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Findings Reported to the National Science Foundation

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Activities

Imaging the Invisible was a 2,000 square foot temporary exhibit at the University of South Carolina's McKissick Museum, on display during the fall semester of 2011.ⁱ The exhibit provided an episodic survey of the history of scientific imaging technology from optical light microscopes to nanotechnology. It asked visitors to question if technology has changed how scientists formulate research questions and how the general public visualizes scientific findings. The exhibit investigated the changing meaning of data representation and challenged visitors to reflect on the proliferation of scientific images in the popular media. The exhibit coupled a broad history of science with a strong local focus by incorporating "Spotlight on USC" panels that featured current research by professors at the University of South Carolina. Using specific examples from the A.C. Moore Herbarium, Department of Mechanical Engineering, South Carolina Institute of Anthropology and Archaeology, NanoCenter, and Department of Art, these case studies put current research in a historical perspective.ⁱⁱ

The initial exhibit proposal identified five target audiences:

1. University students and visitors
2. Local science community
3. Local history of science and technology community
4. Local art community
5. Former Citizens School participants (these are members of the wider Columbia area who have shown a previous interest in science and history of science public outreach events)

1,259 people visited the exhibit over its 5-month engagement.

In addition to the exhibit, members of the team wrote an article about the collaborative process, "Sharing Credit: What Public Historians Can Learn from Scientists about Collaboration," which is currently under review with *The Public Historian*, the journal of the National Council on Public History.

Findings

The exhibit team knew that it wanted to showcase current scientific research, place that research in a historical context, and show the intersection of science and art. Unfortunately, scientists, historians, and artists do not always share common vocabulary. The exhibit team began with a front-end evaluation, specifically targeting humanities students, to gauge understanding of certain scientific principles. Because the NSF provided the majority of funding for the exhibit through a grant focusing on nanotechnology and society, the team specifically wanted to assess prior knowledge of nanotechnology. Perhaps unsurprisingly, the front-end evaluation revealed an almost complete lack of knowledge or interest in nanotechnology. In fact, the evaluation highlighted significant apprehension of such an exhibit. The front-end evaluation confirmed that the exhibit design needed a comfortable, safe, or accessible starting point. The team chose the

common light microscope, under the assumption that most people have some experience with microscopy, even if it was back in 7th grade.

A summative evaluation was administered to group of science and engineering students. The **average overall exhibit experience was 3.94 on a 5-point scale** (1-poor, 2-fair, 3-good, 4-excellent, 5-superior). More importantly, the team wanted to measure perceived improvement in knowledge of nanotechnology. Using the same 5-point scale as above, the average pre-exhibit self-rated knowledge of nanotechnology was 3.18. The average post-exhibit self-rated knowledge of nanotechnology was 3.76, for **an increase of 0.58 or 11.6% improvement**.

The exhibit won several awards. It received an **Award of Merit** from the South Carolina Federation of Museums. It received a **Certificate of Commendation** in the category of exhibition design and an **Honorable Mention** in the category of publications from the Southeastern Museum Conference.

Training & Development

Allison Marsh supervised one graduate student and two undergraduate students in the development of *Imaging the Invisible*. Dr. Marsh served as the project manager; she developed the broad outline for the exhibit and monitored the student work. PhD Candidate Sarah Scripps, as part of a yearlong research assistantship, defined the initial exhibit themes, researched each case study, chose appropriate objects and images, contacted potential lending institutions, and helped with installation. Ms. Scripps wrote most of the main panel labels; Dr. Marsh wrote most of the object labels. Linda Fung, an undergraduate graphics arts student and graduating senior, designed all of the text panels and the accompanying printed materials. Megan Coker, an undergraduate library and information science student, researched all of the content for the accompanying printed materials. Each of these students used their own disciplinary background to add value to the exhibit team.

Outreach

Recognizing that McKissick Museum is a university museum, the obvious target audience is the university community. The museum offered class tours for the following departments: **Art, Dance, English, History, and Library and Information Science**. The museum provided tours for **University 101** students, an award-winning introduction to college life. Additionally they offered specialized tours for the **English Programs for Internationals**, providing ESL instruction, and the **Steps to STEM** program, a course designed to introduce transfer students from USC's branch campuses and 2-year colleges to the interdisciplinary nature of the STEM fields. The museum also provided tours for USC's branch campus in Lancaster, SC.

The multiple disciplines that found appropriate content in the exhibit underscored the curators' desire to appeal to both the humanities and the sciences. Students could look at

the images as art or examine the technology that produced the works or consider the scientific research questions posed or contemplate the philosophical quandaries of creating images of things that are not visible to the naked eye. More importantly, tours of *Imaging the Invisible* challenged students to break down traditional disciplinary boundaries, to see how scientists and artists worked together.

McKissick has a predominant role as a campus museum, but it is also a part of the broader Columbia museum community. Despite the focus on a college-educated audience, the museum also adapts all of its exhibits to K-12 classes to inspire the goal of college attendance. Beginning with the introductory panel, which poses four questions for the audience to consider, the exhibit is built around an inquiry-based approach to design. This approach translates easily to K-12 education, often asking children the very same questions of adult tour groups. Asking visitors how to image – or even imagine – things that cannot be seen is not an age-sensitive question. In this vein, McKissick offered tours to five local elementary and secondary schools: **Daniel Christian Center, Harmony School, Heywood Learning Center, Jewish Day School, and Lexington High School.**

McKissick also reached beyond the formal school systems to provide life long learning opportunities for a variety of adult groups, including the **Midlands Education and Business Alliance (MEBA), North Trenholm Church, and Redeemer Church.** During Parents' Weekend, McKissick sponsored a **Behind the Scenes Tour** and a **Curator's Tour.**

In conjunction with an international conference on the **Public History of Science and Technology** organized by USC, McKissick Museum hosted the opening reception. At the reception, biology professors and graduate students offered a hands-on demonstration of a digital microscope to engage visitors with current imaging technology.

Press coverage included traditional print media: *Columbia Free Times* (September 7, 2011), *The Daily Gamecock* (September 12, 2011), *Columbia Star* (December 16, 2011). Curator and Co-PI Allison Marsh was interviewed on camera by Andy Burns on WOLO (ABC affiliate) for the 12:00 noon news (November 18, 2011). Additionally, the exhibit was listed on the websites of WCSC (CBS affiliate) and WIS (NBC affiliate). The exhibit remained on McKissick's website for the entire Fall 2011 semester, and was featured on the home page for USC for one week. The exhibit was included in *Under the Dome* (Fall 2011, McKissick Newsletter) and the USC Parents Weekend Schedule of Events.

ⁱ The exhibit *Imaging the Invisible*, as well as the writing of this article, was supported by the National Science Foundation under Grant No. #SES 0531160.

ⁱⁱ For the "Spotlight on USC Research" case studies included in each exhibit section, the exhibit team worked closely with the professors to ensure that their complex research was presented accurately: Dr. John Nelson of the A.C. Moore Herbarium; Dr. Michael Sutton, Mechanical Engineering; Dr. Chris Amer, Archeology and Anthropology; Chris Robinson, Art. Additionally, Dr. Soumitra Ghoshroy and graduate student Erika Balogh of the Electron Microscopy Center created SEM (scanning electron microscopy) images of the Herbarium specimens, and the team had tremendous support from USC's NanoCenter: Dr. Tom Vogt, Dr. Thomas Crawford, and Dr. Chris Toumey.