



# ARCHIVING 2022

Expanding Connections Across  
Digital Cultural Heritage



## FINAL PROGRAM AND PROCEEDINGS

General Chair: Fenella France, Library of Congress



[www.imaging.org/archiving](http://www.imaging.org/archiving)

Sponsored by the Society for Imaging Science and Technology

The papers in this volume represent the program of Archiving 2022,  
held June 7-10, 2022, online.

Copyright 2022

Society for Imaging Science and Technology  
7003 Kilworth Lane • Springfield, VA 22151 USA  
703/642-9090; 703/642-9094 fax  
info@imaging.org; www.imaging.org

All rights reserved. The abstract book with full proceeding, or parts thereof, may not be reproduced in any form  
without the written permission of the Society.

ISBN Archiving 2022 eProceedings (with full papers and appendices): 978-0-89208-358-9  
ISBN Archiving 2022 Abstract PDF (papers listing only; no appendices): 978-0-89208-359-6  
ISSN Print: 2161-8798  
ISSN Online: 2168-3204

Manuscripts are reproduced from PDFs as submitted and approved by authors; no editorial changes have been made.

Printed in the United States.

## WELCOME TO ARCHIVING 2022

It is with immense pleasure that I welcome you to Archiving 2022. While we had hoped to be in person this year, the timing for needing to decide in January when Omicron was rampant made things challenging and, along with travel options for folks in Europe and the US being somewhat restricted, we made the prudent decision to stay virtual.

It has been so heartening to see how the Archiving community has responded so warmly to staying connected throughout the past two years. Likewise, it is deeply gratifying and exciting to see the expansion of our community to include many new participants. This truly is a positive outcome from the past two years, as online platforms allowed colleagues to participate from different time zones and to view presentations at a time of their choosing. I want to thank all the presenters and participants in DigiTips and the monthly Grab-a-Cup, as this—along with all the wonderful projects you are all working on—seems to have created an extremely vibrant set of papers and presentations for Archiving 2022.

Once again, IS&T staff and colleagues have worked magic to get a series of tours available, and we have a fantastic lineup of keynote speakers. We are using Gather to enhance our coffee breaks and poster sessions, and are looking forward to the energy and new areas of research and projects that are going to be presented.

As I reflect, the past two years have seen an extraordinarily strong focus from Archiving committee members, reviewers, supporters, and organizers on assuring that this conference and our community mirror the full gamut of cultural heritage organizations that encompass all that we do. We have seen so many of the challenges mirrored across archives, libraries, museums, and galleries, and being able to share our experiences, new techniques, modified processes, and workflows is such a powerful component of us all coming together.

Thank you all for being part of this amazing community, and we will share again, through time zones and screens.

My warmest regards,  
*Fenella G. France*  
*General Chair, Archiving 2022*

## CONFERENCE COMMITTEE

### GENERAL CHAIR

Fenella France, Library of  
Congress (US)

### PROGRAM CHAIR

Sony George, Norwegian  
University of Science and  
Technology (Norway)

### SHORT COURSE CHAIRS

Martina Hoffmann, Swiss  
National Library (Switzerland)  
Bethany Scott, University of  
Houston Libraries (US)

### STEERING COMMITTEE CHAIR

Peter Burns, Peter Burns Imaging  
(US)

## REVIEW COMMITTEE

Ottar A.B Anderson, Intermunicipal Archive of Møre og Romsdal (Norway)

Michael Conyers, October Archivism LLC (US)

Jamie Cope, Smithsonian Institution Digitization Program Office (US)

Terrance D'Ambrosio, Northeast Document Conservation Center (US)

Hilda Deborah, Norwegian University of Science and Technology (Norway)

Roger Easton, Chester F. Carlson Center for Imaging Science (US)

Susan Farnand, Rochester Institute of Technology (US)

Rebecca Frank, Humboldt-Universität zu Berlin (Germany)

Kurt Heumiller, National Gallery of Art (US)

Martina Hoffmann, Swiss National Library (Switzerland)

Christine Huhn, University of California Berkeley Library (US)

Anssi Jääskeläinen, South-Eastern Finland University of Applied Sciences (Finland)

Olivia Kuzio, Rochester Institute of Technology (US)

Ryan Lieu, Stanford Libraries (US)

Claire Lovell, South Central Library Regional Council (US)

Giacomo Marchioro, University of Verona (Italy)

Anne Mason, National Archives and Records Administration (US)

Kit Messick, Getty Research Institute (US)

Jeanine Nault, Smithsonian Institution (US)

Taren Ouellette, Library of Congress (US)

Snehal Padhye, Rochester Institute of Technology (US)

Thomas Rieger, Library of Congress (US)

Jamie Rogers, Florida International University (US)

Lynda Schmitz-Fuhrig, Smithsonian Libraries and Archives (US)

David Schuster, Binghamton University (US)

Bethany Scott, University of Houston Libraries (US)

Raju Shrestha, OsloMet - Oslo Metropolitan University (Norway)

Steven Simske, Colorado State University (US)

Dina Sokolova, Columbia University (US)

Giorgio Trumpy, Norwegian University of Science and Technology (Norway) and University of Zurich (Switzerland)

Eva Maria Valero, University of Granada (Spain)

Corine van Dongen, Koninklijke Bibliotheek (the Netherlands)

A. Marie Vans, Colorado State University (US)

Christoph Voges, consultant (Germany)

E. Keats Webb, Smithsonian Museum Conservation Institute (US)

Meghan Wilson, Library of Congress (US)

---

## IS&T BOARD OF DIRECTORS JULY 2021 – JUNE 2022

### President

Susan Farnand, Rochester Institute of Technology

### Executive Vice President

Nicolas Bonnier, Apple Inc.

### Conference Vice President

Sophie Triantaphillidou, University of Westminster

### Publications Vice President

Robin Jenkin, NVIDIA Inc.

### Secretary

Peter Morovic, HP Inc.

### Treasurer

Ken Parulski, aKAP Innovation, LLC

### Vice Presidents

Graham Finlayson, University of East Anglia

Paul Hubel, Apple Omc/

Teruaki Mitsuya, Ricoh Company, Ltd.

Marius Pedersen, NTNU

Gaurav Sharma, University of Rochester

Maria Vanrell, Universitat Autònoma de Barcelona

### Immediate Past President

Scott Silence, Corning, Inc.

### Chapter Directors

Rochester: Roger Triplet, retired

Tokyo: Atsushi Tomotake, Konica Minolta Inc.

### IS&T Executive Director

Suzanne E. Grinnan

## ARCHIVING 2022 COOPERATING SOCIETIES



american  
institute for  
conservation  
**Preserving Cultural  
Heritage**



**Council on  
Library and  
Information  
Resources**

**cni**

Coalition for Networked Information



Digital Preservation Coalition

**THE RPS**

ROYAL  
PHOTOGRAPHIC  
SOCIETY

# SHORT COURSE PROGRAM

---

## Monday 23 May

### SC01: Best Practices for Implementing a FADGI Compliant Color Digitization Workflow

Duration: 4 hours

Instructors: David R. Wyble, Avian Rochester, LLC, and Thomas Rieger, Library of Congress (US)

---

## Tuesday 24 May

### SC02: Introduction to Blockchain for Cultural Heritage

Duration: 2 hours

Instructors: Gaurav Sharma, University of Rochester (US)

---

## Wednesday 25 May

### SC03: Scanner & Camera Imaging Performance: Ten Commandments

Duration: 2 hours

Instructors: Peter Burns, Burns Digital Imaging, and Don Williams, Image Science Associates (US)

### SC04: Scanner & Camera Imaging Performance: Evaluation and Interpretation

Duration: 2 hours

Instructors: Peter Burns, Burns Digital Imaging, and Don Williams, Image Science Associates (US)

---

## Thursday 26 May

### SC05: Digitization of Federal Records to Comply with US National Archives Regulations

Duration: 2 hours

Instructors: Michael Horsley, NARA (US)

---

## Tuesday 31 May

### SC02: OpenDICE for Digital Imaging Quality Assessment

Duration: 2 hours

Instructor: Lei He, Library of Congress (US)

---

## Wednesday 1 June

### SC07: Advanced Imaging: Exploring Multimodal and Spectral, from Simple to Complex

Duration: 2 hours

Instructors: Fenella France and Meghan Wilson, Library of Congress (US)

### SC08: Planning and Managing a Digital Collections Project

Duration: 2 hours

Instructor: Dinah Handel, Stanford University (US)

---

## Thursday 2 June

### SC09: International Standards and Why You Should Care

Duration: 4 hours

Instructor: Alan Hodgson, consultant (UK)

### SC10: From CIELAB to CIEDE2000

Duration: 2 hours

Instructors: Roy S. Berns, Gray Sky Imaging

---

## Friday 3 June

### SC11: Digitizing Motion Picture Film

Duration: 2 hours

Instructor: Giorgio Trumpy, Norwegian University of Science and Technology (Norway) and University of Zurich (Switzerland)

---

## On-demand

### SC12: Integrating Advanced Imaging and Digitization into Your Institution

Duration: 2 hours

Instructor: Michael B. Toth, R.B. Toth Associates (US)

Recorded: Archiving 2021

### SC13: Measuring, Modeling, and Rendering Surface Appearance

Duration: 2 hours

Instructors: James Ferwerda and Snehal Padhye, Rochester Institute of Technology (US)

Recorded: Archiving 2021

# TECHNICAL PAPERS CONFERENCE PROGRAM SCHEDULE

## TUESDAY 7 JUNE 2022

---

### WELCOME AND OPENING KEYNOTE

---

Session Chair: Fenella France, Library of Congress (US)

10:00 – 11:00 NY / 16:00 – 17:00 PARIS

10:00 **Computational Museology: Interfaces to Cultural (big) Data,**  
*Sarah Kenderdine, EPFL (Switzerland)*

Computational museology is a scaffold that unites machine intelligence with data curation, ontology with visualization, and communities of publics and practitioners with embodied participation through immersive interactive interfaces. Research into computational museology at the Laboratory for Experimental Museology (eM+), EPFL reaches beyond object-oriented curation to blend experimental curatorship with contemporary aesthetics, digital humanism, and emerging technologies. This lecture explores key themes in a repertoire that manifests in an applied exhibition practice including: interactive archives and emergent narrative; deep mapping and carto-criticism; deep fakes and blockchain sovereignties; embodied knowledge systems and motion as meaning.

11:00 – 11:30 NY / 17:00 – 17:30 PARIS

### WELCOME RECEPTION

Join other attendees in the Archiving 2022 Gather.town for some special conversations.

---

### ARCHIVING AND BOOKS

---

Session Chair: Leah Jones, National Museum of African American History and Culture (US)

11:30 – 12:35 NY / 17:30 – 18:35 PARIS

11:35 **Multispectral Scheimpflug: Imaging Degraded Books that Open less than 30 Degrees,** *Gregory Heyworth<sup>1</sup>, Keith T. Knox<sup>2</sup>, Kenneth Boydston<sup>3</sup>, and Yuhao Zhu<sup>1</sup>; <sup>1</sup>University of Rochester, <sup>2</sup>Early Manuscripts Electronic Library, and <sup>3</sup>MegaVision (US) . . . 1*

This paper presents an imaging system that reads texts from books that open less than 30 degrees (due to their fragile bindings) and whose paper quality is degraded. In particular, the system operates on the Scheimpflug principle to correct the geometric distortion necessarily introduced when imaging barely open books. We introduce the guiding principles behind such a system, discuss how it is calibrated and set up, present the results of imaging two dime novels from early twentieth century, both with fragile bindings, and discuss lessons we learned.

11:55 **Practical Comparison of Rendering Programs for 2.5D Models of Embroidered Binding Covers** *Leah Humenuck, Rochester Institute of Technology (US); presentation-only . . . . . A-1*

Embroidered bindings are books covered in a textile which was embellished before it was applied as a covering material. The covers of embroidered bindings are complex, 2.5-dimensional structures. They may involve many different types of textures and materials. When these items are digitized for educational use, conventional 2D capture techniques do

not convey their dimensionality. However, a solution to this is the use of 3-dimensional rendering software to produce a 2.5-dimensional rendering of their surfaces. This research investigates the practical comparison of free rendering software to produce 2.5-dimensional models of embroidered binding covers. The images are captured using a smartphone and the workflows and outcomes of the rendering software are compared to provide a practical comparison guide.

12:15 **Digitizing and Printing the Burgert Brothers Ledger Books: A Case Study in High-volume Facsimile Production,** *Harrison Walker and Sami Wright, Northeast Document Conservation Center (US) . . . . . 5*

The goal of digitization is typically to create digital assets which represent the physical object as a means of digital preservation or access. On occasion, projects require bringing those digital images back into the physical world in the form of a facsimile. While reproducing objects for display and/or use is a common and well-established practice, there are unique cases that require innovative applications of existing tools and methods. Working closely with NEDCC's book conservation lab, we imaged eight ledger books and then printed two copies of each to be rebound into near-identical, usable copies. Using this project as a case study, we will share some of the successes and hurdles we encountered while working through this large volume of material, with particular attention to deviations in image capture and processing workflows when producing bound facsimiles.

12:35 – 13:00 NY / 18:35 – 19:00 PARIS

### BREAK / POSTERS ON VIEW

Join other attendees in the Archiving 2022 Gather.town.

---

### ARCHIVING

---

Session Chair: Bethany Scott, University of Houston Libraries (US)

13:00 – 14:00 NY / 19:00 – 20:00 PARIS

13:05 **Interactive Paper Preview: Film and Digital Media: Open Issues and Novel Approaches for Digital Color Film Restoration,** *Alice Plutino, Università degli Studi di Milano (Italy) . . . . . 11*

The problems and issues which can affect color film restoration may involve all the steps of the cinematographic and photographic restoration workflow, from the digitization to the final quality assessment. In this paper, I aim at providing an overview of the main problems which can occur throughout a digital restoration, with particular focus on glare effect, and at offering some novel solutions.

13:10 *Interactive Paper Preview: Handwritten and Printed Text Identification in Historical Archival Documents*, Mahsa Vafaie<sup>1</sup>, Oleksandra Bruns<sup>1</sup>, Nastasja Pilz<sup>2</sup>, Jörg Waitelonis<sup>1</sup>, and Harald Sack<sup>1</sup>; <sup>1</sup>FIZ-Karlsruhe, and <sup>2</sup>Landesarchiv Baden-Württemberg (Germany) . . . . . **15**

Historical archival records present many challenges for OCR systems to correctly encode their content, due to visual complexity, e.g. mixed printed text and handwritten annotations, paper degradation, and faded ink. This paper addresses the problem of automatic identification and separation of handwritten and printed text in historical archival documents, including the creation of an artificial pixel-level annotated dataset and the presentation of a new FCN-based model trained on historical data. Initial test results indicate 18% IoU performance improvement on recognition of printed pixels and 10% IoU performance improvement on recognition of handwritten pixels in synthesised data when compared to the state-of-the-art trained on modern documents. Furthermore, an extrinsic OCR-based evaluation on the printed layer extracted from real historical documents shows 26% performance increase.

13:15 *Design and Development of Digitization Workflow for the Medium Format Capture of Oversized Artwork*, Isaac S. Harper, Abby G. Beazer, and Brenna H. Cooper, Brigham Young University (US) . . . . . **21**

Over the last decade, medium format imaging solutions have made instantaneous capture of large 2D objects possible, dramatically increasing the throughput and image quality of digitization in cultural heritage applications. Despite this, the process of digitizing oversized objects, such as original artwork and scroll manuscripts is substantially more complicated; little research has been conducted on the efficacy of using such medium format solutions for this purpose. In this study, a workflow for digitizing a collection of oversized artwork according to the Federal Agencies Digital Guidelines Initiative (FADGI) guidelines was developed. Successful development of this process demonstrates the potential this process and others like it have to expand the applications of cultural heritage digitization solutions.

13:35 *E-justice to Bridge Records Management Gap at the High Court in Namibia*, Beauty Matongo, University of Namibia (Namibia), and Lorette Jacobs, University of South Africa (South Africa) . . . **25**

E-justice is an electronic records management system aimed at enhancing the availability of electronic court records to support the discharge of justice. Urgent need to assess the relevance of the system was required as statistical information from 2019, indicated that approximately 25440 high court cases could not be finalised between 2015 and 2019 due to a lack of access to reliable court records. This created perpetual embarrassment as suspects who are innocent until proven guilty, remain imprisoned. Towards exploring the enhancement of an e-justice system to expand access to records in the judiciary, the study adopted a qualitative approach in which data was collected through interviews and observation. Twelve participants were interviewed, and numerous high court offices visited, to assess the extent to which improvements to an e-justice system is required. Findings

revealed that a lack of specific policies and procedures to govern the management of records impacted negatively on the access to court records. In addition, financial limitations, old ICT infrastructure, and poor human resource skill further exacerbate the problem. The solution towards the problem is based on the development and implementation of an e-justice framework where records are captured, categorised, and made accessible to high courts through advanced information and communication infrastructures. Towards this end, it is recommended that the Namibian Judiciary embark on a change management process where updated ICT infrastructure support records management life cycle functions and where all members of the judiciary are well versed in the use of an e-justice system.

13:55 **Closing Remarks**

---

## BEHIND-THE-SCENES TOURS I

14:15 – 15:15 NY / 20:15 – 21:15 PARIS

**HILA Digital Imaging Lab**, Hoover Institution Library & Archives at Stanford University

**CCP Digital Imaging Lab: Frozen negatives and the implementation of programmatic digitization**, Center for Creative Photography, University of Arizona

## WEDNESDAY 8 JUNE 2022

---

## BEHIND-THE-SCENES TOURS II

10:00 – 11:15 NY / 16:00 – 17:15 PARIS

**Beyond 3D geometry and color: Reproducing surface-light interaction:** Fraunhofer Institute for Computer Graphics Research, Cultural Heritage Digitization

**Imaging Edvard Munch’s “The Sick Child”**, Norwegian National Museum of Art

---

## COMPUTATIONAL ANALYSIS

Session Chair: Robert Kastler, Museum of Modern Art (US)

11:30 – 12:25 NY / 17:30 – 18:25 PARIS

11:35 **Enhanced Computer Vision using Automated Optimized Neural Network Image Pre-processing**, Kevin Patrick Fenton, Vincil Bishop, and Steven J. Simske, Colorado State University (US) . . . . . **30**

This research focuses on the benefits of computer vision enhancement through use of an image pre-processing optimization algorithm in which numerous variations of prevalent image modification tools are applied independently and in combination to specific sets of images. The class

with the highest returned precision score is then assigned to the feature, often improving upon both the number of features captured and the precision values. Various transformations such as embossing, sharpening, contrast adjustment, etc. can bring to the forefront and reveal feature edge lines previously not capturable by neural networks, allowing potential increases in overall system accuracy beyond typical manual image pre-processing. Similar to how neural networks determine accuracy among numerous feature characteristics, the enhanced neural network will determine the highest classification confidence among unaltered original images and their permutations run through numerous pre-processing and enhancement techniques.

11:55 **Isolated Handwritten Character Recognition of Ancient Hebrew Manuscripts**, *Tabita L. Tobing, Sule Y. Yayilgan, and Sony George, Norwegian University of Science and Technology; and Torleif Elgvin, NLA University College (Norway)* . . . . . **35**

Character recognition is widely considered an essential factor in preserving and digitizing historical handwritten documents. While it has shown a significant impact, the character recognition of historical handwritten documents is still a challenging task. This work aims to present a study on building a character recognition system for a handwritten ancient Hebrew text utilizing convolutional neural networks, dealing with material degradation, script complexity, and varied handwriting style. Our research underlined the importance of creating a ground-truth dataset for a robust and reliable character recognition system. Moreover, this study compares the performance of four convolutional neural network models applied to our dataset.

12:15 *Interactive Paper Preview: Artificial Intelligence and the Creation of a Holistic Historical Record: Digitizing Collections held by The HistoryMakers*, *Hannah Storch, Digital Transitions (US); presentation-only* . . . . . **A-3**

Physical collections are subject to deterioration over time and the metadata information that accompanies them is time-consuming and labor-intensive to generate, often involving the individual knowledge of one person. And yet, if this information is not extracted, cataloged, and linked to the image, this valuable context can be lost to sheer volume and amount of time—obscured by the scale of images one might have to look through manually to find given content. Through the application of Artificial Intelligence (AI), Digital Transitions’ service bureau division has been able to capture descriptive metadata information from digital images, creating a comprehensive and enhanced historical record. By partnering with The HistoryMakers to digitize and analyze the personal collections of their HistoryMakers, creating Optical Character Recognition (OCR) transcription records and providing object and notable person recognition through the use of AI, Digital Transitions has been able to assist in the telling of these seminal stories by providing enhanced digital assets and metadata that promote accessibility, prompt research, and provide valuable visual context.

12:20 *Interactive Paper Preview: How to Generate and Import Functional Test Cases into Project Management Software Systems using Natural Language Processing*, *Ricardo Reyna and Steven J. Simske, Colorado State University (US)* . . . . . **40**

The main purpose of software testing is to identify what the software does and whether it matches its functional expectations. Applying a test plan

allows one to prevent problems in early stages, identifying and addressing solutions before a project goes into production. Test cases play an important role during the software testing phase. A test case is a document with comprehensive details and sequences of actions to guide the software tester through the steps that need to be taken and the outputs that are expected.

The proposed system generates test cases based on scraped data that are used to interact with Natural Language Processing (NLP) approaches to generate functional test cases. A project management software (e.g., JIRA) is integrated with the JIRA python library to manage the test cases by the software tester.

12:25 – 12:55 NY / 18:25 – 18:55 PARIS

**BREAK / POSTERS ON VIEW**

Join other attendees in the Archiving 2022 Gather.town.

---

## ART & IMAGING

---

Session Chair: Olivia Kuzio, Rochester Institute of Technology (US)

12:55 – 13:50 NY / 18:55 – 19:50 PARIS

13:00 FOCAL TALK: **Artist Acrylic Paint Spectral, Colorimetric, and**

**Image Dataset**, *Roy S. Berns, Gray Sky Imaging (US)* . . . . . **45**

Spectral datasets, and subsequent colorimetric and image data, have a variety of uses in cultural heritage imaging including sensor design, lighting design, synthetic target generation, spectral accuracy assessment of multispectral and hyperspectral cameras, color accuracy assessment of digital cameras, and encoding errors. Spectral data for 58 Golden Artist Colors Heavy Body Acrylics were used to calculate the spectra of 831 varnished tints, tones, and masstones, based on the two-constant opaque form of Kubelka Munk turbid-media theory. The data were used to calculate a synthetic target that was used to quantify encoding errors using AdobeRGB (1998), commonly used in cultural heritage imaging, and sRGB, commonly used in documents and consumer imaging. 22% and 31% of the target colors were out of gamut, respectively. Principal component analysis was performed and the first three eigenvectors used to extract spectra similar to cyan, magenta, and yellow. These PCA-based primaries poorly approximated the 58 pigments.

13:30 **3D Imaging Rembrandt’s ‘The Night Watch’ – A New Scanner Design, Calibration Procedures, and Optimized Capturing**

**Strategy** (presentation-only), *Willemijn S. Elkhuisen, Tessa T.W.*

*Essers, Mascha Slingerland, and Yu Song, Delft University of Technology; and Rob Erdmann, University of Amsterdam (the Netherlands); presentation-only* . . . . . **A-5**

This paper presents a new design, calibration procedures, and an optimized capturing strategy, of a 3D imaging system for capturing very large paintings. It describes relevant design requirements and constraints, various (improved) calibration steps, and additional capturing automation, aimed at optimally and efficiently capturing the characteristic topographical features, such as impasto and craquelure, of (17th century, Dutch) paintings. The 3D imaging system was used to capture Rembrandt van Rijn’s ‘The Night Watch’ (1642), a painting with a surface area of more than 17m<sup>2</sup>. We highlight some preliminary result of this scanning campaign and possible applications such as painting documentation, condition analysis, and visualization.



13:50 – 14:00 NY / 19:50 – 20:00 PARIS

STRETCH BREAK

Join other attendees in the Archiving 2022 Gather.town.

**AWARD PRESENTATIONS AND WEDNESDAY KEYNOTE**

Session Chair: Fenella France, Library of Congress (US)

14:00 – 15:00 NY / 20:00 – 21:00 PARIS

**Senior Membership Awards presented to Peter Burns and Don Williams**

14:10 **digitalpasifik.org—Reflections on Designing and Delivering a Bridge Between Worlds**, *Tim Kong, National Library (New Zealand)*

The Pacific Virtual Museum (PVM) project is funded by the Department of Foreign Affairs & Trade in Australia, and implemented by the National Library of New Zealand in collaboration with the National Library of Australia, but with a deliberate focus on making an impact across the Pacific region.

The project aims to make visible and accessible the digitized cultural heritage of the people in and of the Pacific. To achieve this, we have designed a site that serves as both a bridge and a mirror between the worlds of Pacific people and the worlds of cultural heritage institutions.

To deliver on these aims, a co-design group from across the Pacific has worked in a way that honors Pacific relationships, realities, and timescales. The project has delivered an interface that leverages and presents metadata only, on a site designed to work usefully across the Pacific, on low bandwidth networks and mobile devices first.

This talk reflects on some challenges and opportunities that the project faced and what these might mean for cultural institutions in the Pacific and around the world, when they are designing digital experiences to honor those in the Pacific seeking to access their cultural heritage.

**THURSDAY 9 JUNE 2022**

**VISUALIZATION**

Session Chair: Giorgio Trumpy, Norwegian University of Science and Technology (Norway)

10:00 – 10:50 NY / 16:00 – 16:50 PARIS

10:05 **New Directions in RTI Software**, *Carla Schroer and Mark Mudge, Cultural Heritage Imaging (US); and Alessandro Muntoni and Federico Ponchio, Istituto Scienza e Tecnologie dell'Informazione (ISTI) (Italy); presentation-only . . . . . A-7*

Reflectance Transformation Imaging (RTI) is widely used in art conservation, archaeology, epigraphy and other cultural heritage and natural science contexts to reveal fine surface details that are difficult to see with the naked eye. The Visual Computing Lab (VCL) of CNR-ISTI and Cultural Heritage Imaging (CHI) are collaborating to provide the next generation of RTI tools. The VCL is building new, open source software that updates the existing RTI software, improves the accuracy of results, and adds support for new web based presentation. CHI will provide testing, user forums, and instructional materials to support widespread adoption of

these new tools. This presentation will show the latest versions of the tools, and present a roadmap for ongoing RTI and Multilight tool development.

10:25 **An Online Model Viewer for Cultural Heritage in Unity 3D**, *Tyler Garcia, Zhangchi Lyu, and Michael Tetzlaff, University of Wisconsin - Stout (US) . . . . . 50*

We present a prototype of a 3D model viewer for cultural heritage built in Unity 3D. The Unity engine allows for the use of custom shaders that can increase realism and provide a uniquely immersive experience with cultural heritage artifacts. Examples of custom shaders that this architecture supports include image-based specular reflections and polynomial texture mapping (PTM) for translucent materials. Furthermore, the software can be built and deployed as a stand-alone WebGL application viewable in the browser without relying on third-party content delivery services. The code for this project is open source and available on GitHub.

10:45 **Interactive Paper Preview: Extended Framework for Multispectral RTI**, *Yuly Castro<sup>1</sup>, Amalia Siatou<sup>1,2</sup>, Mattieu Rossé<sup>1</sup>, Hermine Chatoux<sup>1</sup>, Ramamoorthy Luxman<sup>1</sup>, Gaëtan Le Goïc<sup>1</sup>, and Alamin Mansouri<sup>1</sup>; <sup>1</sup>University of Bourgogne Franche Comté (France), and <sup>2</sup>University of Applied Sciences and Arts Western Switzerland (HESSO) (Switzerland) . . . . . 56*

Reflectance transformation imaging (RTI) is a widespread technique for studying and documenting cultural heritage artifacts encompassing textual information. The principle is capturing an object from a static camera position by changing the direction of the incident light in each image. The coupling of this approach with multispectral imaging (Multispectral RTI) has shown promising results in the recent years. Considering this approach, we propose an expanded framework for the investigation and documentation of the visual appearance of surfaces, targeted to cultural heritage artifacts. In this work, we study the integrated representation of the angular and spectral components of reflectance, as well as the contributions of exploration by independent wavelengths

10:50 – 11:15 NY / 16:50 – 17:15 PARIS

BREAK / POSTERS ON VIEW

Join other attendees in the Archiving 2022 Gather.town.

**DIGITIZATION**

Session Chair: Rita Hofmann-Sievert, Applied University of Bern (Switzerland)

11:15 – 12:25 NY / 17:15 – 18:25 PARIS

11:20 **Mass Digitization with Smartsheet: Leveraging a Commercial Solution for Flexible Project Management**, *Emma Stanford, Hoover Institution Library & Archives, Stanford University (US) . . . . . 62*

The Hoover Institution Library & Archives (HILA) has implemented Smartsheet, a cloud-based project management tool, to manage tasks and cross-team handoffs for its new mass digitization program. By combining task-specific tools such as Capture One and LIMB Processing with the administrative flexibility of Smartsheet, HILA has succeeded in leveraging commercial project management functionality for cultural heritage purposes, resulting in improvements to our program's efficiency, flexibility, and reporting capabilities.

11:40 **Digitizing with a Mobile Phone System: A Contribution**, *Marcele de Oliveira Gonçalves, Moreira Salles Institute (Brazil)* . . . . . 67

This article aims to present the experience gained during the development and implementation of a digitization system for cultural heritage collections using a cell phone. This project was developed in four stages: search and creation of the system, training of professionals assigned to operate the equipment, writing the guidelines that summarize the knowledge obtained and, finally, monitoring the results and disseminating the digital surrogates via Wikimedia.

The digital team of the Moreira Salles Institute developed this project in partnership with Institute Goethe and Wiki Movimento Brasil between October 2021 and February 2022. The main goal is based on the understanding that different digitization methods can meet different needs and resources that are available for cultural heritage institutions, and the goal of democratizing knowledge and contributing to public access to collections of fundamental importance for Brazilian history.

12:00 **Issues Concerning the Use of Duplication Positives in Digitizing Analogue Films**, *Marek Jicha, digital restorer and researcher (Czech Republic)* . . . . . 72

The main required parameter of digital restoration is to preserve the original appearance of the restored film as it was presented at its première screening. However, there are two different approaches in looking at the nature of cinematic arts which in turn influence the preference of the master sources. The first one views the film as a preserved analogue archival material while the other views it as a live performance. The main premise of Method of Digital restored Autorizate (DRA) is to work with image scans taken at the highest resolution using the original film negatives, and to try to recreate the original appearance of the film performance through subsequent digital restoration. In contrast, there is a method recommended by FIAF to work preferentially with second-generation scans of positive copies of films and to maintain the appearance of preserved archival material. This paper analytically compares the results of both methods and draws attention to a very important parameter – the structure of the film image. It advocates the perception of film grain as one of the basic building blocks of film image formation. The result of the practical comparison is presented.

12:20 *Interactive Paper Preview: Integrating Digitization and Advanced Imaging of HMML Icons*, *Katherine Goertz, Hill Museum & Manuscript Library (HMML), and Michael B. Toth, R.B. Toth Associates LLC (US)* . . . . . 78

HMML (The Hill Museum & Manuscript Library) digitized and hosted online a recently donated collection of Orthodox 19th Century religious icons. With R.B. Toth Associates they also conducted collaborative testing of multispectral imaging on these unique HMML collection objects. A joint team digitized all the icons in conjunction with multispectral imaging of a select few icons to analyze the dyes, paints, and other materials. The goal of this testing helped determine the feasibility of using multispectral imaging as an art history research tool. The image data enabled digital cataloguing of the collection, which proved indispensable during COVID on-site access restrictions. Digitization and advanced imaging with standardized digitization and data management practices is providing new insights into these unique historic works that are applicable to other icon collections, as well as potentially other artwork on wood and solid substrates.

---

## INTERACTIVE PAPERS POSTER SESSION

12:25 – 13:25 NY / 18:25 – 19:25 PARIS

Join the Interactive Paper authors in the Archiving 2022 Gather.town to discuss their work in real time. PDFs of posters are also available via the Technical Session Library within the Archiving Conference Portal.

---

## NEW ADVANCEMENTS IN DIGITIZATION

Session Chair: Carla Schroer, Cultural Heritage Imaging (US)

13:25 – 14:20 NY / 19:25 – 20:20 PARIS

13:30 FOCAL TALK: **Tracking the Functions of AI as Paradata & Pursuing Archival Accountability**, *Jeremy E. Dave<sup>1</sup>, Babak Hamidzadeh<sup>2</sup>, Patricia C. Franks<sup>3</sup>, and Jenny Bunn<sup>4</sup>*; <sup>1</sup>University of British Columbia (Canada), <sup>2</sup>University of Maryland (US), <sup>3</sup>San Jose State University (US), and <sup>4</sup>The National Archives (UK) . . . . . 83

While a familiar term in fields like social science research and digital cultural heritage, ‘paradata’ has not yet been introduced conceptually into the archival realm. In response to an increasing number of experiments with machine learning and artificial intelligence, the InterPARES Trust AI research group proposes the definition of paradata as ‘information about the procedure(s) and tools used to create and process information resources, along with information about the persons carrying out those procedures.’ The utilization of this concept in archives can help to ensure that AI-driven systems are designed from the outset to honor the archival ethic, and to aid in the evaluation of off-the-shelf automation solutions. An evaluation of current AI experiments in archives highlights opportunities for paradata-conscious practice

14:00 **Braille Digitization at the Library of Congress**, *Thomas Rieger, Library of Congress, and Juliette Appold, National Library Service for the Blind and Print Disabled (US); (presentation-only)* . . . . . A-9

The National Library for the Blind and Print Disabled (Library of Congress) presented at Archiving 2018 in Washington D.C. describing the failed state of braille digitization technology. This presentation documents the work done to date re-inventing braille digitization using an entirely new approach.

14:20 **Closing Remarks**

---

## BEHIND-THE-SCENES TOURS III

14:30 – 15:30 NY / 20:30 – 21:30 PARIS

Imaging Department, National Gallery of Art

# FRIDAY 10 JUNE 2022

---

## CLOSING KEYNOTE

Session Chair: Fenella France, Library of Congress (US)

10:00 – 11:00 NY / 16:00 – 17:00 PARIS

10:00 **Reading Books through a Biomolecular Lens: Revealing the Hidden Microbial Life of Written Cultural Heritage Objects,**

*Cecilia G. Flocco, Leibniz Institute DSMZ (Germany)\**

Microbes in written cultural heritage collections are prevalently understood as culprits of the deterioration of the objects and as infection agents, representing a health hazard. The Mikrobib research consortium—a team of scholars and scientists from the fields of cultural heritage studies, philosophy, and microbiology—gathered to exchange disciplinary knowledge and methods to interrogate written heritage objects in novel ways.

Through the exploration with microbiological and biomolecular methods, the book is perceived as a habitat and archive of unexplored biodiversity and the microbes it hosts, collectively called microbiome, as biological probes reporting about the object's materiality and past events. The interdisciplinary approach challenges the cultural heritage conservation paradigm, which situates the microbe as the enemy of collections, by highlighting the microbiome's biographical and biological value and proposing it as part of the written cultural heritage objects.

11:00 – 11:30 NY / 17:00 – 17:30 PARIS

BREAK / POSTERS ON VIEW

Join other attendees in the Archiving 2022 Gather.town.

---

## SPECTRAL IMAGING

Session Chair: Jon Hardeberg, Norwegian University of Science and Technology (Norway)

11:30 – 12:55 NY / 17:30 – 18:55 PARIS

11:35 **Spectral Classification of Paper Fixatives: A Case Study on Thomas Fearnley's Drawings,** *Irina-Mihaela Ciortan<sup>1</sup>, Tina Grette Poulsson<sup>2</sup>, Sony George<sup>1</sup>, and Jon Yngve Hardeberg<sup>1</sup>;*  
*<sup>1</sup>Norwegian University of Science and Technology and <sup>2</sup>National Museum (Norway) . . . . . 89*

Drawing materials, such as soft graphite or charcoal applied on paper, may be prone to smearing during transport and handling. To mitigate this effect, it was common practice among 19th century artists to apply a fixative on drawings made in friable media. In many cases, the fixative has been imperative in preserving the drawings, although it may also have altered the appearance of the paper and/or the media. It is rarely possible to identify the type of fixative used, without using analytical techniques that require sample taking. As the fixative layer is very thin, any sample will often also contain small fragments of the paper. In this article, we are proposing a non-invasive approach for recognizing fixatives based on their spectral signatures in the visible and near-infrared range, collected with a hyperspectral imaging device. Our approach is tested on mock-up samples designed to contain fixatives of animal and vegetal origin, and on two drawings by the Norwegian artist, Thomas Fearnley.

11:55 **Beyond RGB: A Spectral Image Processing Software Application for Cultural Heritage Studio Photography,** *Olivia R. Kuzio and Susan P. Farnand, Rochester Institute of Technology (US) . . . . . 95*

A software application for colorimetric and spectral processing of six-channel spectral images has recently been developed. The application, called Beyond RGB, takes as input two RAW RGB image sets (object/flat-field/dark current) captured under two different lighting or filtering conditions, and outputs 1.) a color managed RGB image with ancillary information about the accuracy of the color calibration and 2.) a spectral reflectance transform that enables the interactive estimation of reflectance curves from user-selected regions of interest in the image. Beyond RGB was designed with considerations for form, function, and user friendliness, and is intended for use by cultural heritage imaging professionals. It is cross-platform compatible and is operated through an interactive graphical user interface. Beyond RGB is a living, updatable, open-source project, and is freely available for download from the project's public GitHub repository.

12:15 **A Spectral Approach to Digitally Restore a Faded Agfacolor Print from 1945,** *Giorgio Trumpy, Norwegian University of Science and Technology (Norway), and Sreya Chatterjee, University of Applied Sciences (Germany) . . . . . 101*

The negative-positive chromogenic process, despite being an important milestone in the evolution of color motion picture film technology, exhibits significant fading of its image dyes, leading to the loss of chromatic integrity. A complete spectral approach for the digital restoration of chromogenic film is proposed. A material-based image processing method allows to extract the residual color information associated with the analytical densities, selectively enhance the faded dyes, and finally recreate the original aesthetics by associating the spectral properties of the film stock.

12:35 **Spectral Imaging Method for Reflective Media,** *David R. Wyble, Avian Rochester LLC (US) . . . . . 106*

An imaging process is described which captures spectral reflectance for reflective media. The ultimate target media are prints and photographs within the collection of the Library of Congress. The system is based on a fifteen channel LED source and a monochrome camera. The LED source sequentially illuminated reference and verification targets, with an image captured for each LED channel. From the measured data and images of reference targets, a model was developed to predict spectral reflectance. With that model, the 15 images of a test sample were combined to a single 31-band spectral image. Spectral images can be used to calculate colorimetric data for each pixel, or to better understand material properties. The colorimetric results show that the system predicts good color as compared to the most relevant FADGI guidelines.

12:55 **Closing Remarks**

---

## CLOSING RECEPTION

13:00 – 13:30 NY / 19:00 – 19:30 PARIS

Grab your beverage of choice and join other attendees for an e-reception featuring a virtual concert by members of our community.

# IS&T CORPORATE MEMBERS

## STRATEGIC PARTNERS

---



**Adobe**



## SUSTAINING

---



**Qualcomm**

**xerox**

## SUPPORTING

---



**RICOH**

## DONOR

---



**Felix Schoeller Group**

Best Performing Papers. Worldwide.

**FUJIFILM**



**Image Engineering**



Norwegian University of  
Science and Technology

**OmniVision**



# ARCHIVING 2022 AUTHOR INDEX

## A

Appold, Juliette . . . . . A-9

## B

Beazer, Abby G. . . . . 21  
Berns, Roy S. . . . . 45  
Bishop, Vincil . . . . . 30  
Boydston, Kenneth . . . . . 1  
Bruns, Oleksandra . . . . . 15  
Bunn, Jenny . . . . . 83

## C

Castro, Yuly . . . . . 56  
Chatoux, Hermine . . . . . 56  
Chatterjee, Sreya . . . . . 101  
Ciortan, Irina-Mihaela . . . . . 89  
Cooper, Brenna H. . . . . 21

## D

Davet, Jeremy . . . . . 83

## E

Elgvin, Torleif . . . . . 35  
Elkhuizen, Willemijn S. . . . . A-5  
Erdmann, Rob G. . . . . A-5  
Essers, Tessa T.W. . . . . A-5

## F

Farnand, Susan . . . . . 95  
Fenton, Kevin . . . . . 30  
Flocco, Cecilia G. . . . . ix\*  
Franks, Patricia . . . . . 83

## G

Garcia, Tyler . . . . . 50  
George, Sony . . . . . 35, 89  
Goertz, Katherine . . . . . 78  
Gonçalves, Marcele de Oliveira . . . . . 67

## H

Hamidzadeh, Babak . . . . . 83  
Hardeberg, Jon Yngve . . . . . 89  
Harper, Isaac S. . . . . 21  
Heyworth, Gregory . . . . . 1  
Humenuck, Leah . . . . . A-1

## J

Jacobs, Lorette . . . . . 25  
Jicha, Marek . . . . . 72

## K

Kenderdine, Sarah . . . . . iv\*  
Knox, Keith T. . . . . 1  
Kong, Tim . . . . . vii\*  
Kuzio, Olivia Rose . . . . . 95

## L

Le Goic, Gaëtan . . . . . 56  
Luxman, Ramamoorthy . . . . . 56  
Lyu, Zhangchi . . . . . 50

## M

Mansouri, Alamin . . . . . 56  
Matongo, Beauty . . . . . 25  
Mudge, Mark . . . . . A-7  
Muntoni, Alessandro . . . . . A-7

## P

Pilz, Nastasja . . . . . 15  
Plutino, Alice . . . . . 11  
Ponchio, Federico . . . . . A-7  
Poullsson, Tina Grette . . . . . 89

## R

Reyna, Ricardo . . . . . 40  
Rieger, Thomas . . . . . A-9  
Rossé, Mattieu . . . . . 56

## S

Sack, Harald . . . . . 15  
Schroer, Carla . . . . . A-7  
Siatou, Amalia . . . . . 56  
Simske, Steven J. . . . . 30, 40  
Slingerland, Mascha . . . . . A-5  
Song, Yu . . . . . A-5  
Stanford, Emma . . . . . 62  
Storch, Hannah . . . . . A-3

## T

Tetzlaff, Michael . . . . . 50  
Tobing, Tabita L. . . . . 35  
Toth, Michael B. . . . . 78  
Trumpy, Giorgio . . . . . 101

## V

Vafaie, Mahsa . . . . . 15

## W

Waitelonis, Jörg . . . . . 15  
Walker, Harrison . . . . . 5  
Wright, Sami . . . . . 5  
Wyble, David R. . . . . 106

## Y

Yayilgan, Sule Y. . . . . 35

## Z

Zhu, Yuhao . . . . . 1

\*abstract only

**Society for Imaging Science and Technology**

7003 Kilworth Lane  
Springfield, VA 22151 USA  
+1 703 642 9090

