

**Smathers Libraries Strategic Opportunities Program (SOP)
GRANT APPLICATION COVER SHEET
Application due: November 10, 2022, 5:00PM**

Principal Investigator (PI) Name: Shelia DeRoche

Check here if this is your first grant application where you will serve as a principal investigator (PI).

Department: Digital Services Email: sderoche1@ufl.edu Phone: 352-273-2696

List any additional project applicants (Include name, email, and brief role for each):
Jake Goodson, jcgoodson@ufl.edu, Object Imaging and Post-Processing

Title of grant project: The Next Dimension in Scanning: Using Photogrammetry to Digitize 3-Dimensional Objects

Project abstract (max 100 words):

The project team requests funding to purchase equipment for digitization of three-dimensional objects using photogrammetry, a method of using photographs to create 3D models. We will use photogrammetry to digitize four objects from the Baldwin Collection and the Panama Canal Collection over the length of the project. The 3D models will be uploaded to Sketchfab for viewing, and a link to the models will be included in the UFDC records for the objects. The project team will create documentation of this process, and after the grant period the equipment will be used to digitize other objects throughout the Libraries' collections.

Funds requested (\$5,000 limit): \$4,230.08

Describe how the 10% mandatory cost share will be met:
(Please contact Jenny Staples at jstaples@ufl.edu for any budget assistance if needed):

PI DeRoche's contributed time will average 1 hour per week and will consist of coordinating object delivery for digitization, research on photogrammetry digitization methodology, creation of workflows and documentation, and presentation on project deliverables. Co-PI Goodson's contributed time will average 1 hour per week and will consist of setup of equipment, photographing 3-dimensional objects, image processing and 3D model creation.

Please list the library resources/departments needed for this project and the name of the person authorizing the intended use and date authorized. Each authorizing person must initial their approval and confirmation of the availability of resources for this project. If you need more room, continue on a separate page.

Departmental Resources Required for Project (if applicable) including cost share contributions	Chair or Authorizing Individual	Approving Initials	Date Authorized
Shelia DeRoche	Laura Perry	<i>LP</i>	12/2/2022
Jake Goodson	Laura Perry	<i>LP</i>	12/2/2022

I confirm receipt of approvals from all project team members to participate in this project as described in the narrative and budget:

Shelia DeRoche
PI Signature

12/1/2022
Date

I support this project and approve the assignment of the described duties to the PI.

Laura Perry
Dept. Chair Signature

12/2/2022
Date

2022 Smathers Libraries Strategic Opportunities Grant PROJECT PROPOSAL NARRATIVE and BUDGET NARRATIVE

The Next Dimension in Scanning: Using Photogrammetry to Digitize 3-Dimensional Objects

PROPOSAL NARRATIVE

PROJECT DESCRIPTION

To enhance the digitization capabilities of the Digital Services unit and provide expanded digitization opportunities for collection managers at the UF Smathers Libraries, the project team is seeking \$4,230.08 to purchase equipment to be used for photogrammetry. Photogrammetry is the process of creating 3D models from photographs. The Digital Services unit regularly receives three-dimensional objects to digitize from the Libraries' collections, but the department currently only has the capability to take still images of these three-dimensional objects. Photogrammetry would allow us to present a more complete reproduction of the item we are digitizing. In order for us to implement this process, we would need a turntable, a camera stand with camera mounts and clamps, an improved lighting setup, and 3D modeling software. As part of the grant project, the project team will digitize four three-dimensional objects in our first year: two pop-up books from the Baldwin Children's Book Collection, and two objects from the Panama Canal Museum Collection. At the end of the year we will have the images and 3D files for the four objects present in the University of Florida Digital Collections (UFDC), with a link to the 3D models in Sketchfab. Once we've successfully created a photogrammetry workflow and documented the process, we'll be able to accept additional three-dimensional objects from other collections throughout the Libraries for digitization.

SIGNIFICANCE

The digitization services provided by the Digital Services Department help to support the Smathers Libraries' strategic directions by "provid(ing) streamlined and enhanced discoverability of, and maximiz(ing) access to, library collections at the point of need, regardless of the user's location or special needs." However, though the department is successfully digitizing text-based objects, digitizing three-dimensional objects using flat imagery misses a lot of the details and context surrounding these more complex objects. As the Libraries' need for object digitization grows, Digital Services needs to expand upon its digitization capabilities to best meet these needs. Using photogrammetry to create 3D models of objects will enable students and researchers from across the globe to better access, study, and expand knowledge utilizing these objects.

INNOVATIONS

Photogrammetry and 3D modeling would be an entirely new approach to digitization by the Digital Services department. Most recently the department has used still imagery to represent 3-dimensional objects that are sent to digitization. In 2015 we used a turntable and 360 software to create a flash video of a carved doll from the Panama Canal Museum Collection. However, the turntable we used for that project is now 14 years old, and the software that operates it is not

compatible with the operating system we use on our computers. In order to continue using it, we would need to provide a computer with an older OS, which would then be incompatible with the software needed to create the 3D models. In light of these issues, our current turntable is a poor candidate for future digitization projects. Photogrammetry, utilizing updated equipment, would be a more modern approach to object digitization, as it would allow researchers to digitally interact with the object by rotating and zooming in on the object. The files used to create the model will be posted in UFDC, which will allow researchers to 3D print replicas of the objects.

COMPARISONS

Photogrammetry has been used in the cultural heritage / museum space for several years now. Some examples of institutions that have been doing digitization work using this method are the [Smithsonian Institution](#), the [British Museum](#), and, more locally, the [Florida Museum](#). However, this method of digitization has cross-over benefits for libraries that have 3-dimensional objects; for example, Eileen J. Manchester wrote a post on the Library of Congress's [blog](#) in January of 2020 on a pilot project to create and display 3D models of objects held in the Library of Congress's collections. Similarly, Cambridge University's Digital Library has created and posted models of some items from their collections, including a pop-up page from [De Humani Corporis Fabrica](#). The project team has visited the digitization lab at the Florida Museum and consulted with the collection manager there. We are modeling our equipment purchases on the setup used by the Florida Museum, as we know it's highly successful.

RESOURCES

Personnel: Library Staff – Shelia DeRoche, Jake Goodson, Jane Pen

Equipment: In addition to the equipment proposed for purchase (listed in the budget narrative), we will use our current equipment, software, and facilities, including a computer, 3 Canon 5DS DSLR cameras with 50MM lenses, Adobe Creative Cloud, and space in the Large Format unit of Digital Services.

Other Costs: N/A

PROJECT TIMELINE (JANUARY 2023 – DECEMBER 2023)

Time Period	Activity	People Involved
January – June 2023	<ul style="list-style-type: none"> • Library/UFIT risk assessment of software • Purchase equipment when funds become available • Set up equipment • Familiarize ourselves with photogrammetry software 	DeRoche, Goodson, UF Libraries IT, UFDC Projects Team

	<ul style="list-style-type: none"> • Testing and workflow development • Work with UFDC Projects Team to begin receiving materials 	
July - September 2023	<ul style="list-style-type: none"> • Digitize three-dimensional objects / pop-up books • Quality control of digital images and 3D models 	DeRoche, Goodson, Pen
October - December 2023	<ul style="list-style-type: none"> • Continue to digitize three-dimensional objects / pop-up books • Document workflows and processes used for digitization • Disseminate results to the UF Libraries collection managers and other venues (Grants Program Lightning talks, etc.) 	DeRoche, Goodson, Pen

COLLECTION DETAILS

The collections we would focus on for this grant are the Baldwin Children's Book Collection and the Panama Canal Museum Collection. Katie Smith has identified a number of pop-up and accordion style books from this collection that could benefit from 3D digitization. Similarly, John Nemmers has identified various objects from the Panama Canal Museum Collection that would interest researchers. Some items that have been identified are figurines, masks, toys, and a blasting tube. Curators would be responsible for clearing the copyright status of the items before digitization. After the completion of the grant project, we would open up the queue for objects from collections throughout the Smathers Libraries and continue to work on Baldwin and Panama Canal items.

PROJECT DETAILS AND EVALUATION

The four objects chosen for the project will be imaged using three Canon DSLR cameras mounted on a camera stand, each camera capturing the object at a different angle. The automated turntable and included software will rotate the object 360 degrees, stopping every 5 degrees to fire each of the cameras in succession and store the images. After imaging, the photos will be processed using the RealityCapture software. This software will use the photos to create accurate textured 3D meshes of the objects. Once the textured meshes are created, we will export the models from RealityCapture and upload to Sketchfab for storage and sharing. We will host the images, model files, and metadata for the objects in UFDC, and include a link to the Sketchfab pages to allow patrons to view the 3D models. These models will be able to be used by researchers both locally and around the world who are not able to physically travel to campus and access the source materials.

A test scan was completed by the project team as a proof of concept. Without the automated turntable and the ability to shoot with multiple cameras simultaneously, the process was slow-going and the 3D model did not achieve the level of quality we were hoping for. However, it did teach us a lot about the process and its potential in a digitization program.

Photogrammetry Test Scan

The objective of the project is to digitize four objects over the course of the grant period. However, to achieve this goal the project team will have to assemble and learn to use new equipment, arrange for the receipt of the objects to be scanned, discover best practices for photographing objects to create a 3D model, discover what (if any) post-capture processing needs to be done to the images to ensure the best results in the modeling software, learn how to use the 3D modeling software effectively, and create workflows, documentation, and presentation materials to support the work we've done in 3D modeling. The project team will consult with Jane Pen on quality control throughout this process to ensure that we are digitizing to the highest standards. We will need to answer a variety of questions surrounding the projects, such as:

1. How will we image the bottom of an item that is placed on a turntable? How will issues like glare and shadows affect our model, and how can we best solve for those potential scanning defects?
2. How will the Quality Assurance process, which was established with still images in mind, need to differ to account for 3D models? What is an acceptable level of quality for these scans?
3. How many of the 219 images that we will take for each object should be displayed in UFDC? How do we ensure that the items are well-presented in both Sketchfab and UFDC?

Therefore, the ultimate goal of the project is not just to digitize four objects, but to create a streamlined workflow that will allow for future high-quality digitization of three-dimensional objects in a reasonable timeframe.

DISSEMINATION

A report on the project and documentation on the workflow will be created and uploaded to the UF Institutional Repository. Results will also be shared at one of the monthly UFDC Projects Meeting. These meetings regularly include faculty and staff from the Special and Area Studies Collections, Libraries IT, Resource Description Services, and Conservation. The project team will reach out to other departments outside of those mentioned to inform them of the project and invite them to attend the presentation at the UFDC Projects Meeting. We will also present at Lightning Talks, the annual grants showcase coordinated by the UF Libraries Grants Management team. The project team also hopes to present on the grant project externally at the ALA Annual Conference Poster Session.

LONG-TERM FINANCIAL IMPLICATIONS

If the Smathers Libraries wishes to continue digitizing 3D objects using photogrammetry beyond the grant period, we will need to continue to pay for both RealityCapture credits and a Sketchfab Pro account. RealityCapture operates on a pay-per-input model, where each 3D model created in RealityCapture costs a specific amount to export depending on file size. The project team estimates that each model is likely to cost no more than \$20 to export. The project team is also recommending a Sketchfab Pro account, as it can support models up to 200 MB (the test model linked above was 125 MB). This would cost \$180 if paid annually. If we choose

not to renew the annual subscription of the Pro account, the models that were uploaded would remain in Sketchfab, but we would be unable to upload new models.

The equipment purchased as part of the grant would continue to be used for future digitization projects. The turntable, which is the largest component of the equipment request, comes with a 1 year warranty. There is an optional extended warranty for 5 years at \$400 for each year. There are also free software updates on the turntable for the first year, and optional updates after this for \$250. The optional software update may be necessary if, for example, the department purchased newer model cameras to be used for object digitization. These expenses would be considered operational expenses. . The vendor states that the turntable has an expected life of 10 or more years.

Budget Narrative

The project team requests \$4,230.08 to purchase equipment needed for a photogrammetry setup. The bulk of this equipment can be purchased from B&H Photo, an approved UF vendor. The expenses in the budget form below were calculated by looking at the current prices listed for B&H in myUF Market. The project team has attempted to closely imitate the photogrammetry setup in use at the Florida Museum, as we are familiar with this setup and know it to be successful. The budget narrative also includes \$100 of RealityCapture credits, which are needed to export the created 3D models out of RealityCapture; a Sketchfab Pro account, which will allow for the uploading of large 3D models in Sketchfab; and various props from Gaylord Archival which will be used to position the objects for imaging. PI DeRoche's contributed time will average 1 hour a week and will consist of coordinating object delivery for digitization, research on photogrammetry digitization methodology, creation of workflows and documentation, and presentation on project deliverables. Co-PI Goodson's contributed time will average 1 hour a week and will consist of setup of equipment, photographing 3-dimensional objects, image processing and 3D model creation.

Strategic Opportunities Grant Budget Form 2022-2023

Please add lines as needed. If you need help completing this form, please contact Jenny Staples at jstaples@ufl.edu

1. Salaries and Fringe

Name of Person	% of effort	Grant Funds	Cost Share	Total
Jake Goodson	1	\$0.00	\$596.00	\$596.00
Shelia DeRoche	1	\$0.00	\$692.00	\$692.00
SUBTOTAL		\$0.00	\$1,288.00	\$1,288.00

2. Equipment

Item	Quantity times Cost	Grant Funds	Cost Share	Total
Turntable	1	\$2,803.68	\$0.00	\$2,803.68
Camera Mount	2	\$127.42	\$0.00	\$127.42
Clamps (lower cameras)	2	\$29.92	\$0.00	\$29.92
Clamp (upper camera)	1	\$48.79	\$0.00	\$48.79
Camera Stand	1	\$188.91	\$0.00	\$188.91
Studio Light Kit	1	\$477.59	\$0.00	\$477.59

USB Cord	2	\$59.98	\$0.00	\$59.98
SUBTOTAL		\$3,736.29	\$0.00	\$3,736.29

3. Supplies

Item	Quantity times Cost	Grant Funds	Cost Share	Total
RealityCapture Credits	5	\$100.00	\$0.00	\$100.00
Sketchfab Pro Account (yearly)	1	\$180.00	\$0.00	\$180.00
Vivak Transparent Sheets	4	\$117.60	\$0.00	\$117.60
Acrylic Display Stand	1	\$11.99	\$0.00	\$11.99
Acrylic Plate Easel	1	\$12.65	\$0.00	\$12.65
5 lb Cloth Bench Weight	1	\$51.05	\$0.00	\$51.05
Flex Snake Weight (2 pack)	1	\$20.50	\$0.00	\$20.50
SUBTOTAL		\$493.79	\$0.00	\$493.79

4. Travel

From/To	# of people/# of days	Grant Funds	Cost Share	Total
N/A		\$0.00	\$0.00	\$0.00
SUBTOTAL		\$0.00	\$0.00	\$0.00

5. Other (Vendor costs, etc. Provide detail in Budget Narrative section.)

Item	Quantity times cost	Grant Funds	Cost Share	Total
N/A		\$0.00	\$0.00	\$0.00
SUBTOTAL		\$0.00	\$0.00	\$0.00

	Grant Funds	Cost Share	Total
Total Direct Costs (add subtotals of items 1-5)	\$4,230.08	\$1,288.00	\$5,518.08

November 4, 2022

Dear Libraries Grants Committee,

I'm writing to support Shelia DeRoche's application for a Strategic Opportunities Grant entitled, *The Next Dimension in Scanning: Using Photogrammetry to Digitize 3-Dimensional Objects* and to receive funding for photogrammetry/3D object digitization tools and access to long-term software. The acceptance of this grant would be beneficial for three specific reasons. First, our collection teams are acquiring more three-dimensional objects. Second, our researchers are more worldwide than ever before. Finally, photogrammetry is a non-contact technology that keeps preservation in mind as it maps objects accurately and with precision.

University libraries have always been defined by their unique collections; however, library acquisitions are now collecting objects and not just flat media. This creates a need for a digitization program that does not just focus text. Even when it comes to books, there is an ever-growing push to digitally render these items in a way that fully represents their mass and shape. The pop-up books in our Baldwin Children's Library is a great example of the inability for two-dimensional scanning to fully convey to researchers the three-dimensional movement and shape of our collections. Photogrammetry could change this.

This is important now because many researchers I'm working with do not reside locally. As demand for our collections increases, so too does our digital library use. Researchers who cannot come in person need to experience our collections in the best possible way. Photogrammetry allows accurate mapping of an object and the conveyance of that mapping into an easily viewable animation accessible anywhere. This will, in turn, increase interest and support of our collections worldwide as it has for the movables and pop-up project I've been working on (and really wouldn't be able to continue without this technology).

Pre-photogrammetry technology required excessive object handling in order to get renderings. As a conservator, the contact-less nature of this process is important when it comes to the preservation and maintenance of our collections. Any imaging technology acquired and used needs to also ensure the least amount of damage to objects during the scanning process. The Florida Natural History Museum has proven the preservation capabilities of this technology with the scanning of their wet collections. The ability to utilize photogrammetry on some of their most fragile specimens pulled from 19th century jars speaks volumes as to the care this technology can provide while also allowing access to researchers. I believe our staff could also safely use this technology on our fragile items.

Shelia and her team work tirelessly to provide digital access to our research community and I believe that this technology will further their work even more. This will also amplify the use of our collections around the world and do so in a preservation-friendly manner. I support it.

Sincerely
Katie Smith
Conservator
University of Florida Libraries

November 8, 2022

Members of the Grants Management Committee:

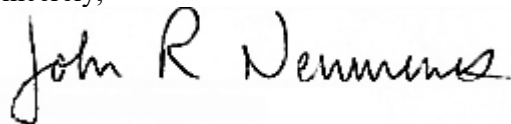
I am very pleased to provide you with a letter strongly supporting the proposed Strategic Opportunities Program grant project, *The Next Dimension in Scanning: Using Photogrammetry to Digitize 3-Dimensional Objects*, directed by Shelia DeRoche.

The department of Special & Area Studies Collections manages special materials in a wide variety of formats, and almost every major curatorial unit in SASC includes multiple examples of three-dimensional objects. The Panama Canal Museum Collection alone includes thousands of 3D objects - everything from tools and equipment to toys and games and cultural artifacts such as baskets, Carnival masks, and so on. In fact, we have several identified several objects in the Panama Canal Museum Collection that are high priorities for imaging when it is possible to do so. Our curators and other personnel in SASC use 3D objects regularly in exhibits, displays, and instruction, which benefits visitors who are on campus. However, we have only digitized a small percentage of these objects, which is not as useful for the users worldwide who are unable to travel to UF.

I am particularly excited that this SOP grant project would enable us to experiment with photogrammetry to create 3D models of our objects. In addition to enabling digital access to these objects online, we have a special digital exhibit case in the Nahmad Panama Canal Gallery in Smathers Library that would be perfect for displaying 3D models of artifacts so that visitors could interact with the objects and view them from various perspectives. I appreciate that the proposed project acquires equipment, allows the team to experiment with selected objects and increase their knowledge of the process, and then paves the way for future imaging of objects using the equipment and the experience gained.

In summary, I strongly support the proposed project and I believe that Shelia and her team have the skills to accomplish the proposed goals.

Sincerely,



John R. Nemmers, University Librarian
Program Director for Special and Area Studies Collections &
Curator of the Panama Canal Museum Collection