mass poverty? Or both?

Lance Gharavi and Jake Pinholster of ASU's School of Film, Dance and Theatre are potential collaborators for the drama dare.

LIST OF PROSPECTIVE ACTIVITIES

Exercise our Specters: A Frankenstein Retreat for Raising Intellectual Risks and Creative Experiments

- Brief description: Who and what are your ghosts and specters? How can you see them? The assumed, the unthought, the hidden, the incomprehensible? This is a chance to examine the processes (the ghost in the machine) of scientific research, artistic research, writing and other contemporary modes of knowledge production. Participants should come out of this creative professional development experience

thinking about their work differently, and with the ability to explain their work more effectively. The retreat is an opportunity to examine the deeper implications of everyday intellectual and knowledge work and its implicit assumptions and dreams, particularly because of the potential that our work will be associated with us forever (e.g., Viktor Frankenstein is superseded by his monster). Outcomes will include unified theories and provocations through music, poetry, visualizations, performances, experiments, conversations.

- Details
 - Summer in the mountains—possibly in conjunction with artist in residence programs administered by the U.S. National Parks. We might target a seashore or lakeside location, to connect with the geographical lineage of *Frankenstein*, which Shelley initially imagined on the shores of Lake Geneva. Another possibility is Arizona’s Biosphere 2 facility, which has artist in residence and retreat programs and living/working facilities available.
 - Timing: Recruit in spring/summer of 2015; first retreat in 2016 (at least 2/3 people there for full 4 weeks; others can stay for 1 or 2 weeks)
 - Some structure for personal work/reflection time (maybe in the morning)
 - Other structured time for collaborative work
 - At the end of each retreat a public show and tell, gallery, talks, readings, etc.
 - Numbers: 10-20 participants; ideal number will be dependent on place and the application process
 - Everyone comes to the workshop with a dare to present to the workshop. Everyone has to accept a dare (like the “Commitments to Action” required of Clinton Global Initiative University conference participants: <http://www.cgiu.org/commitments>).
- Resources and Potential Collaborators
 - Connect to National Institutes of Health and National Science Foundation opportunities for outreach and professional development
 - Group member Gregory Benford suggests that wealthy sponsors might support the retreat in exchange for an opportunity to join the participants at private dinners and other engagements. Prospects include Peter Diamandis and Peter Thiel, who our group member Ben Hurlbut is working with currently.
 - Headland Center, Banff Center for the Arts, Montavo are among the potential cosponsors who already have the infrastructure to accommodate the retreat.
 - University with housing (e.g., Santa Cruz—Asilomar Conference Grounds, <http://www.visitasilomar.com>)
 - Other potential cosponsors: AAAS, Breakthrough Institute, Stewart Brand/The Long Now Foundation
- Connection to STEM Topics and Areas: Our plan is to invite a mix of people, including established scholars (e.g. Paul Davies, theoretical physicist, cosmologist,

Templeton Prize winner, and director of ASU's BEYOND Center for Fundamental Concepts in Science), young researchers, fiction authors, artists, etc. Conversations and activities will focus on emerging fields and questions in fields ranging from synthetic biology and artificial intelligence to neuroscience, physics and energy systems. We imagine engaging student thinkers and researchers by inviting select undergraduate students to participate. For example, we might work with ASU's Barrett: The Honors College to send a handful of students to participate; one could imagine research and discussion groups of three working collaboratively throughout the retreat, with one undergraduate student participant in each group.

- **Broader Impact:** We believe that the ideas developed during the retreat could have broad, transformative impact across a number of fields, from literature to the natural sciences. We are inspired by the evening of the original dare that led to *Frankenstein*; it was an almost mundane moment, but its outcomes have transformed how we think about art, literature and scientific discovery. The retreat will provide the quiet time, collaborative energy and intellectual space for groups to make significant progress on their selected dares and unveil their works-in-progress at the end of the experience, perhaps to a public audience.
- **Intended Audience:** We imagine the results of this retreat inspiring the next generation of transformational and inspirational thinkers about science, technology and their social implications – people like theoretical physicist and mathematician Freeman Dyson at age 18. In terms of an audience of participants, our two exemplar contributors are physicist, technologist, author and inventor Stephen Wolfram and author, journalist and activist Cory Doctorow. Wolfram and Doctorow exemplify the kind of seeking, intellectually curious mind that will thrive in this retreat; they are thinkers who do not think of their work in terms of specific disciplines or bodies of knowledge, but rather as a vehicle for changing the world.
- **Plan for Underrepresented Groups:** We envision inviting a few “civilian” participants who are not a part of rarefied science, technology, research and author communities as many of our participants. These participants would be selected to align with particular dare topics to which they could bring a unique perspective. They might be makers, citizen scholars, activists, deep subject matter experts, or people from the burgeoning DIY/Maker community. We might identify underrepresented constituencies to engage as participants or to share outcomes with through citizen science organizations such as CALPIRG, the Federation of State Public Interest Research Groups (<http://www.calpirg.org>). As we recruit undergraduate students as research collaborators, or collaborators on communication and dissemination of results from the retreat, we will work diligently with our partners (such as ASU's Barrett: The Honors College) to include members of underrepresented groups.
- **Funding:** See the “Resources and Potential Collaborators” section, above, for ideas about partners and cosponsors.

Drama Mashup: Reproduction in the 21st Century

- **Brief Description:** Reproduction will be one of the major “hot button” issues of the 21st century, which we imagine will be a century marked by massive biological advancement and change – perhaps even the *Frankenstein* century. Soon humans will have unprecedented levels of control over the production, reproduction and management of life: much like the vision put forth in the 1997 Hollywood film *Gattaca*, parents will soon have the option of not only “editing out” proclivities to disease in their children, but also the ability to edit in and out physical traits and even cognitive and personality characteristics. Our ethical burden as a socio-technical society will be multiplied when these powers become widely available, so we need to begin scaling up our societal capacity for deliberation, debate and governance now. This “drama dare” will have two components that will challenge people to use the tools of theatre and performance art to explore *Frankenstein* as a direct precursor to the techno-ethical dilemmas of today and tomorrow. First, we will dare middle and high school-age students to illustrate moments from *Frankenstein* in a contemporary light, selecting a passage from the original text and riff off of it, connecting it to contemporary and emerging issues. Second, we will commission a one-act play, perhaps through a competition, exploring issues around *Frankenstein* and the creation of life in the context of contemporary and emerging challenges. The play will not only be performed live but also recorded throughout the process of creation and performance so that fragments can be mashed up, remixed and reinvented by others all over the world. An inspiration is Joseph Gordon-Levitt’s *HitRecord on TV*, a “Frankenstein’s creature”-style production featuring short films, skits, songs, animations, live performances and stories crowdsourced from participants worldwide. This play could also be paired with a high school or college-level curriculum package that will enable educators to use the play as a starting point for in-class activities, projects and assignments that link science, technology, art, literature, ethics and social dimensions. A possible public engagement component could be to give people the opportunity to respond to a conceptual outline of the one-act play in process, create their own characters and share them through a digital community platform, and share their insights and feedback with the core set of narrative architects for the play. Another possibility is to challenge members of the public to upload online performances to add an Act II to the one-act play, extending, continuing and complicating the main story.
- **Details:** As the first thrust of the project, we will challenge middle and high school students to create their own illustrations of moments from *Frankenstein* in the context of contemporary scientific and technological quandaries. We will host outcomes from these challenges on a digital community platform for sharing, commentary and public engagement. As a second thrust, we will organize a one-act play competition or other means of commissioning or creating a one-act play examining the core issues of the reproduction and creation of life in the “biological century.” Following on the competition or commission of the one-act, we will launch an online competition to hack that one-act and write or perform Act II online. This

might involve a collaborative “assemble the monster” process where many different participants work together to create the hacked, remixed products or Act II extensions or responses. We imagine using an online tool like Vine, the 6-second video sharing service, to tightly constrain these contributions. A major inspiration for this constrained, fragmentary approach is *Pattern Recognition*, the 2003 novel by science fiction legend William Gibson, whose plot turns on a series of film fragments that appear anonymously on the Internet and possess a mysterious power over their viewers.

- **Resources and Potential Collaborators:** Jake Pinholster, director of ASU’s School of Film, Dance and Theatre, is a potential major collaborator for making this project possible. Because of the project’s crowdsourced, techno-democratic and collaborative ethos, we envision Cory Doctorow and his incredibly popular group blog, Boing Boing, being major collaborators in terms of communicating this opportunity to the public and soliciting participation. Creative Commons, a nonprofit organization that advocates for free, broad, open access to information and creative products, could also be a valuable partner in this regard. Matthew Gray, a theatre professor at Northeastern University, has a long-term collaboration with roboticists to create theatrical and performance products; he could be a valuable collaborator in terms of integrating artistic principles with technological, collaborative platforms. Don Marinelli, co-founder of Carnegie Mellon University’s famed Entertainment Technology Center and an adjunct professor at ASU’s School of Arts, Media and Engineering, can also be a resource in terms of fundraising, outreach to influential individuals and organizations, and integrating technology and aesthetics.
- **Connection to STEM Topics and Areas:** We imagine leveraging the STEM dimensions of this project through school outreach programs that combine experiments with readings and guided discussions about ethical concepts, social impacts and the creator’s responsibility for their creations. A possible early-stage partner for this outreach element could be ASU’s Preparatory Academy District, which consists of a preschool, elementary school, middle school and high school, all located in the Phoenix area. We also imagine the “steampunk” movement as an aesthetic pillar of this project. Steampunk culture links artistic expression, historical knowledge, and hands-on experimentation and innovation with science and technology principles and methods, and it can be used as an accessible way to raise awareness about scientific and technological issues, and give members of a public a greater sense of agency about contributing their own thoughts, designs, and engineering processes and objects. For the school-based thrust of the project, we plan to have students focus their work on the connections between *Frankenstein* passages and scientific and technological issues facing humanity in the present and future.
- **Broader Impact:** This project is about democratizing storytelling, building on other collaborative creative movements like DIY/Maker culture and Steampunk and on collaborative or sharing-intensive creative digital networks like Vine and DeviantArt. The one-act play has the potential to reach hundreds of thousands of people around

the world, not only through live performances but through digital viewing and video mash-ups, remixes, and Act II extensions and responses. Our classroom outreach ideas will bring *Frankenstein's* unique mix of science, technology, artistry, history and narrative into classrooms and challenge students to grapple with real scientific possibilities, but also their potential consequences – both positive and negative. To further intensify broad public engagement with the project, we might begin with a Kickstarter crowd funding campaign that will raise funds to support the one-act competition, public engagement activities, and dissemination to schools and classrooms and invite members of the public to invest in the project directly.

- **Intended Audience:** We plan to make the invitation to participate in the one-act project broad, working with universities; public schools; community organizations; professional and scholarly organizations for literature, theatre, science, and engineering; popular publications like *Slate*, *New Scientist* and *MAKE* magazine; and science and engineering fairs and festivals. We believe that promotion through popular media channels (through press releases and a publicity push supported by Arizona State University's public affairs community), along with appealing prizes and the chance for participants to see their work in a major venue (e.g., a Broadway show, the Toronto Film Festival, the EMP Museum in Seattle, WA) will attract many people to participate and contribute.
- **Plan for Underrepresented Groups:** We will use informal science hubs such as science centers and museums, local/state science festivals (such as the Arizona Science and Technology Festival, <http://azscitechfest.org>), and online citizen science communities to reach underrepresented groups. We will also work with professional and scholarly organizations that serve as network hubs for underrepresented people in STEM, such as the Association for Women in Science and the American Indian Science and Engineering Society.
- **Funding:** Possible funding partners include the Sloan Foundation; foundations with interest in bioscience and reproductive technology and research, such as the Doris Duke Charitable Foundation; the Gates Foundation, in the context of health research and futures; the genetics company 23 and Me; Google.org; the David and Lucile Packard Foundation, in the context of reproductive health; and companies that create video editing and manipulation software, like Adobe and Avid.

Other ideas the group is excited about, but that need more detailed conceptualization, planning and development:

The Dare Exchange

- A global, digital “truth or dare” network for posing and accepting challenges to change the world. An example of a similar digital network is ASU's 10,000 Solutions project (<http://10000solutions.org>).

The Frankenstein Cult

- A decentralized movement, like DIY or the Open Source movement around *Frankenstein*, hybridity, bio-hacking, remixing and mash-up culture, creating life and coming to grips with the social and ethical consequences of innovation. The movement would start online, with the goal of seeding *Frankenstein* thinking throughout culture and have people take up the Frankenstein ethos and interpret it on their own terms, through their own passions, skills, stylistic proclivities and social networks. Movement members might create relics and artifacts that somehow embody *Frankenstein* as a guiding ethos, or discover and reinterpret existing relics or artifacts. To kick off the movement, we might create a sigil (a powerful, iconic, magical symbol) that people can use to “stamp” their projects as associated with the Frankenstein Cult. We also might create a manifesto that would live online, along with some stories, narrative fragments and visual images. We also might quietly tap advocates to further the movement through their own networks and channels, including artists, student groups, museum and gallery curators, blog and website editors, scientists and engineers, makers and hackers, etc.

Science Poetry Competition

- A collaboration with ASU’s Virginia G. Piper Center for Creative Writing to create an anthology of poetry about scientific and technological creativity and societal/ethical consequences. This competition is inspired by the work of Alison Hawthorne Deming, a poet, nonfiction writer, professor of creative writing at the University of Arizona and the author of *Science and Other Poems* (LSU Press, 1994); Alison would be a potential partner to join the project and serve as a judge and help us reach out to poetry communities, programs and circles.

Vitalism Punk

- Steampunk, a subgenre of science fiction inspired by the technology, aesthetics and social structures of industrial Western societies in the 19th century, has been growing in popularity throughout the late 20th and early 21st century. Steampunk is a cultural style that neatly incorporates science and technology as inspirational principles, design elements and provocations to hack, make and learn more about STEM areas through artistic and artisanal modes of engagement. We propose to launch a number of activities to push the steampunk aesthetic slightly further back into Mary Shelley’s Romantic Era. We propose to call this “vitalism punk” – a new subgenre and cultural style that draws on early electrical technology and the era’s obsession with vital forces and invisible bodily mechanics, in the same way that steampunk draws mainly on steam-powered propulsion and industrial technologies and their accouterments. Vitalism Punk might spawn a decentralized movement (see “The Frankenstein Cult,” above), a digital platform for sharing art, writing and multimedia content; museum or gallery exhibits; collections of fiction and nonfiction writing and art; and events and performances that might stand alone or be

embedded into existing science activities such as ComiCon or national/global science and engineering festivals.

BRINGING NONFICTION TO LIFE: FRANKENSTEIN AND SCIENCE WRITING (CREATIVE NONFICTION)

Group members: Torie Bosch, Slate; Shannon Conley, Arizona State University; Claire L. Evans, OMNI Reboot; David Guston, Arizona State University; Lee Gutkind, Arizona State University; Jathan Sadowski, Arizona State University; Brenda Trinidad, Arizona State University; Michael Zirulnik, Arizona State University

OVERVIEW

From the [Bicentennial Project](#) website, *Frankenstein* represents a landmark fusion of science, ethics, and literary expression. The bicentennial “provides an opportunity for vivid reflection on how science is culturally framed and understood by the public, as well as our [scientists, engineers] own ethical limitations and responsibilities for nurturing the products of our creativity.” The “Bringing Nonfiction to Life: Frankenstein and Science Writing” group (herein referred to as the CNF group, for “Creative Nonfiction”) was charged with developing writing projects that “bring together social, cultural, artistic, and historical work on *Frankenstein* with STEM research and exploration inspired by or connected to the novel,” as well exploring ways to “leverage *Frankenstein* and the bicentennial to communicate with the public via print and online journalism.” In response the CNF group chose as its mission:

To communicate the scientific, ethical and artistic complexities of creativity and responsibility through true storytelling (plus one fantasy!)

To that end, the CNF group of professors, doctoral students, and practitioners representing a diverse array of disciplines and perspectives met for three days to brainstorm and create a list of proposed projects. Professional backgrounds and experience included freelance writers, physicists, performance ethnographers, editors of major publications, political scientists, cognitive scientists, communications scholars, musicians, and others. At the conclusion of the three days, the group felt confident and enthusiastic that the following list of goals and outcomes with tangible outputs could be accomplished over the course of the next four years. These include (in no particular order):

- Frankenstein Bicentennial Library
 - *Reflections after Creation: Scientists, Artists and Other Creators Discuss the Morning After*
 - *Monsters Under the Bed, Monsters Across Cultures*
 - *Following Frankenstein’s Footsteps: A Travelogue*
 - *SYNDicated Frankenstein* or *From the Monster’s Mouth: Essays and Dialogues on the Wisdom of Frankenstein*

- The Frankenstein Book Club: e-reader and readers' guide of the books the Monster and Victor read during the novel *Frankenstein*
- Frankenstein's Cookbook: Famous Chefs Design Monstrous Dishes - a gastronomical frankenfeast.
- Frankenstein for President!
- Coordinated call for special issues of academic journals across the natural and human sciences

If the pursuit of knowledge is one of the ideas at the heart of *Frankenstein*, then at what point and to what extent is the pursuit tempered, mediated, and/or influenced by a sense of responsibility, ethics and morality, then and now? Vibrant discussions through the workshop explored these questions both generally and specifically; some of the rationales and main emergent themes (identified in italics) driving the project proposals are contained in the following sections.

Who is the Audience?

On the first day of the workshop (April 28, 2014), the CNF group focused on the potential audience of the group outputs. Group leader Lee Gutkind stated that the group's work should be informative and compelling enough to connect with science, ethics, and social science; responsibly crafted creative nonfiction is just one among many ways to achieve this goal. After much discussion the group agreed that both scientists and the public would be potential audiences for the group's efforts. One participant noted that science and society topics are typically broached in ethics and social science journals, and recommended that science and engineering journals might be one avenue through which the group could speak to a science/academic audience. Ideas to reach the general public include book clubs, writing contests or travel-related experiences.

When the Creator and the Created Meet

For the remainder of Day 1, the CNF group discussed broad directions for potential Frankenstein creative nonfiction projects. To begin, what was the "science" described in the book? Gutkind ruminated on the actual absence of science in the book, and offered a thought experiment comparing "the science of then" to the "science of now." How would have scientists 200 years ago have actually created the monster, and what are we capable of now? Based on observations from four years of experience shadowing organ transplant surgeons, Gutkind noted a public concern and "envelope pushing" that accompanied the doctors and scientists testing transplant techniques, and described a gap between the "thinkers (software engineers) and the builders/engineers" from his fieldwork writing about robotics and medicine. A group member followed up to suggest that the CNF group focus on the idea of "hysteria around the monster," when the promise of technology can be completely lost due to the fear of "the monster." She proposed that a project might focus around researching evidence of "cyclones of communication" around the hysteria that has

accompanied certain scientific breakthroughs (such as the Human Genome Project research). When has the hysteria, instead of being squelched, morphed and evolved?

Another group member suggested a focus around “narratives of creativity,” such as transplant surgeons, the work of Craig Venter, and roboticists. Reflecting on the *Frankenstein* story, in which the omniscient narrator tells Victor’s story, and the Monster tells its own story, he specifically suggested exploring moments when the creator meets his creation through creative nonfiction tools. He also noted that a similar project is being conducted by a PhD Candidate in ASU’s Human and Social Dimensions of Science and Technology program who is researching similar “moments” as portrayed in film.

As the CNF group deliberated the question of to whom this work would be targeted, all agree that the audience would be scientists and engineers that may not normally reflect or recognize “when things change/that moment of change.” The work would focus either on reflections on scientific practice, profiling of a researcher, or both. This would be accomplished through recording oral histories, researchers “writing letters” to another researcher, or the scientist writing a letter to herself.

Stories of Failure

Focusing on stories of failure, and the blurring of the demarcation between success and failure, was another theme of the day’s conversations. The point was raised that “just because something is successful, doesn’t make it right.” Transplant surgeons, for example, save many lives, but they also initially crossed ethical boundaries and violated their colleagues’ trust, and along the way ultimately may have “done it because they wanted to do it.” In the *Frankenstein* novel, the creation of life is a success, in the sense that Victor accomplished his goal of reanimation. However, Victor also perceives the Monster as a successful failure, because he did not realize the full implications of his work. Because he perceives the Monster as a failure, he abandons it. The point of recounting stories of failure, the group agreed, would be able to describe and capture the ability of the scientist to reflect on the creative process that, in the *Frankenstein* novel, Victor is not capable of doing.

Monster’s Eye View

Another key theme that emerged out of the CNF group discussions was the notion of the “Monster’s-eye view.” One participant observed that there was no evidence of the Monster being evil until he was rejected by the family of cottage-dwellers. What self-perception and self-identity does the Monster have vs. that of others? Where did the Monster learn about the world and develop an initial self-identity? This idea opens up the “nuanced perspectives on issues of inclusion and exclusion,” noted one group member. The Monster is a person that we can feel sorry for, yet the story is a lesson that science can “bite back.” Are there examples of compassion on the part of or for the monster that also may be lessons? From this conversation emerged a few different ideas. One idea focuses on creating “Frankenstein’s Book Club,” which would provide a set of readings based on the books the Monster reads in the novel. ASU lecturer Cajsja Baldini currently assigns her students

readings based on the Monster's readings, an example of the potential success of this idea. CNF group members also suggested that famous writers be invited to read what the monster reads, and reflect on what "it made them become," similar to the Monster's experience. Others suggests that the famous writers "go on the road" for a speaker series in various public spaces to share these reflections or other aspects of the book. The group also discussed training local facilitators at public libraries and other spaces, who could engage members of the public in conversation around *Frankenstein*.

As a means of reintroducing the Monster to the public, one group member suggests a public engagement campaign with the slogan "Frankenstein for President." In contrast to the book, this would be a more "proactive" approach, one that allows the Monster to tell its story of "becoming." Depending on funds, the Monster could embark on "listening bus tour" to inform the public of "How I got to be who I am." Another aspect of the campaign could be a competition to design a new Frankenstein's Monster.

There are also a number of tropes and themes within novel regarding creation, responsibility, power, and control. These typically emerge from the Monster's own reflections. The CNF group agreed that a series of articles focusing on each trope, either published on *Slate* or other prominent journal, could be another salient way of "getting into the head of the monster."

International Dimensions

The CNF group agreed that it should also delve into the international dimensions of the *Frankenstein* motif. The Frankenstein Book Club would be one way of tapping into the international dimension of *Frankenstein*. The group envisioned the Frankenstein Book Club engaging with people across an entire community, similar to an experience of one of the group members' participation in a "big read" while living in a small town in Texas. A goal of the discussion would be encouraging communities to have conversations about science and ethics in "other spaces besides academia." One way the international aspects of the book club would emerge is to identify geographically diverse locations to host the book clubs. This international scale, while potentially complex, could yield some fascinating insights into culturally diverse values relating to "the science" as support material is prepared and interviews conducted with book club facilitators.

Drawing from the international dimension, another book idea was proposed, focusing on the notion of monsters and Frankensteins across cultures. The book centers on the question of "what are the monsters under the bed in different cultures?" The book would be titled *Monsters Under the Bed, Monsters Across Cultures*.

The final idea centering on the international dimensions of *Frankenstein* was the group's discussion of the "Frankenstein Trail." The Frankenstein Trail would follow a writer (or multiple writers) to the various landscapes depicted or mentioned in *Frankenstein*. It could

take the form of a single-authored book, or could also be an anthology or collection of essays discussing science in “especially exceptional places.”

In preparation for the next meeting at which more concrete proposals would be formulated, Gutkind challenged the group to come up with “three big dream ideas” to contribute. While developing these ideas, Gutkind asked the group members to keep in mind three key questions: 1) Why should we do this? 2) How can we make a gigantic impact? 3) How can we do it through creative non-fiction?

EXISTING AND PARALLEL PROJECTS

While the answers to the key questions described above continue to be discussed, the following projects work to answer them in concrete ways. These projects would exist in collaboration, coordination, or complementarity with other efforts associated with The Frankenstein Bicentennial Project. The first half of the list below contains projects discussed in the most in-depth and potential next steps, while the latter half of the list contains supplementary ideas that garnered high interest but still need to be fleshed out.

ONGOING COLLABORATION

Every effort will be made to coordinate with the other groups from this workshop. Working group leader Lee Gutkind is currently in conversation with publishers who are interested in printing the book series. The collaborative online space provided by the Frankenstein Bicentennial Project website will be used to share information and keep group members in touch with each other. Email communication will also be utilized to keep group members up-to-date and projects on task. As described below, securing a project coordinator as soon as possible to work throughout the entire Bicentennial period is crucial to continue the collaboration and turn ideas into realities.

LIST OF PROSPECTIVE ACTIVITIES

Frankenstein Bicentennial Library

- **Brief Description:** To create a repository into which various books, publications, articles and oral histories may be collected and made available. Issues such as where this repository would be housed and mechanisms by which to provide access remain to be decided. The CNF group proposes to seed the library with the production of the following four projects.
- **Details:**
 - *Reflections after Creation: Scientists, Artists and Other Creators Discuss the “Morning After”*
 - **Brief Description:** Collected essays by and interviews of various scientists and/or artists reflecting on their creations, breakthroughs, discoveries and failures. These narratives would ideally be written by

the scientists/artists themselves, or via a partnership between a professional author and a scientist/artist.

- Resources and Potential Collaborators: To date the list includes (acknowledging the need to include more artists and ensure inclusion of underrepresented groups as much as possible): Craig Venter, Rodney Brookes, Robert Jarkvik, Tom Starzel, Rebecca Skloot, Neil DeGrasse Tyson, Exene Cervenka. Institutional collaborators could include ASU's Lincoln Center for Applied Ethics.
 - Connection to STEM Topics and Areas: An initial focus would be topics related to synthetic biology and neuroscience research.
 - Broader Impact: The creative nonfiction approach will present the complexity of the science and the related personal struggles of the "creators" in way that is accessible to a wider audience.
 - Intended Audience: Designed to serve as a teaching tool for aspiring young scientists and engineers. As creative nonfiction, this would secondarily be a tool for at a broader public audience interested in learning more about the "human story behind the science," through both formal and informal education environments.
 - Funding: Obtain adequate seed money to commission one or two big name collaborators/contributors and some funds for prize money. A potential partner/funding source is ASU's Lincoln Center for Applied Ethics.
 - Next Steps: Identify "cyclones of communication" around which scientific debates have emerged that exemplify or highlight a potential "morning after" effect that creates a "monster" or results in unintended consequences.
- *Monsters Under the Bed, Monsters Across Cultures*
 - Brief Description: The book centers around the question "what are the monsters under the bed in different cultures?" by exploring various cultural interpretations of *Frankenstein*, and ways in which current scientific research may be interpreted through various cultural lenses. Bounded by themes such as composite beings and/or subcreations, these ideas could be explored through this book, either an edited volume or co-authored by two representatives in the CNF group, and include:
 - ❖ Archetype(s) of a human being playing God and creating something; what are similar and/or contrasting notions across cultures?
 - ❖ Collection of archetypes/creation myths, such as those found in the Native American culture.
 - ❖ Locating and exploring the juxtaposition of Milton/Frankenstein concepts in other cultures.

- Resources and Potential Collaborators: Journal *Monsters and the Monstrous*; American Association of Anthropologists; Virtual Institute for Responsible Innovation at ASU
- Connection to STEM Topics and Areas: Ties mythological ideas of “the monster” into modern day debates about science gone awry. Could provide novel ways to spark conversation in educational settings, across disciplines, and specifically open up conversations on doing “responsible science.”
- Broader Impact: Provides a mechanism by which to communicate science literacy/expand dialogue and themes through and to a variety of cultural groups.
- Intended Audience: Scholars, students, and the broader public.
- Plan for Underrepresented Groups: A number of different outlets would advertise the call for papers in order to establish a diverse group of contributors, from international backgrounds.
- Funding: The John Templeton Foundation
- Next steps: Identify and/or develop a good international, cross-cultural network through which to locate contributors and avenues of dissemination. Lee Gutkind has offered to help with contacts in Australia, New Zealand, and the UK.
- *Following Frankenstein’s Footsteps: A Travelogue*
 - Brief Description: This book would chronicle the adventures of writers/photographers/artists /historians as they travel along the same journey as the Monster. This book could ultimately serve as a travel guide for anyone wishing to retrace the steps taken by the Monster, and to see each location through the Monster’s eyes via passages extracted from the novel. It could also serve as a historical source, a companion reader, which provides depth and context to the novel through themes such as historical accounts of life during the 19th century in related areas, archival photographs of the landscape and architecture, and sustainability through modern day written and visual interpretations of the same locations.
 - Resources and Potential Collaborators: The National Geographic Society would be targeted as the main partner, given their established reputation and credibility in producing similar projects. [Byliner](#) could also be a partner to help distribute travelogues. This also has the potential to become an interactive gallery (physical and/or online) and/or short film/documentary.
 - Connections to STEM Topics and Areas: Having more potential as a “history of science meets art” source, this “journey” would cover a number of different scientific activities and artifacts used during the novel’s timeframe, explore relevant issues of sustainability through

literature, and provide a primer that aids in the development of educational exhibits for informal science education locations.

- **Broader Impact:** This project would be produced for a broad audience, both those familiar with *Frankenstein* and interested in learning more through a creative channel. The project has the potential to introduce both the novel and its themes to a new generation in engaging and interactive ways. As a travel-oriented experience, the prospects of increasing cultural understanding and appreciation of the geographic location of the novel through direct experience of the locations is enhanced, as compared to merely reading a book. If and/or how these opportunities could be adapted to various demographics remains to be determined.
 - **Intended Audience:** The general public interested in history, history of science, literature, adventure travels, photography, and similar topics.
 - **Plan for Underrepresented Groups:** Partnering with the National Geographic Society at minimum will provide access to a diverse population.
 - **Funding:** Funds would be needed to hire and support the authors and artists during the initial travels, to publish and distribute. If a gallery exhibit (either for a singular location or as a traveling exhibit) is approved, funds would be needed to support the design and implementation. Potential funding sources include the Smithsonian Institution, National Geographic Society, and the International Visual Sociology Association. Travel can be an expensive endeavor. As funds are available, scholarships or grants could be provided to members of underrepresented groups to travel to the locations either as “tourists,” students, or potentially contributors.
- *SYNDicated Frankenstein* or *From the Monster’s Mouth: Essays and Dialogues on the Wisdom of Frankenstein*
 - **Brief Description:** This would be a series of articles focused on four main themes – each captured by an aphorism or passage – from *Frankenstein*. The series would be published monthly over the course of one year, each article written by a partnership between one social scientist/humanist and one scientist/engineer. Working to capture a dialogue between a social scientist and a natural scientist discussing each theme, the form of the article could be a conversational transcript rather than a traditional essay.
 - **Resources and Potential Collaborators:** *Slate* is the potential “home” of the articles, and *OMNI Reboot* magazine has offered support.
 - **Connection to STEM Topics and Areas:** Each essay/dialogue would be framed around contemporary or emerging issues in science and technology.

- **Broader Impact:** This type of interdisciplinary dialogue would shed light on diverse perspectives not common in single-discipline circles. In addition, it increases accessibility of both the science and the scientists to a broader audience, thereby potentially increasing understanding of the social and ethical implications with which scientists may have struggled.
 - **Intended Audience:** The essays/dialogues will be aimed at a broad, popular magazine readership.
 - **Plan for Underrepresented Groups:** There will be an eye towards including writers who have diverse perspectives and backgrounds. This will need to be discussed in more detail as the project develops.
 - **Funding:** If *Slate* is used as the publishing outlet, there is no money needed for publication; we will only need commission money for writers.
- **Frankenstein Book Club**
 - **Brief Description:** This project is potentially a large-scale endeavor: an international network of book clubs specifically focused on the readings of and referred to in *Frankenstein*. These book clubs would be hosted by community groups in libraries, recreational centers, summer reading clubs, independent living centers, meet-up groups or any other groups of likeminded individuals. Through the lens of the Monster and its creator, the opportunity to delve deeply specifically into the themes of the novel and the ethics and social aspects of current scientific research would be one of the unique and defining qualities. Additional components/deliverables of this project include:
 - ❖ A study guide for both readers and facilitators outlining the themes and related discussion points.
 - ❖ An anthology of the books contained within the novel, a *Frankenstein* reader. This and the study guide would be e-books that would be freely distributed.
 - ❖ A series of “dares,” wherein professional writers are challenged to reflect on the readings and blog online. This would then become part of an editorial component that would lend itself well to virtual discussion opportunities wherein people can “read along” with authors, engage with the authors via comments, and participate in Google Hangouts. Potential authors include Margaret Atwood, Joyce Carl Oates, and Marge Piercy.
 - ❖ Developing a “Train the Trainers” workshop to help prepare facilitators of local book clubs specifically around the social and ethical aspects of current scientific research.
 - ❖ A writing component could be incorporated that “dares” participants to write their own *Frankenstein*-esque short fiction

or creative non-fiction story around a current scientific or technological issue, blog their own impressions of the novel, or interpret today's world through the books the Monster read.

- Resources and Potential Collaborators: Public libraries; *Slate's* Future Tense; community centers; Google (sponsor Hangout meetings); meet-up groups; Arizona State University groups including Changemaker Central, and Student Affairs departments such as Campus Activities, Leadership Development, First Year Courses, Orientation and Residential Life. Byliner could also be a potential collaborator as a distributor of stories written and inspired by the book club activities.
- Connection to STEM Topics and Areas: The objective of the Frankenstein Book Club is to stimulate dialogue around responsible science. This would connect with a number of STEM areas, ranging from neuroscience to synthetic biology.
- Broader Impact: By taking conversations around science and ethics out of academia and into the public sphere, an increased understanding and perhaps appreciation of the complexity of scientific issues can be fostered as participants – mostly nonacademics – grapple with discussions around research and governance processes.
- Intended Audience: The intended audience is the public in its broadest sense. Close collaboration with local libraries will be essential for reaching local publics.
- Plan for Underrepresented Groups: Teachers' guides could be translated into multiple languages as resources are available. To reach academic communities, two or three major book club events could be sponsored at major science conferences (AAAS, ScienceWriters conference, ComiCon, NASPA, Your Science Open Forum, STGlobal, etc.)
- Funding: Due the large-scale nature of this project, it is highly recommended that a person dedicated to its management – a project coordinator – be hired. This could be at minimum a one-year position as a start-up, but preferably a position that will begin soon and be sustained throughout the Bicentennial period, filled by a postdoctoral researcher or graduate research assistant. Salary and/or benefits and materials/equipment costs would need to be secured. The remainder of the deliverables, if produced as e-book or e-files, could be produced on a low budget. The Science Communication component of the Sloan Foundation is a possible funding resource.
- Next Steps: Develop job title and descriptions for coordinator; identify funding sources and RFPs; submit grant proposals; develop outlines for study guides and “Train the Trainer” workshop sessions; identify proof-of-concept location locally (Phoenix), compile list of existing book clubs.

List of additional project ideas that have high potential and interest from the CNF group include:

Frankenstein's Cookbook: Famous Chefs Design Monstrous Dishes

A “FrankenFeast” event at which prominent chefs would experiment with the juxtaposition of foods (such a smoked ice cream), recreate mistakes, and develop gastronomically cool, interesting, and adventurous creations that may have begun as mistakes. This event could be either a one-time special event by invitation, a fundraiser for other projects, or a series of events (perhaps for television shows?). Idea variations for an ongoing series include an adaption of the TV series *The Taste* whereby the cooks of the culinary “failures” are given a chance to correct and improve upon their errors, and contestants are rewarded for the creative juxtapositioning of the ingredients and flavors discovered as part of the solution.

A recipe book would then be produced containing the resulting recipes, and recipes for meals one might have enjoyed if living during the time of *Frankenstein*. Short essays about “the story behind the recipe” would accompany each entry.

Frankenstein for President!

As mentioned above, this would be an opportunity to bring *Frankenstein* “to life” in a very different way. An actor would be hired to portray and embody the Monster, then go on a nationwide tour to “meet the people.” Since 2016 is also an election year, this tour could be run as a “Frankenstein for President” tour, complete with a platform and positions on important issues related to science and technology. The Frankenstein persona would act as a catalyst to engage the general public, perhaps even other political candidates, in important policy conversations. Care would need to be exercised that this is done professionally and responsibly, so as not to take away any potential votes from real candidates. If not for president, the Frankenstein persona could certainly be an ambassador for “doing responsible science.”

This could be another major endeavor requiring a larger funding source, but could potentially reach a very large audience, and connect elegantly with the Book Club if designed as an author tour.

Coordinated call for special issues of academic journals in the natural and human sciences

This project is aimed more specifically to the natural and human science academic communities, tackling real-world issues directly faced by the scientific community. Starting with the identification of the original ethical issues contained in *Frankenstein*, natural and human scientists would be invited to explore how those issues apply today

through articles published in academic journals. Both scientists and people from the humanities would discuss aspects of the creation of “the monster” that just don’t work out and why (exploration of failures). It could also create new opportunities for dialogue about strategies to minimize or alleviate anxieties about the possibilities of “Frankenstein” science, explore ways that Frankenstein science can become more feasible, or prevent it altogether.

This type of academic dialogue could parlay into a collaborative event with the Origins Project at ASU – something like “The Origins of Self-Awareness.” One additional collaborator for this project is NPR and their Radiolab series.