Citation:

Sorrell M, Joseph K, Norton D, Reichard S, McAdams J. (Sept 1, 2017) Planning and Coordinating an Exhibit of Photomicrographic Art by Science Faculty and Students in an Academic Library. *Science & Technology Libraries*. Vol 36 (3), pg. 309-328. https://www.tandfonline.com/doi/full/10.1080/0194262X.2017.1365043

Planning and Coordinating an Exhibit of Photomicrographic Art by Science Faculty and Students in an Academic Library

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Abstract

In 2015, the J. Murrey Atkins Library recruited faculty, staff, alumni, and students to submit digital images of photomicrographic art, which were printed and placed on exhibit in the library's main lobby. *Visualizing Science: Microscopic Images from UNC Charlotte* celebrated research with 43 intriguing images, bringing science to the lay community. Events included an open house, publicity in a local newspaper, and the presentation of a student seminar to guests from a local retirement community. Additionally, the images were accessible in an online version. Libraries are encouraged to organize similar exhibits after evaluating the approaches taken by the exhibit committee.

Introduction

The *Visualizing Science: Microscopic Images from UNC Charlotte* exhibit of photomicrographic art at the J. Murrey Atkins Library required 18 months of planning by librarians and library support staff. This article is a chronological account of the project, in which the processes of organizing a committee, creating websites, recruiting campus exhibitors, planning and promoting associated events, and installing and dismantling the exhibit are described in sufficient detail to allow others to replicate the project, taking into account the reasoning behind decisions and lessons learned. This endeavor benefitted the library, exhibitors, and visitors by demonstrating the library's commitment to interdisciplinary scientific research produced by the campus

community, fostering new relationships between librarians and scientists, giving visibility to campus research programs, bringing the microscopic world to lay visitors, and illustrating how the library's resources support scientific work.

Origin, Feasibility Assessment, and Committee Formation

While visiting online nanoart competitions and viewing beautiful scientific images, the UNC Charlotte Science Librarian saw the possibility and benefits of doing something similar in the Atkins Library physical space. Scientists are rarely celebrated in our society; an exhibit of their work displaying science as art would highlight UNC Charlotte research using microscopy, give the library a platform to show how it supports this research, increase scientists' involvement with the library, and increase the librarians' understanding of the scientists' accomplishments in the laboratory. To complement the exhibit, students would be invited to present seminars related to microscopy, which would help develop their public-speaking skills. Finally, the exhibit would bring science to lay visitors, who would see the wonder and elegance of the microscopic world.

The UNC Charlotte Libraries mission statement says, "We inspire innovation, support research, and cultivate scholarship by connecting people, ideas, and resources" (University of North Carolina at Charlotte J. Murrey Atkins Library 2017a). The Science Librarian saw an exhibit of scientific art as an opportunity to showcase an appreciation of science in the UNC Charlotte Libraries. Recent journal articles offer examples of how other academic libraries have pursued similar goals through exhibits, such as presenting research posters printed by investigators (Chan and Hebblethwaite 2014), permanent art collection pieces as educational tools (Cirasella and Deutch 2012), scholarly work and university-sponsored community programs on a media wall (Bronars and Crowley 2014), and research faculty journal covers (McCullough 2015). One

article discussed how glass cases situated outside the physical library drew attention to the physical space and the library's support of research (Barr 2016).

Envisioning a display on the first floor of the library, the Science Librarian met with the Library Facilities Manager in May 2014 to discuss the feasibility of such an exhibit and the availability of suitable library spaces. The Facilities Manager agreed to assist with the maintenance needs of the exhibit, and the Library Security Coordinator consented to provide security.

Before planning could advance, it was necessary to assess the interest of campus scientists in such an exhibit. Scientists generally do not think of the images they create as art and are unaccustomed to having their work displayed to the general public. Also, participation in the exhibit would not further faculty members' careers and could distract students from finishing theses or dissertations. The Science Librarian met with department chairs and academic program directors to introduce the idea of an exhibit of nanoscale images and asked whether they would promote participation among colleagues. They responded favorably and promised to act.

Once it appeared that the exhibit was feasible, the Science Librarian approached the head of the library's Research and Instructional Services department to acquaint her with the idea and request permission recruit other library staff to serve on an exhibit committee. The department head was enthusiastic about the idea of the exhibit. She decided that it should be a competition and obtained the support of the Interim Library Director. The Art and Architecture Librarian and the Engineering Librarian committed to serve on the exhibit committee. The Art and Architecture Librarian had experience working with museum exhibits and connections to the College of Arts and Architecture, and the Engineering Librarian had contact with a number of engineers who worked with electron microscopes. The committee held strategy sessions about

exhibit content, physical space, image submission criteria, and possible dates for an open house (opening reception).

The committee solicited input from a faculty member who created nanoscale photomicrographic images as part of his research programs. He served as a Technical Advisor and suggested submission criteria for digital images, along with names of faculty members who might be interested in participating in the exhibit. For additional guidance, the Science Librarian spoke by telephone with Assistant Director & Education/Outreach of the Nebraska Center for Materials and Nanoscience (NCMN) at the University of Nebraska, which had held an annual nanoart competition since 2013. She obtained a copy of NCMN's submission and judging criteria. A Google Sites committee website was created to coordinate the committee's task list, reading material, meeting minutes, and project documents. This wiki tool would also maintain continuity if any committee members were unable to fulfill their obligations. A shared document was generated for recording notes for a future journal article.

Planning and Budgeting

The exhibit area needed to be large enough to accommodate all of the prints, be centrally located to encourage viewing, and provide clear wall space free of tables and chairs, while being close to the security office. It was decided to mount the prints on the curved walls in the southwest zone of the library's first floor and on all four sides of the large columns in that area. Furniture could be moved to the perimeter of the space, creating a defined viewing area for the duration of the exhibit.

Costs were estimated for printing of images and welcome signs, food to be served at the open house, campus transportation for a visit by residents of a local retirement community (a

possibility being explored by the Science Librarian), and prizes for exhibitors (Table 1). At this early stage, cost estimation was difficult, as it was unknown how many submissions would be received or how many people would attend the open house. The printing estimate was obtained from a commercial printer, based on assumptions about the number and dimensions of the prints.

Originally, the exhibit was to consist of nanoimages — images on the atomic level, of objects measuring 1 to 100 nanometers. To gauge the potential participation level, preliminary submission criteria were developed and sent to potential exhibitors in a Google survey. The survey results suggested that not enough nanoscale research was conducted on campus to produce enough submissions for an exhibit. After evaluating the survey responses and interviews and email correspondence with campus scientists, the committee decided to broaden eligibility from nanoscale images to images produced with any microscope, from atomic force and electron microscopes to compound and dissecting microscopes. This meant that the object could be measured in millimeters, micrometers, or nanometers, and that exhibitors could be recruited from the Department of Kinesiology and from more research areas in the Department of Biological Sciences.

One critical decision was whether the exhibit should consist only of images specifically created as art, or whether it should include any images with visual appeal, regardless of the purposes for which they were created. The more inclusive approach was chosen, to increase the likelihood of participation.

To determine whether photomicrographs could be successfully enlarged and printed, test prints were needed. For this purpose, the Technical Advisor sent electronic files of several transmission electron microscope images of gold particles. The committee held a teleconference with a

commercial printer (an approved university vendor) to discuss image requirements, printing materials, and mounting solutions. Using 96-dpi test files, the printer verified that images at that screen resolution could be resampled in Photoshop to produce sharp and detailed images when printed at a size of 16 × 24 inches.

The Atkins Library Software Developer built the exhibit website, which would house information regarding registration, submission criteria, open-house details, student seminar and poster presentation opportunities, and the list of committee members. The Software Developer used PHP, MYSQL, and Apache, running on a Debian Linux server, to develop the website, and formatted the text content supplied by the committee.

The committee developed the following submission criteria for images and research statements describing the images, and posted them on the exhibit website:

1) Digital images may be produced with any type of microscope.

2) Computer programs may be used to colorize elements, but must not be used to insert an artificial object into the image.

3) Images must not have been published or submitted to other exhibits or competitions.

4) A Microsoft Word document (.docx or .doc) description must accompany the image that includes:

    a) The title of the image

    b) The names and academic departments of all creators

c) A statement of up to 200 words that describes the type of microscope used, field magnification, any unique methods used to produce the image, and an explanation in layman's terms of how the image fits within the stated research goals

5) Files must be submitted by 11:59 pm, October 11, 2015.

6) Images should be taken at the highest resolution possible and submitted preferably as TIFF files (15 MB maximum). JPEG files may be accepted on a case-by-case basis.

On the website, exhibitors were asked to save files at a resolution ensuring sharpness when the images were enlarged to a print size of approximately 16 × 24 inches. They were asked to include magnification scale bars, so that viewers could make size comparisons. The submission guidelines stated that the Library had permission to display the images and use them for marketing purposes, but that the exhibitors would retain the copyrights to their images.

At this stage, the newly hired Dean of the Library approved the budget. A name for the exhibit was chosen, and a timeline was developed for committee activities and communications.

Recruitment of Exhibitors

The Director of Library Communications and Public Relations (LCPR) and the library's Graphic Artist worked together on the Call for Submissions advertisement, which included photomicrographs produced by faculty consultants, to provide visual appeal and show potential exhibitors what types of images might be accepted. The Director of LCPR arranged for an Academic Affairs listserv email blast to the campus faculty, followed by emails to students in the Honors College (Pre-Health Advising), Graduate School, and Levine Scholars (merit scholarship) program. A news item was posted on the library's homepage, Facebook page, and

Twitter account. Emails also were sent to select department chairs and college deans who oversaw areas where microscopy was frequently used.

A deadline five weeks after the Call for Submissions seemed reasonable, since existing images would be accepted, thereby allowing exhibitors to participate without having to create new images, which in some laboratories required reserving time to use a microscope. Furthermore, potential exhibitors who had completed the survey had been aware for months that the exhibit would likely take place.

To conduct more focused recruitment, the Science Librarian searched UNC Charlotte online biographies, laboratory websites, and publications for photomicrographs or any evidence of microscopy. Armed with that information and department chairs' recommendations, she contacted certain individuals personally by email, telephone, or office visits. She visited relevant buildings and offices, posting and distributing flyers and initiating conversations that produced additional leads. Her background in the biomedical sciences and experience with compound and dissecting microscopes was advantageous, as she was conversant with various types of microscopy and research disciplines.

In recruiting exhibitors, it proved helpful to propose ideas for images, as scientists might not think they had material worth exhibiting, never having thought of their work as art in someone else's eyes. In the chemistry department, the Science Librarian attended a departmental faculty meeting and specifically requested nanoscale images or images of crystals and precipitates. She suggested that these solids could easily be turned into art through the use of special stains or polarized light or enhancement in Photoshop. In addition to announcing the exhibit and requesting submissions, she updated the faculty on library services and reminded them of

ongoing bibliographic database instruction. The meeting also gave the Science Librarian an opportunity to meet new chemistry faculty members.

Despite the recruitment efforts described above, the committee found that convincing potential exhibitors to submit images was more difficult than anticipated, even on a campus of over 27,000 students, faculty, and staff. The goal was to obtain about 25 images, but a month after the Call for Submissions, only six or seven images had been submitted, four of which were from the same student. In the last week before the deadline, the committee intensified their recruitment efforts. A second email blast from Academic Affairs was sent to faculty and staff, and some faculty members were contacted individually, to ask them to remind alumni, especially recent graduates already identified as potential exhibitors, to submit images. In the last two days before the deadline, technical problems with the website occurred that prevented registration and uploading of files. The deadline was therefore extended by a week. By the close of registration, 43 images had been submitted.

The departments contributing to the exhibit were Biological Sciences, Kinesiology, Physics and Optical Sciences, Mechanical Engineering and Electrical Engineering, and Engineering Science. A number of exhibitors were from the interdisciplinary program of the Nanoscale Science Ph.D. Program, which was specifically targeted, as many visitors were unlikely to have seen matter imaged on such a small scale.

Processing of Submissions and Printing of Images and Supporting Materials

Exhibitors uploaded their images as TIFF or JPG files, with accompanying research statements as Word documents, which were automatically paired in a folder with the image title as the folder name. The exhibitors' usernames were used to obtain information about each scientist,

such as the department and affiliation, from the campus personnel and student database; this information was included as a text file. If the exhibitor chose to submit more than one image, those files were automatically moved into the same folder.

The printer downloaded all of the images from a single ZIP folder created with a PHP program and containing only the images. Despite receiving some images of low resolution or small size, the printer produced stunning prints, most 16 × 24 inches. The printer mounted the prints on foamboard and delivered them to the library.

The research statements were printed in-house on desktop printers as wall labels to be posted next to the images. Some of the statements lacked exhibitor names and/or titles, were not written for a lay audience, or did not specify magnification. The committee added missing names and image titles and ensured consistency of department names and degree titles, but did not correct spelling, punctuation, or grammatical errors, for lack of time and to avoid having to obtain exhibitors' approval of rewritten statements.

The committee determined the need for directional and welcome signs, their content, and their locations in the library. The library's Graphic Artist designed the signs, which were printed by the campus copy center. General promotional posters were placed at each of the three library entrances. A welcome poster for the exhibit area (Figure 1) gave some background about the exhibit and the URL for the online exhibit. Three additional posters, placed in library lobbies, gave directions to the exhibit and to the open house.

Development of the Online Exhibit

To make the exhibit accessible to people unable to attend in person and to people with visual impairments, the committee decided to create an online version. All exhibitors were contacted to rally their support for converting the exhibit website into a single webpage of exhibit images, and for reaching out to the visually impaired community.

The Science Librarian and the Software Developer worked together to post on the webpage each research statement, a low-resolution thumbnail of each image, and a brief description of its visual aspects, which a screen reader program would read aloud. The brief description focused on texture, sizes, shapes, and colors, with minimal scientific terminology. The images had to be described in such a way that a completely blind or low-vision individual with no background in the sciences could conceptualize the appearance of each image. A one- to two-sentence description was drafted for each image. The task was challenging, as several disciplines were represented, and a number of the exhibitors had omitted some basic information about the images. The exhibitors assisted in editing these short descriptions.

The URL for the exhibit website (https://library.uncc.edu/VisualizingScience) was redirected to this new webpage (University of North Carolina at Charlotte J. Murrey Atkins Library 2017b). Images were converted from either TIFF or JPEG to PNG formats for compatible and consistent display on the web. The Software Developer programmed the digital exhibit to release in conjunction with the open house.

For a technical explanation of how the website and online exhibit were constructed, along with the accompanying usability testing and problems encountered with social media postings, see Sorrell et al. (2017). This webpage was a common interest shared with the campus Office of

Disability Services (ODS). The ODS Assistive Technology Specialist advised on how to format and program the webpage to ensure that screen readers would process and read the content for those with visual impairments, and ODS posted an advertisement for the exhibit on its Facebook page. The online exhibit took about 100 hours to complete. The URL is now permanent and may also be accessed through the Atkins Library's homepage (http://library.uncc.edu) under "Discover Unique Collections."

Exhibit and Open-House Preparations

To prepare for the print installation, the Art and Architecture Librarian created a floorplan based on the dimensions, color, and content of each print. The committee discussed how the prints would be situated on the columns and along the curved wall. The furniture was moved outside the perimeter of the exhibit by library student workers. Freshly painted columns and walls brightened the space. Before the exhibit was installed, the floorplan had to be revised to accommodate changes in the exhibit space, due to library renovations and rearrangements.

The Art and Architecture Librarian used painter's tape to mark, 52 inches from the floor, the positions where the prints would be mounted. As a guide for installation, she printed a small picture of each print and taped it at the location for the print. She also used tape to place a wall label next to the location for the print. Facilities Maintenance personnel used the painter's tape to guide installation of T-pins in the wall and columns; for each print, two T-pins on which the print could be set were placed a specified distance apart. On installation day, the Art and Architecture Librarian, with volunteer assistance, set each print on the two bottom pins and inserted two more T-pins along the top edge of each print, turning the heads of the T-pins 90 degrees to hold the print in place.

A display table was created featuring library resources that supported the research depicted in the images. To create the display, the committee studied the research statements and identified print books, electronic books, and electronic journals relevant to the images. Circulation staff pulled the requested print books, and covers of the electronic resources were printed on a desktop printer and placed in clear Plexiglas document holders. The items were arranged on a table in the exhibit space.

Refreshments consisting of light hors d'oeuvres, iced tea, and lemonade were selected from the University's catering service menu. Serving finger foods would allow visitors to walk around the exhibit with their plates, taking advantage of the library's lenient food policy.

An English professor had mid-19th century photomicrographs, but could not offer them for the exhibit, as he had not taken the pictures. The Science Librarian suggested that they collaborate on an informational poster entitled "Look How Far Microscopy Has Progressed." The poster showed historical photomicrography for comparison with the surrounding present-day images. The professor emailed several files and accompanying text, which were reformatted to fit on a poster designed by the Graphic Artist. Pictures of the two photomicroscopists whose work was highlighted on the poster were included, along with brief biographies.

Invitations to the open house with personalized messages were emailed to the University's Chancellor, Provost, and Associate Provost for Academic Affairs, and to the deans and department chairs whose faculty, staff, students, and alumni were exhibitors.

Open House and Competition

The open house featured the prints in the front lobby (Figures 2 through 4) and a catered reception in a nearby multipurpose room. Several of the exhibitors attended; they talked about their prints and their research to other guests (Figure 5). Students were excited seeing their work so tastefully displayed. The library resources table materials generated conversations about what the library had in its collection and what else should be added. The University Chancellor attended the open house and remarked that the exhibit was a good use of library space.

Figures 6 and 7 are examples of the images exhibited, with their wall-label text. The undergraduate biology student who exhibited the image of breast-cancer cells shown in Figure 6 had this to say about her experience creating the image: "I created the image by first taking a photo through the microscope with a smartphone. The smartphone camera picks up the light emitted in illuminating the specimen from the microscope. It required steady hands, so it took many attempts to capture a clear image. Then I digitally colored the image in Adobe Photoshop. The original specimens were not stained, but a slight color field was added so that the colorless cells could be seen. None of the 'shapes' were added in Photoshop, but are from the original field of view." Figure 7, entitled "Colorful Nanoribbons," is a nanoscale image of twisted boron ribbons created by a student and professor team that was a fan favorite.

The competition ballot box was available on the library resources table during the open house and for the following week. Votes could be cast in three categories: Campus Popular Vote, Library Personnel Vote for Best Image, and Library Personnel Vote for Best Description. The last category was established to reward scientists who composed explanations of their research in

such a way that lay visitors gained a better understanding of the importance of the research and, perhaps, how difficult it may have been to produce the image.

Although the committee anticipated instances where a winning print with several creators would require several prizes, it had not anticipated ties or that some exhibitors would win in more than one category. As it happened, the Library Personnel Vote for Best Image resulted in a two-way tie between images with two creators each, and the Library Personnel Vote for Best Description resulted in a five-way tie in which three of the images were created by the same individual, who also won the Campus Popular Vote. The committee awarded only one prize per person. Fortunately, enough funds were left in the budget to purchase the promised small prizes, which were bought at the Student Union bookstore, where the library has a 10% discount. The prizes were held until after the exhibit was dismantled. Certificates for the winners were printed in-house.

Press Coverage and Community Outreach

The exhibit was covered by a local newspaper, the *Charlotte Observer*. A freelance journalist who covers the University area for the *Observer* saw the exhibit announcement on the library homepage and reached out to LCPR. To arrange for interviews with exhibitors, LCPR contacted several student exhibitors and forwarded to the journalist the email addresses of those who agreed to be interviewed. The resulting article (Thornton 2015) provided background about the exhibit and the impressions of two student exhibitors.

One of the interviewed students said afterwards, "I enjoyed speaking with the reporter, who pursued a story about the exhibit and understood the passion I have for my research. The most important point I wanted to share is that science is for everyone and is found in every facet of

life, even art. It is important that an event such as this be covered by the local press, so more people can experience it."

The Science Librarian had previously established a relationship with a local retirement community through organized volunteer work. When she heard that the residents' monthly field trips rarely involved science, she thought the *Visualizing Science* exhibit might be a good fit. The retirement community's social director agreed, and they began making specific plans for a visit. The retirement community arranged shuttle bus transportation to the library, but a retirement community representative ascertained that the path from the main campus road to the front entrance of the library was too steep for residents using walkers or wheelchairs. The cost of transporting residents from the road to the library entrance was included in the project budget. For the day of the field trip, carts accommodating up to six people were rented from Campus Transportation Services, which furnished drivers.

The visit started with a seminar by the undergraduate biology student who had created the breast-cell image shown in Figure 6. She first presented a historical chronology of comparative microscopy. Of her involvement, she wrote, "As an adult student, I learned the value of effective communication, so the *Visualizing Science* exhibit offered an opportunity to sharpen my public speaking skills. My presentation about the history of microscopy was tailored around an audience of senior citizens, who have seen the advent of certain technologies in their lifetime. I wanted to present in a way that would remind them of their high school and college learning experiences. The visual and tactile presentation included passing around my personal compound microscope. I also included pictures and a brief explanation of my exhibit submission and research work to provide context. The question-and-answer portion was a lively discussion of things learned in school and microscopy's uses in today's medical landscape. For an

undergraduate student researcher in biology, presenting for the *Visualizing Science* exhibit was memorable, and because I shared my love for science, it was richly received."

The student then took the guests to the lobby to see her prints, educated them about the cells represented in the images, and told how she produced the colorful images with a hand-held smartphone and Photoshop software enhancement. The Science Librarian then escorted the group around the exhibit, interpreting the information on the wall labels and explaining why the research represented in the prints was important. In recognition of the student's effective representation of the library's exhibit, the committee sent a complimentary memo about her performance to the interim chair of the Department of Biological Sciences and to her faculty supervisor.

Dismantling of the Exhibit

Committee members and library student workers removed the prints from the walls, wearing gloves to prevent leaving fingerprints. The heads of the T-pins were turned 90 degrees, and the prints were lifted off the bottom pins and stacked, separated for protection by endsheet paper donated by library Technical Services.

Dates and times were set for the committee members to be available for exhibitors to pick up their prints and wall labels and competition winners to be presented their prizes and certificates. On these occasions, the librarians were able to converse with the scientists about their research and learn what they would do with the prints.

After the exhibit had closed, the Head of Special Collections was contacted about possibly maintaining the images as a digital collection in the library, but she advised that these types of scientific or microscopic images were not covered in the collection policy. However, the

Archivist for Collection Management captured the *Visualizing Science* online exhibit through the Archive-It web archiving service (https://archive-it.org). The webpage is found in the Division of Academic Affairs collection, preserved for posterity and to serve as a template for librarians planning future exhibits.

Lessons Learned

Benefits

The library pursued this project as a contribution to scholarship and as a platform to demonstrate the educational resources in the collection that support the scientific research on campus. Hosting a microscopy-themed exhibit yielded positive outcomes for the library, such as gaining the attention of university administration and the community and providing opportunities for networking with faculty and students, collaborating with coworkers, and reaching out to those who would not otherwise have the opportunity to view photomicrographic images. Librarians and students collaborated on two articles about *Visualizing Science,* giving those who had never published the experience of writing for peer-reviewed journals. People unable to attend the exhibit could access the exhibit on a webpage, where low-resolution thumbnails of the images were posted with the research statements, which screen readers could translate for those with visual impairments. New relationships were forged through the networking involved in mounting the exhibit. Science faculty and students interacted with the committee, and the librarians had the opportunity to learn more about the exhibitors' research, thus gaining better insight into the types of resources needed to support future investigative work.

Recruitment Challenges and Strategies

The most challenging aspect of the project proved to be recruiting exhibitors. Unlike artists, scientists are not accustomed to having their work publicly exhibited; their photomicrographs are normally published in journals or other academic contexts. Scientists are also not accustomed to having their images judged for artistic merit or by nonscientists. For some, answering the call for artistic photomicrographs came easily, because of the individual's creative bent or the nature of the subject matter. Others were urged to look at their work in a new way and see it as artistic, novel, and educational for a lay audience.

A key element in recruitment was familiarity of the Science Librarian with the scientists' research, especially during impromptu door-to-door office visits. It is much more difficult to turn down a face-to-face plea than an impersonal written appeal. The Science Librarian's particular background enabled her to influence several scientists who might not otherwise have submitted images. This effort also generated introductions of the Science Librarian to new faculty members. The scientists probably had various reasons for participating. Some made it clear that they understood the inherent value of the exhibit in promoting academic or research programs and in reaching the lay public, and others expressed pride in displaying their work. Some faculty members strongly motivated their students to participate, and students and alumni appreciated that their names would be associated with those of their faculty colleagues.

The undergraduate biology student who created the image of breast-cancer cells shown in Figure 6 expressed her reasons for submitting images: "Being an exhibitor in the *Visualizing Science* exhibit was an important accomplishment. I was excited to showcase the beauty of science and biological discovery. I was also very passionate about my research project and

wanted to create a visual representation of the work. To a researcher, there is something motivating and validating in being able to see a visual representation of your intricate work shared for the enjoyment and inspiration of others."

Despite the advance notification, a few faculty members who had promised submissions months in advance did not follow through. This may indicate that collaborating with the library on this project was not a high priority for their limited time, or that they did not perceive benefits to their research programs.

Contingencies, Hurdles, and Suggestions

Despite attempts to assess interest among potential exhibitors, the committee was uncertain whether the number of entries would be sufficient for an exhibit, or whether too many entries would be submitted, exceeding the budget and the capacity of the exhibit area. The committee decided in advance that if too many images were submitted, exhibitors could be limited to one or two images each. If not enough entries were received, the committee could intensify its recruitment efforts. Even though the number of entries did exceed the committee's goal, it did not prove necessary to limit entries.

Major factors contributing to the exhibit's success were broadening eligibility to include photomicrographs at any scale (not just nanoscale) and the availability of images from a wide range of scientific disciplines. Libraries considering hosting a similar exhibit may want to include any scientific image, not just photomicrographs. A limit of two images per exhibitor may needed to align with budget and space constraints.

Because of uncertainty about the number of entries, the committee had to wait for the final printing bill in order to see how much of the budget remained for purchasing food and prizes and printing directional posters. Fortuitously, the cost for printing the images was lower than expected, because a different printing vendor was used than the one who had prepared the initial estimate. As shown in Table 1, the whole project came in under budget.

The committee did not anticipate the effort that would be required to edit the research statements and format them as wall labels. Some descriptions contained moderate to very advanced scientific terminology. The committee chose not to request that the descriptions be rewritten in layman's terms, because of concern that rewritten statements would not be received in time (or at all). They hoped that exhibit visitors would understand most of the statements as written. For future exhibits, the Call for Submissions could emphasize the importance of written description understandable by a lay audience. To increase consistency in format among wall labels, the exhibit website could include text fields for names and image titles.

Another hurdle to overcome was that some of the submitted images were of low resolution, and others were very small. Access to personnel experienced in processing digital images in Photoshop proved to be essential, as the images needed to be upscaled without noticeable loss of quality. The committee considered it impractical to reject low-resolution or small images, as placing the burden of additional work in Photoshop on the scientists would discourage them from submitting images. Preserving the integrity of the image was important for this exhibit when printing an enlargement because enlarging an image can affect the sharpness of specimen or object edges (Cromey 2010).

After the exhibit closed, the question arose as to whether it could become an annual event. In deciding whether to repeat the exhibit, the library will bear in mind the advice received from the Nebraska Center for Materials and Nanoscience, where interest in an annual nanoart competition among both staff and scientists began to decline after only two years, and scientists who had not won awards proved unlikely to submit entries in future exhibits.

Looking back, perhaps the conversation about special-needs visitors should have continued. The exhibit was attended by at least one little person and several guests in wheelchairs, who would have benefitted from a second set of wall labels placed 40 inches from floor, in addition to the standard 52 inches.

Not all exhibitors attended the open house; some had scheduling conflicts, but others simply forgot. Attendees thus lost the chance to speak with these exhibitors, and the exhibitors lost the chance to explain their work to visitors and interact with other scientists. In the automated thank-you messages and registration email confirmation sent to exhibitors, an ICS file should have been created that would automatically open the recipient's Google calendar to post the open house details as a reminder.

Time ran out for including several additional elements in the exhibit, such as pictures of all of the microscopes used to create the images, a banner listing individuals who had made significant contributions to microscopy through the centuries, and an informational poster about the millimeter, micrometer, and nanometer scales for comparison with the macroscale. The exhibit website included a request for design of a metrology poster, but no student or student group responded. It also was initially hoped that a faculty member from the College of Art and

Architecture could be recruited to give a seminar on science as art and nanomaterials as an art medium, but this idea was not pursued.

Despite the hindrances, the committee felt that the *Visualizing Science: Microscopic Images from UNC Charlotte* exhibit was successful. In sharing our experiences, we hope other libraries will benefit from this description of our committee's outreach, recruitment, and decision-making processes.

Acknowledgements

We thank Sara DeWaay for her excellent and meticulous work on the floorplan, knowledge of digital images, and assistance in organizing the competition, reconfiguring research statements into wall labels, and developing the system for hanging prints.

Dr. Marcus Jones, Associate Professor of Chemistry, referred committee members to potential exhibitors and served as Technical Advisor, helping the committee define parameters for high-magnification images, educating them about how non-optical cameras record images from electron and atomic force microscopes, and providing electron micrographs for test prints.

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Photomicrographic art manuscript: Figures and Table together for clarity (WITH NAMES)

Figure 1: Welcome poster for the *Visualizing Science* open house

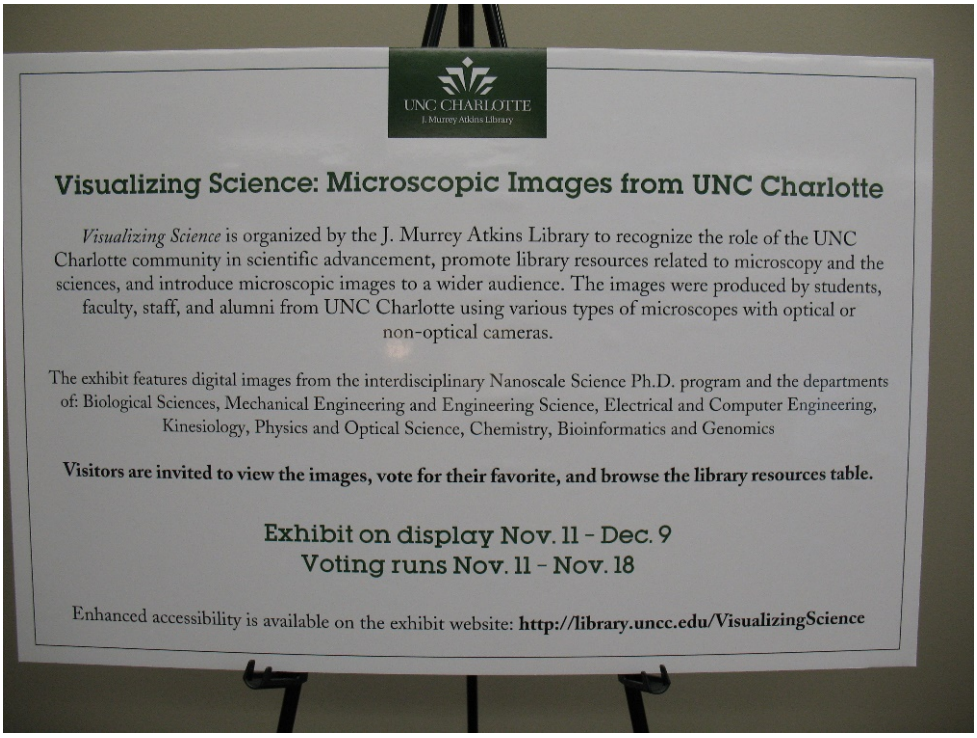

Figure2: Visualizing Science exhibit in library lobby with poster of historical photomicroscopists in foreground and study tables relocated to outside of exhibit space

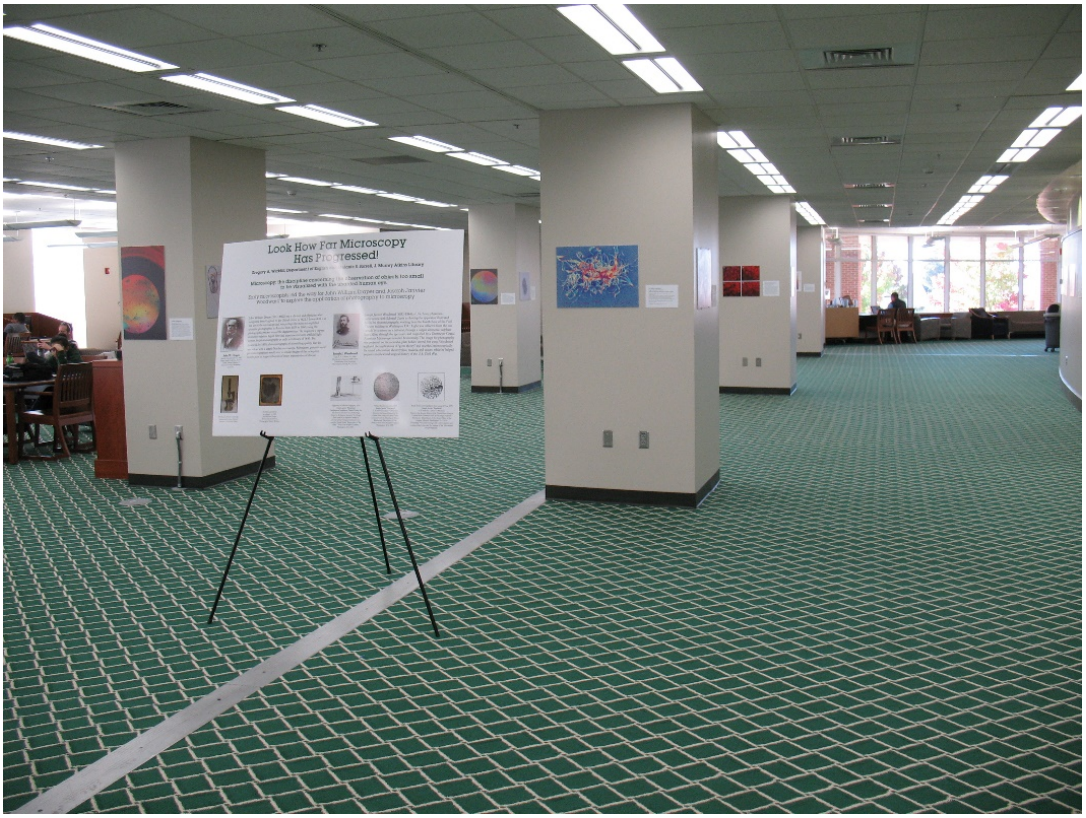

Figure 3: Posters and wall labels mounted along curved wall

Figure 4: Popular print with wall label

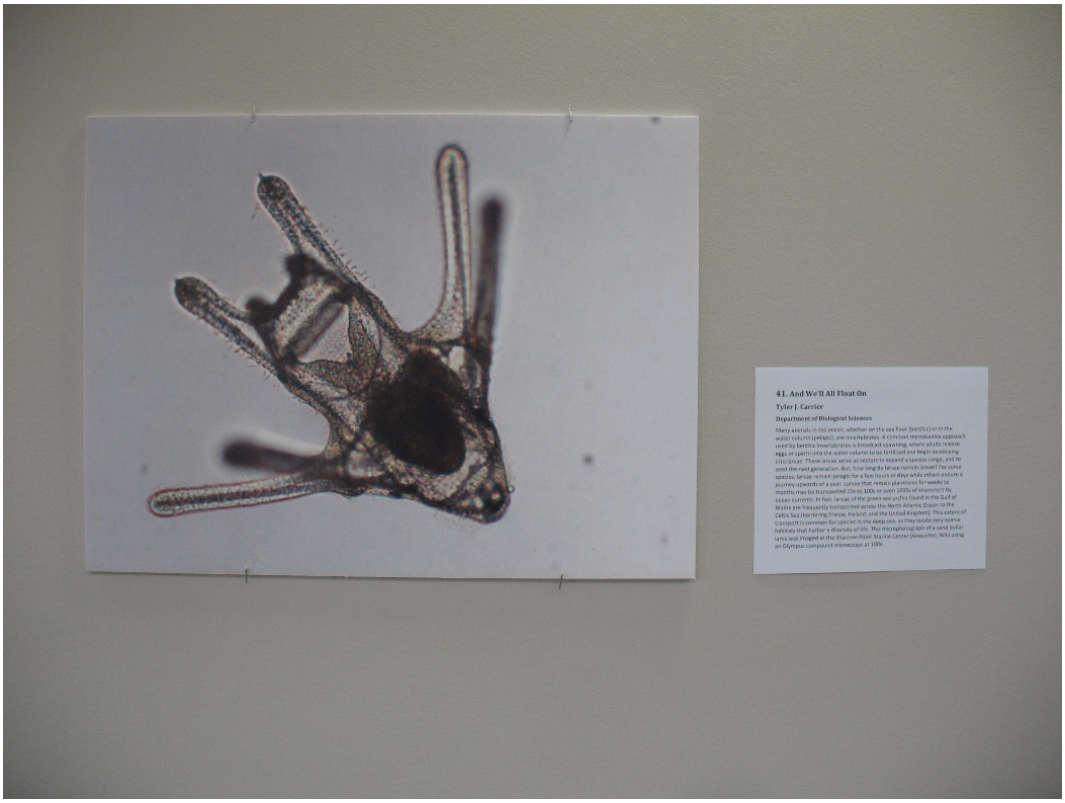

Figure 5: Scientists discussing their research with guests at the open house

Figure 6: Close-up of "MB-MDA 231 nonGFP Cells" with accompanying research statement.

Reproduced from the *Visualizing Science* webpage and with permission of Kenya Joseph and Dr. Kirill Afonin:

Kenya Joseph 1, PI: Kirill Afonin, Ph.D. 2 – 1 Department of Biological Sciences, 2 RNA Nanotechnology Lab

This image was taken from our Leica TCS SP2 Confocal Laser Scanning Microscope at 10X magnification by a Samsung Galaxy 5 cell phone. Our lab creates RNA nanoparticles for use in cancer research, personalized medicine and targeted drug delivery. This image is of breast cancer cells of cell line MDA-MB-231. We use them to study siRNA nanoparticle uptake and silencing of GFP fluorescence expression in these cells and other nanoparticle uptake. At the point of this image, the cells were being cultured into a new passage and we were observing confluence or cell growth and adherence prior to splitting them into a new culture. In this image, many cells have died and only a few survive here. Cancer cell lines are immortal and are used extensively in many areas of biological research to observe cellular processes and conditions. They are cells descended from a single cell and contain the same genetic makeup as their original tissue source.

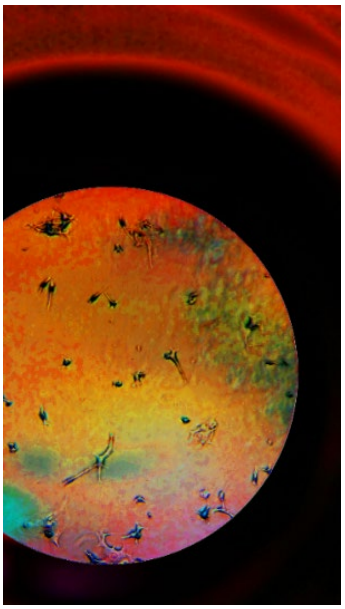

Figure 7: Close-up of "Colorful Nanoribbons" with accompanying research statement.

Reproduced from the *Visualizing Science* webpage and with permission of Siang Yee Chang and Dr. Terry R. Xu:

Siang Yee Chang, Terry T. Xu, Ph.D. Department of Mechanical Engineering and Engineering Science

Image credit: Dr. Zhe Guan, alum of Xu group, now at Intel Corporation, AZ. Formation of twisted boron nanoribbons on the Si/SiO_2 substrate during the synthesis of boron carbide one-dimensional (1D) nanostructures by co-pyrolysis of diborane (B_2H_6) and methane (CH_4) gases at elevated temperatures in a low pressure chemical vapor deposition (LPCVD) system.

Microscope used: JEOL JSM 6480 SEM (Scanning Electron Microscope). Magnification: 3,000X Methods used: Colored with Adobe Photoshop CS6

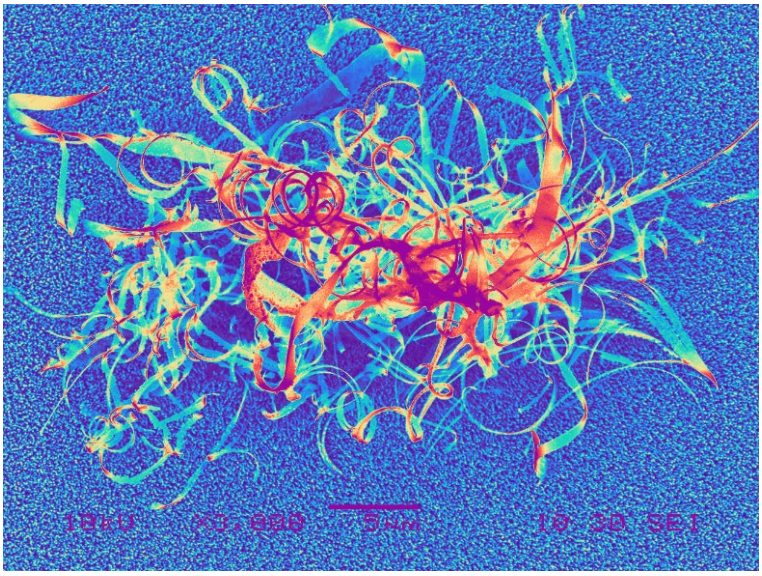

Table 1: *Visualizing Science* events budget

Visualizing Science Events Budget	
Beginning balance (approved budget)	**$2,692.50**
Item or Service	Cost
Commercial printer - test prints	$112.35
Commercial printer - final prints	$609.01
Open House catering vendor	$884.24
Campus printing service	$264.00
Competition awards	$119.66
SafeRide carts for field trip guests	$50.00
Expenditures	**$2,039.26**