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DISCUSSION GROUP CO-CHAIRS

Art on Paper Discussion Group 2020
Imaging in Practice: Techniques for the Examination of Works of Art on Paper

INTRODUCTION

This year's Art on Paper Discussion Group program examined the range of techniques conservators are currently using to study and document works on paper, and how they inform our connoisseurship and treatment. Introductory remarks by the co-chairs were followed by five presentations by paper conservators and allied professionals working in private practice, conservation education, and institutions with varying priorities for research and access to specialized equipment.

Although photographic documentation has long been integral to conservation practice, recent advances in digital equipment, instrumentation, and image processing have both improved existing technologies and introduced new techniques to conservators. These developments have allowed more conservators to examine works on paper in UV, visible, and infrared (IR) spectral ranges and expand into hyperspectral imaging. Collaboration with allied professions to perform elemental and molecular phase mapping of paper objects and computer-assisted integration of imaging with other data increasingly contributes to the scholarship on prints and drawings. These techniques can be invaluable in helping us understand an object's materials, manufacturing processes, and condition.

Given the diversity of conservators' goals and resources, this topic felt timely for several reasons. As conservators all have access to digital imaging, from iPhones to IR cameras, a more unified widespread discussion around workflows and equipment is possible. The development of imaging standards provided in conservation publications, graduate training programs, and professional training workshops provide a shared vocabulary and approach to these tools. Increased access to this technology has generated more case studies that focus application of imaging techniques that are complementary to the study of paper. This program aimed to create a space to share more examples of discoveries made by conservation colleagues.

For many, the months leading up to the program brought the value and need for imaging to the fore as the impact of the Covid pandemic on funding and access made it more urgent for conservators to contribute their knowledge to online programs and materials. As many institutions prioritize digital content, these images can have a positive impact on public engagement and increase visibility of conservation within institutions. Remote work has also called attention to more basic deficits of collection digitization. What will the impact be on conservators who may increasingly be asked to evaluate loans, acquisitions, and treatment decisions based on images or video rather than in-person examination? Is this an opportunity to prioritize resources for documentation?

PRESENTATION SUMMARIES

THERESA J. SMITH
TECHNICAL STUDIES OF WORKS OF ART ON PAPER: WHAT IR LUMINESCENCE CAN REVEAL

Smith discussed a joint project between Oberlin College's Allen Memorial Art Museum and SUNY Buffalo State, started by Judith Walsh in 2015 with funding from the Kress Foundation. The project highlighted the uses of imaging in technical studies performed by the students. The goal of the project was to generate material for a future online catalog of the museum's pre-20th-century drawings, using information gleaned by the students from close looking, digital imaging, and nondestructive analysis. Imaging was used to identify and record materials and condition issues and helped answer curatorial questions about the works. Smith focused on the potential of newer techniques, like IR luminescence, for examination and areas of further research.

Smith proceeded to share examples of the students' images and findings. Visible, angled, and transmitted light, as well as UVA-induced visible fluorescence, reflected UVA, and transmitted IR, were useful in revealing the manufacture and condition of paper supports, artistic process, and prior

This open discussion took place *virtually* on August 11, 2020, during AIC's 48th annual meeting. The moderators organized and led the discussion and recorded notes. Readers are reminded that the moderators do not necessarily endorse all comments recorded, and although every effort was made to record proceedings accurately, further evaluation or research is advised before incorporating any observations into practice.

Fig. 1. P. F. Mola, *Sketch for Lunette with Life of a Saint* (Allen Memorial Art Museum 1961.52), seen in visible light (top); UVA-induced visible fluorescence (lower left); and visible-induced IR luminescence (lower right). Images by Meaghan Perry.

housing of the drawings. One drawing, by P. F. Mola, *Sketch for Lunette with Episode from the Life of a Saint*, was executed in pen and brown ink. Imaging by Meaghan Perry in normal light and UVA-induced fluorescence showed signs of tide lines and foxing. In an IR luminescence image, the paper and media did not fluoresce, allowing the extent of the tide lines and foxing to be fully revealed.

Visible-induced IR luminescence (IR lum) uses visible light to excite electrons in the imaged material, then energy emitted from the material in IR wavelengths is captured in an image. As with other images that detect nonvisible energy, IR lum produces monochromatic (black and white) images. Smith has found IR lum to be a good complement to other imaging techniques. For the study of a drawing by Edouard

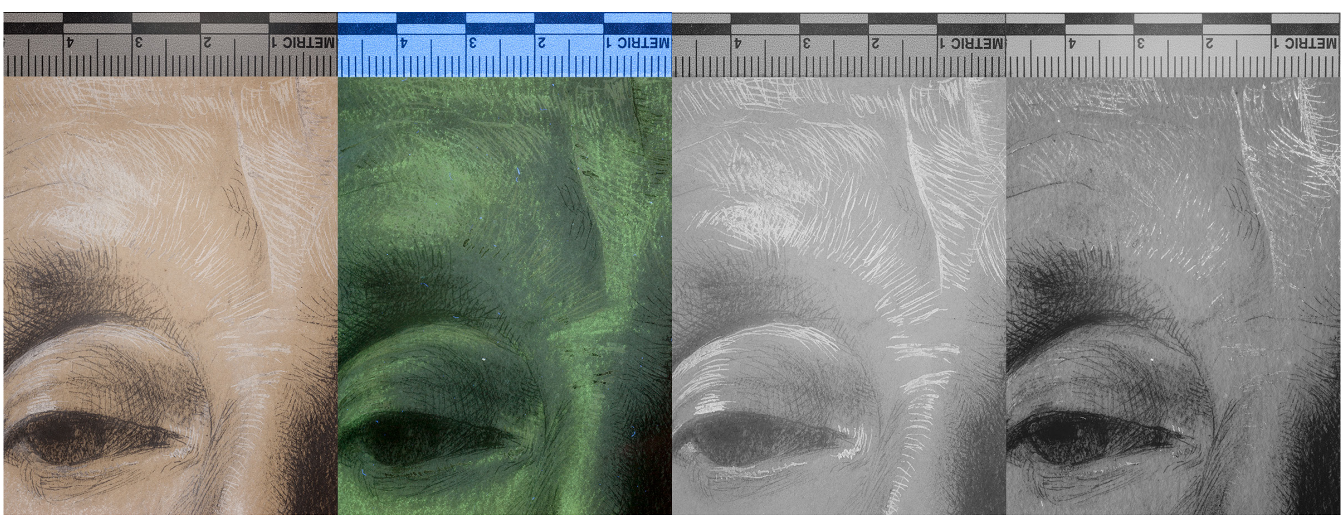

Fig. 2. Details of Eduard Otto Braunthal drawing, *Portrait of Woman with a Headscarf* (CNS 197775), seen (left to right) in visible light, UVA-induced visible fluorescence, reflected UVA, and visible-induced IR luminescence. Images by Basia Nosek.

Otto Braunthal, *Portrait of Woman with Head Scarf*, imaged by Basia Nosek, IR lum proved helpful in distinguishing between the various white heightening materials used by the artist. UVA-induced fluorescence clearly showed the white chalk highlights, whereas the reflected UVA elucidated brush-applied white lead pigment. The IR lum image revealed discrete application of a third white material.

Previously, Smith and Jiuan Jiuan Chen, associate professor of Conservation Imaging, Technical Examination, and Documentation at Buffalo, collaborated on a salted paper print project that piqued Smith's interest in IR lum. The technique proved to be quite helpful when looking at tide lines, excessive mounting adhesive, and foxing spots, often reinforcing what was seen in UV fluorescence imaging. The IR lum images were visually simpler due to the increased contrast from the monochromatic image. Smith highlighted the potential benefits of IR lum, as sensitive artworks are not exposed to destructive UV wavelengths, which is especially important for vulnerable salted paper prints. Smith showed examples of foxing spots found on a salted paper print and showed details in visible, UVA-induced fluorescence, and IR lum. Foxing spots of a fungal origin were visible in both UVA and IR, fluorescing in a similar manner. Metallic inclusion foxing spots were also seen with a darker center in both UVA and IR. Foxing is not always solely fungal or metallic in origin, and, interestingly, a foxing spot with a darker center in both visible and UVA images lacked the dark center in IR lum. Smith then posed the question of what, exactly, was being seen? Is it a third type of foxing? What was the luminescent material?

During the course of the project, many interesting questions arose, prompting Smith and Chen to perform a literature review of scholarship on IR luminescence. Smith shared selections from a bibliography that they are compiling. The earliest reference was from 1937, in which the technique was used to examine writing inks. In 1958, it was used to differentiate between inks and dyes for forensic document analysis. At the same time, IR lum was employed to examine geological minerals, which, not surprisingly, led to its use in the examination of works of art and inorganic pigments. More recently, the technique has been utilized to identify Egyptian blue and cadmium pigments. Smith summarized that IR lum can be useful for differentiating both organic dyes and inorganic pigments because there are multiple chemical pathways for generating IR luminescence, as in crystalline materials for mineral pigments and coordination complexes of chromophores for dyes and inks. Smith identified future areas of research into the sources of IR luminescence of foxing.

Fig. 3. Anonymous, *Male Portrait*, albumin photograph mounted to board (private collection), seen in visible light (left) and visible-induced IR luminescence (right). Images by Jiuan Jiuan Chen.

IR luminescence has not been studied for works on paper or photographs, and many questions and areas of interest arose from the project. Showing an image of a mounted albumen photograph with foxing and a fluorescing ring around the image, Smith pondered some of these issues. What is being seen? What materials or combination thereof are causing the fluorescence? Is it image deterioration? Silver oxides or silver sulfides?

Smith is also trying to characterize the IR luminescence of paper and the role of fiber materials. She showed an IR lum image of an array of partially processed paper pulp samples made from different fibers, including abaca, hemp, linen, and various types of cotton. The abaca exhibits strong luminescence, whereas the different cottons display a range of luminescent intensity dependent on their processing stage. What is the effect of different paper fiber types, sizing, and peroxides on IR luminescence? Acknowledging that there is much to learn, Smith expressed hope that more paper and photograph conservators would integrate IR lum into their imaging practice and help further the conversation. Smith and Chen have recently published detailed information about the practical setup and use of IR luminescence in JAIC (Chen and Smith 2019) .

Theresa J. Smith, Garman Art Conservation Department, SUNY Buffalo State, Buffalo, NY

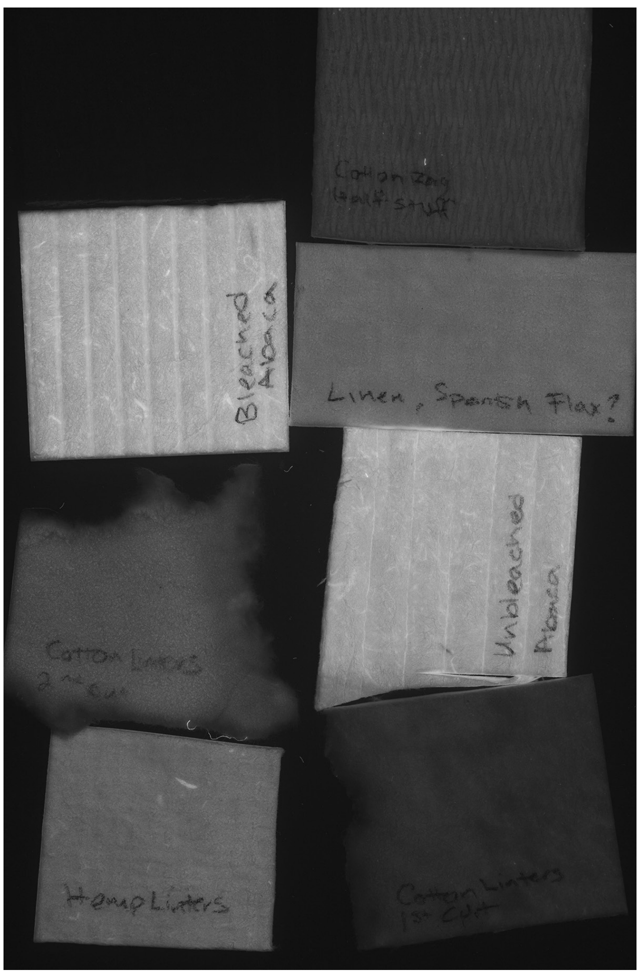

Fig. 4. Samples of partially processed paper half stuff seen in visible-induced IR luminescence. Clockwise from top right: Cotton Rag, Linen/Spanish Flax, Unbleached Abaca, Cotton Linters 1st Cut, Hemp, Cotton Linters 2nd Cut, Bleached Abaca. Image by Jiuan Jiuan Chen.

VICTORIA BINDER AND RANDY DODSON

A PRACTICAL AND VERSATILE MICROSCOPE IMAGING SYSTEM

Binder presented the microscope imaging system that she and Dodson developed at the Fine Arts Museums of San Francisco's paper conservation laboratory. Microscope imaging systems can often be complex and expensive systems that are challenging to use, with components that can become quickly outdated. Binder and Dodson were able to create a cost-effective, versatile system that is simple to use, with components that can be used for multiple purposes.

Binder started the process of upgrading their microscope imaging system in 2014, to integrate with their Leica Wild MZ6 Stereozoom Microscope and Leica photo port. Their camera, a Nikon Coolpix dating from 2001, was problematic for several reasons: the small viewing screen, its age, and the fact that it was a challenge to operate. As she surveyed the cameras and systems available, Binder found that although many of the systems had features like live view, image capture in different formats, and effective software, they did not meet the needs and the budget of the lab. The software was often complex, and the cameras did not offer significantly more resolution, 3–5 megapixels, than their existing system (3.2 megapixels). In addition, the $2000–$5000 cost was prohibitive to their budget.

Binder had a breakthrough when Dodson introduced her to the CamRanger Pro, a wireless, remote, camera control transmitter. The CamRanger creates a WiFi connection between a Nikon or Canon digital single-lens reflex (DSLR) camera and a phone, tablet, or computer viewing device. The included app allows users to remotely control the camera from their untethered viewing device. Currently available CamRanger products are the CamRanger mini, retailing around $200, and the CamRanger 2, with a price range of $350–$425. Binder then went into a detailed, component-by-component description of the imaging system that she and Dodson created. Some parts were already on hand in the lab, namely a microscope photo port and a Nikon DSLR 12 megapixel camera. They needed to purchase a digital camera adapter ($500) to connect the DSLR to the existing photo port. The CamRanger Pro Wireless transmitter was acquired for $315 and connects to the DSLR via a USB cable. The CamRanger creates its own WiFi hotspot, which the viewing device connects to. A WiFi only iPad for $480 completed the system. The CamRanger free app was downloaded to the iPad, allowing the tablet to connect to the CamRanger and remotely operate the camera. The total cost of the new components of the imaging system was about $1300.

The CamRanger software, according to Binder, is intuitive and simple to use and offers many useful features, such as HDR bracketing, wireless live view, video recording, and wireless image capture. The files are saved to the camera card but can be wirelessly downloaded to the viewing devices. Computers can accept jpegs and raw files, but tablets and phones can download only jpegs. Files can be e-mailed once they are downloaded to the viewing device or shared on social media. Multiple devices can live stream or download images, using the CamRanger Share software. For controlling the Nikon camera, the software has many settings, including shutter speed, ISO, white balance, metering mode, and different image formats, including jpeg and raw.

Binder showed images demonstrating the system in use. The slides illustrated how the live view allowed several colleagues to study a print and, as the iPad is untethered, how it can be passed around for close inspection. Binder noted that this was especially helpful for visiting classes. In addition, the remote operation of the camera helped reduce shake during image capture. The remote operation also proves helpful when photographing large objects from overhead in a studio setup, as demonstrated in an image of Ann Getts, associate textile conservator at the Fine Arts Museum, photographing a textile.

Binder summarized the pros and cons of the imaging system. The many pros included the tetherless viewing device, the simple and easy-to-use software, the variety of file formats for image capture, and image sharing via WiFi. The system is versatile, and components can be separated out for different uses or updated individually as needed. A disadvantage of the system is the lack of a scale; Binder has devised a system to image the scale separately and insert it via Photoshop. The system can be heavy, and Binder noted that she had purchased a heavy-duty boom arm for their microscope. To share images via WiFi, users have to disconnect from the CamRanger's hotspot and connect to their own WiFi. Images can appear blurry or out of focus if the camera sensor's capacity to resolve detail is greater than the microscope lens system; Binder and Dodson have found this to be the case for their microscope when images are more than 24 megapixels.

Binder concluded by acknowledging that many changes in camera features have occurred since 2014, and that many DSLRs or mirrorless cameras now have WiFi capabilities. She expressed interest in hearing from conservators who have used these cameras and learning about their findings, as she hopes to purchase a WiFi-enabled camera for their compound microscope.

Victoria Binder, Legion of Honor, Fine Arts Museums of San Francisco, San Francisco, CA
Randy Dodson, Fine Arts Museums of San Francisco, San Francisco, CA

JENNIFER MCGLINCHEY SEXTON
INVESTIGATING PROCESS USING A USB MICROSCOPE

McGlinchey Sexton shared her experiences using a USB microscope as part of her portable examination toolkit to study and identify processes and materials of works on paper and photographic materials. As a conservator in private practice, she often works on-site and has compiled a toolkit that includes a tablet computer, a cell phone, a mirrorless camera, various imaging targets and rulers, a low-power magnifier, a flashlight, and sometimes a Nikon DSLR. Considerations for weight, size, and cost have influenced many of her choices in equipment.

For work without an on-site microscope, McGlinchey Sexton brings a digital USB microscope, Dino-Lite Edge AM4115ZT, which is a mid-range model retailing for approximately $650 when it was purchased in 2019. The Dino-Lite Edge has a pixel resolution of 1280 × 1026, approximately the same resolution as a cell phone sensor in an iPhone 7, and magnifies from 10 to 220×, with a working distance from 50 to 2 mm. The Dino-Lite itself is conveniently small and portable with integrated LED lighting, but the accompanying stand adds weight and bulk to packed baggage.

For reporting magnification, McGlinchey Sexton relies on scale bars that she includes in the image, as the sensor size of the microscope and the size of the viewing screen directly affect the magnification level that the viewer sees. Scale bars can be configured easily with a calibration slide and the integrated software, DinoCapture. The DinoCapture software is free and straightforward to use, if somewhat limited in its capabilities. Features include live view, and the ability to capture still images, video, and time-lapse sequences, and take measurements. The user can control exposure, white balance, and the LEDs. Controlling the exposure and the integrated histogram is crucial to achieve consistent images, according to McGlinchey Sexton.

The Dino-Lite captures in the visible range, allowing numerous visible multimodal options including normal, specular, raking, transmitted, and UV/visible fluorescence. To capture UV/vis, McGlinchey Sexton uses separate UV lamps and a Wratten 2E filter over the sensor. The circular arrangement of the LEDs around the sensor is excellent for capturing specular images and the surface sheen of the paper. However, using the LEDs can lead to intrusive highlights; to avoid these highlights, the integrated polarizer can be engaged, but oversaturation can be an issue. McGlinchey Sexton observed that true normal light images are possible with ambient lighting, but obtaining even lighting can be challenging.

To achieve raking light images, she uses a LED flashlight equipped with black matboard "barn doors" to narrow the beam of light, better capturing surface morphology of the paper and layering of media. The barn doors reduce the contrast and prevent the highlights from blowing out. Moving the flashlight farther away from the object reduces shadows and allows for a more even capture of the surface morphology. A sidelight cap included with the microscope is inadequate for true raking light images.

McGlinchey Sexton provided some examples of different lighting conditions and the information gained from each setup. Two images of iron gall ink text in normal and specular light showed the halo of discoloration around the letters and the sheen of the ink, respectively. Images of a Donald Varnell work illustrated the layering technique and order of application in normal light and highlighted potential condition issues of loose pigment particles in raking light. As a conservator specializing in photographic materials, McGlinchey Sexton illustrated the usefulness of the Dino-Lite for process identification, with examples of an autochrome in transmitted light and an inkjet in normal light.

Nonetheless, McGlinchey Sexton brought up some limitations of the system. The depth of field is limited, but focus stacking is available on some models. It is possible to achieve focus stacking post production, but good lighting during image capture is crucial. The Dino-Lite stands cannot extend safely over long distances, which is limiting for the examination of larger works. Alternative stands are available but require some adaptation to be successful.

In conclusion, McGlinchey Sexton shared a detailed list of her current examination toolkit components, providing a practical and immediately applicable resource for many conservators.

Jennifer McGlinchey Sexton, MS Conservation, Colorado Springs, CO

KRISTI DAHM
MULTIPLE IMAGING MODALITIES REVEAL EVOLVING IMAGERY IN PICASSO'S GOUACHE

The Faun Musician by Pablo Picasso (1881–1973) is a drawing in brush and black ink and gouache in the Art Institute of Chicago's collection.[1] In 2013, the framed work was brought to the paper laboratory for review prior to exhibition. Irregularities in the surface led Dahm to believe that another composition might lie beneath the gouache depiction of a faun playing a pipe. Picasso is well known for painting over previous compositions, but the practice has not been studied for his works on paper. When the work was unframed, the paper support was revealed to be the frontispiece folio removed from *Cinq sonnets de Petrarque*, a translated volume of poetry by the 14th-century Greek poet Petrarch that was published in Paris in 1947, the same year Picasso created *The Faun Musician*. Picasso had contributed an etching to illustrate the publication. Sewing holes found in the fold of the folio confirmed that it had been removed from a bound volume.

IR imaging at 1.5–1.75 μm was carried out to create a composite image that revealed the composition of flowers beneath the faun. However, the carbon in the ink defining the faun's features and his pipe strongly absorbed IR and made deciphering the lower composition difficult. Using Adobe Photoshop and the clone stamp tool, which copies pixels and then replicates them where desired, Dahm digitally removed the black ink lines from the IR composite, fully revealing the image below. The composition of a vase of naturalistic flowers on a striped tablecloth was fully legible in the digitally altered IR composite. This raised the practical and ethical implications of digitally manipulated images, with Dahm recommending that the original and altered images always be shown together and clearly labeled, so no conclusions are drawn solely from an altered image.

Additional analysis of the *Faun* was done by Dr. Francesca Casadio, Grainger executive director of Conservation and Science, who used Macro XRF to map the elemental distribution of cobalt, titanium, and iron in the work. Surprisingly, the Macro XRF revealed a third composition of spiky flowers with linear petals. This third composition was much more stylized than the naturalistic flowers painted over them. The titanium map clearly showed the initial crayon drawing underneath the gouache as negative space. It was hypothesized that the crayon had acted as a resist for the wet media painted over it. Dahm returned to the work to look for evidence of dry media and found waxy blue crayon strokes along the bottom edge, delineating the stripes on the tablecloth.

When examining the verso of the work with strong raking light, the impression of the crayon was clearly visible, as were finer raised lines that may be details added with a colored pencil. Dahm noted that it is important to recognize that raking light showed more of the initial composition than either IR or Macro XRF, highlighting the need to combine sophisticated analytical techniques with simpler readily available ones.

Kristi Dahm, Art Institute of Chicago, Chicago, IL

MARGARET HOLBEN ELLIS
SEARCHING FOR MOLDMATES IN LEONARDO'S PAPERS

Ellis presented research undertaken with C. Richard Johnson Jr. from Cornell University and William A. Sethares from University of Wisconsin to create computational tools to document and analyze internal paper features including watermarks and chain lines intervals. When surface marks

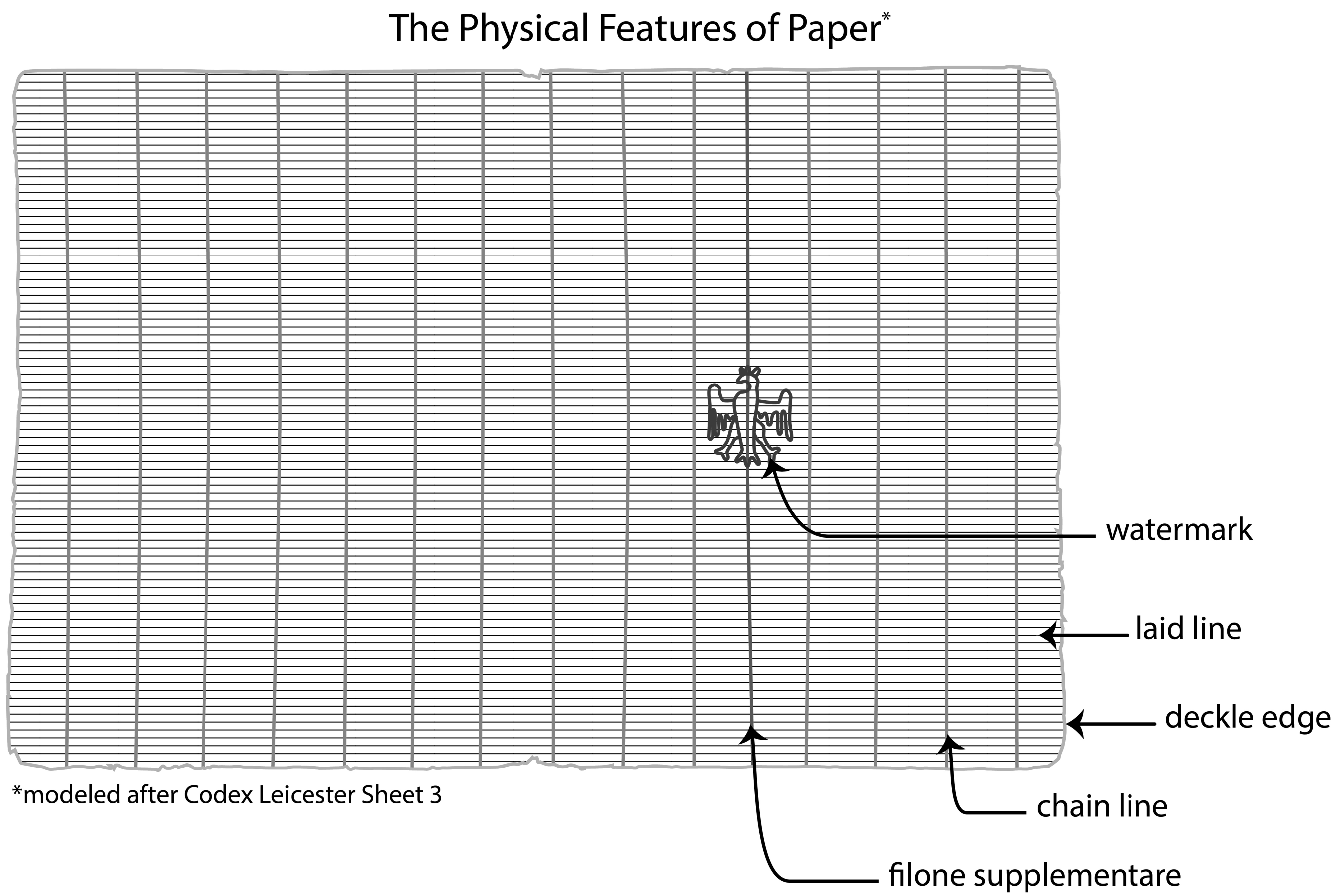

Fig. 5. The physical features of a paper reflect the unique characteristics of the papermaking mold used to form it. Moldmates share the subtle variations in watermark details, chain line intervals, and laid line densities. Twins have seemingly identical, but slightly different, physical features. Drawing by A. Slawik.

(writing, drawing, printing) obscure these features, the watermark is first enhanced. Then the application of two newly developed open source software programs, *watermarkMarker* and *chainLineMarker*, enable slight differences in the watermarks and chain line/wire intervals to be accurately and efficiently measured and compared.

As case studies, Ellis presented applications of these tools to the study of two Leonardo codices, Codex Leicester (contents date ca. 1506–1512, Bill Gates Collection) and the *Codex Arundel* (compilation date ca. 1478–1518, British Library). These are interesting notebooks to compare because scholars have determined that both were created when Leonardo was living in Florence. Therefore, it was conjectured that the papers in them would be roughly contemporaneous and, if purchased from the same paper manufacturer, would share three markers: watermarks, chain line intervals, and laid line densities. Ellis briefly reviewed 16th-century hand paper-making processes to demonstrate the presence and uniqueness of these features, which can help identify moldmates, or sheets made from the same paper mold, as well as papers produced by the second mold of a mold pair that have only slight variations, called *twins*.

As these papers were processed sequentially, papers made from one mold pair were consistently present in individual runs of paper production. Thus, moldmates and twins frequently occur in the reams of paper used to compile manuscripts and printed books. The identification of moldmates suggests a common place of origin and date of manufacture, ranging from the same production run (i.e., days or weeks) to the life span of that particular papermaking mold, estimated to be anywhere from nine months or two years for a popular paper size produced in an active mill. The existence of moldmates and twins within the *Codex Leicester* and *Codex Arundel* or by extension, shared between them, can therefore be used to support existing theories about dating and original collation or point to tantalizing connections either among the folios in the same codex or between codices.

Paper coding involves three steps: elucidation of internal features (watermarks and chain line intervals) by enhancement of images to remove surface marks; measurement of specific,

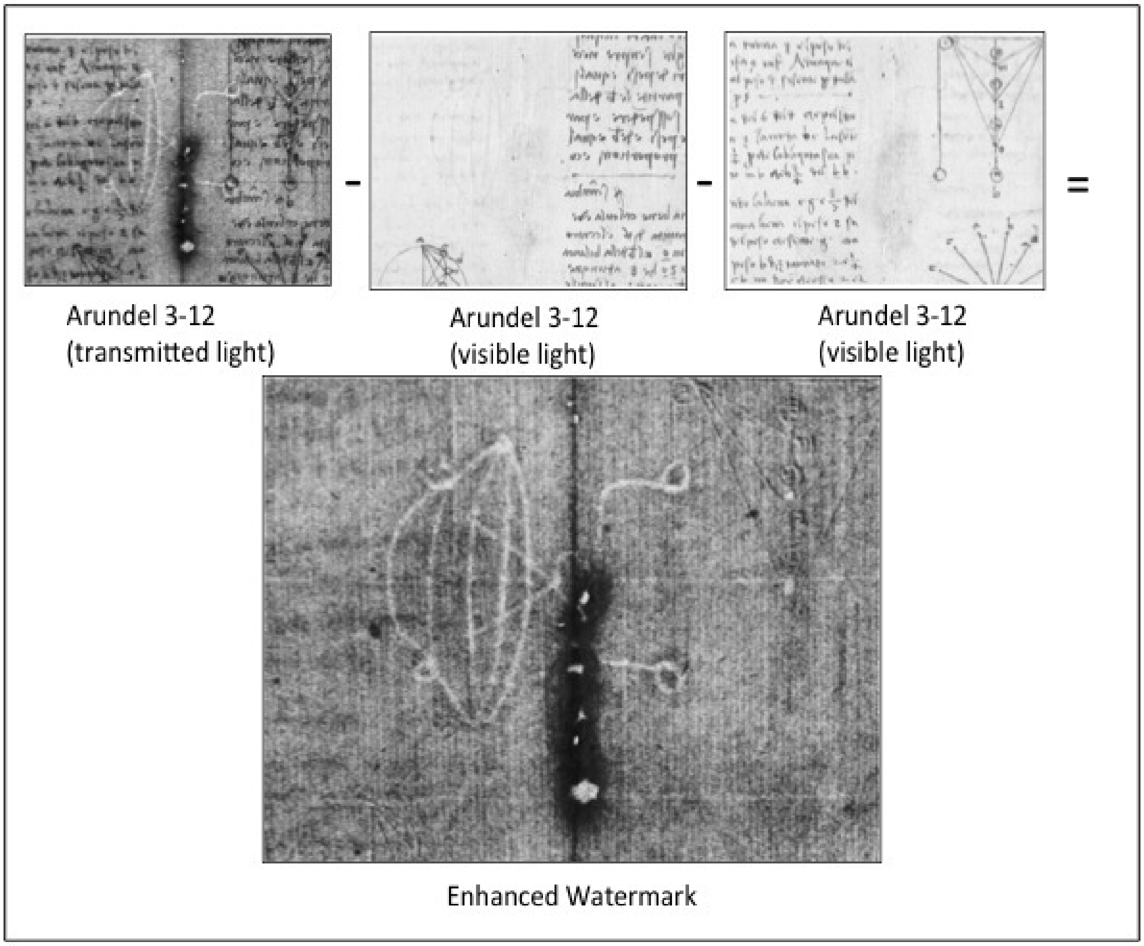

Fig. 6. Watermarks and chain line intervals are enhanced by subtracting optimally weighted visible images of the recto and verso of Arundel MS 263, ff. 3-12 (top center and top right) from a transmitted light image of the same area (top left). The resulting image (bottom center) has been "denoised" of distracting surface marks. Image copyright: British Library Board: Arundel 263 ff 3-12; processed image: William A. Sethares, Ruixue Lian.

unique features of watermarks and chain line intervals; and comparison and matching of these features and intervals to identify identical paper moldmates and probable twins. The pages in Leonardo's papers are typically covered on both sides with dense text and diagrams, and so the virtual suppression of surface interference was necessary to create a clear image of the watermark, chain, and laid lines of the paper.

Using images of a Cardinal's Hat watermark in *Arundel* 3-12, Ellis showed a visual representation of the sequence of subtraction of the two visible light photographs of the recto and verso from the transmitted light image of the watermark to create an enhanced or "denoised" image. A detailed description of this process was recently published in JAIC (Sethares et al. 2020).

To analyze and compare the features in the enhanced images, *watermarkMarker* software was used to measure and plot differences found, for example, in Flower watermarks in *Arundel*, such as the span between leaves and petals. The *chainLineMarker* software reports the ratios of the chain line intervals relative to each other, across the sheet. Code visualizations group papers based on their watermark and chain interval codes.

Analysis of 37 sheets across the two codices identified moldmates and twins for the Cardinal's Hat, Eagle, and Flower watermark types in the *Codex Leicester* and *Codex Arundel*, allowing for accurate collation diagrams and for confirmation that bifolia 1-30 of the *Codex Arundel* are closely related. Cross-codex paper moldmates for the Eagle and Flower watermark types were identified in both codices, suggesting affinities in dates and geographic origin.

Ellis closed by summarizing research undertaken by Sara Gorske with Paul Messier (Yale University) to map the unique variations in laid line frequencies across the mold, using a collection of 16th-century papers. The significance of this coding option is the potential to match papers with no watermark and confirm results using chain line intervals.

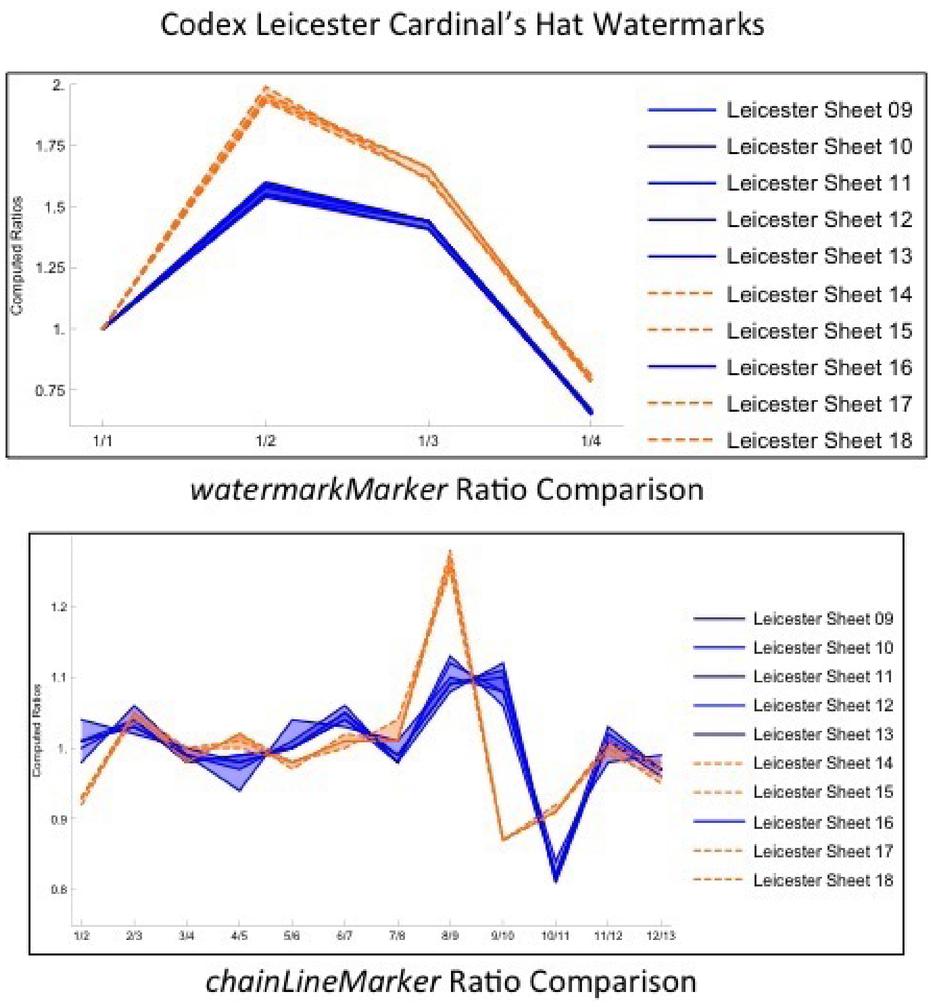

Fig. 7. The code visualizations for the Cardinal's Hat watermarks found in the Codex Leicester indicate that their watermark and chain line interval codes fall into two distinct groups thus graphically demonstrating that these 10 papers were produced by only two paper-making molds. Because moldmates and their probable twins are present in an uninterrupted sequence, it seems likely that the papers came from one run, which ended up in Leonardo's studio. Visualization: C. Richard Johnson Jr.

An article on laid line density mapping is forthcoming in the *International Journal for Digital Art History*. Beyond the characterization of Leonardo's papers, Ellis envisions applying computational coding to other collections of artists' and writers' papers to solve questions of dating, sequence, geographic origin, and aggregation, and encouraged colleagues to contact her with possible paper-coding projects.

Margaret Holben Ellis, Conservation Center, Institute of Fine Arts, New York University, New York, NY

DISCUSSION SUMMARY

After the last presentation, the moderators opened the floor for questions and comments. The wide-ranging discussion encompassed technical, equipment-related recommendations and philosophical perspectives on the expanding role of imaging in conservation practice and ethical considerations of image interpretation to a wider audience.

As conservation educators, Smith and Ellis alternately acknowledged imaging as a growing field in conservation, and expressed the value of having a dedicated professor in their programs for examination and documentation techniques. Smith shared how Buffalo graduates regularly disseminate their diverse knowledge of imaging processes to update workflows and equipment in various laboratories with a range of resources.

The importance of making images, especially those created using specialized techniques, more accessible to clients, curators, and other allied professionals was discussed by several panelists. Questions were raised about how these files are labeled and accessed within institutions, including those that have been adjusted or otherwise altered to make them more

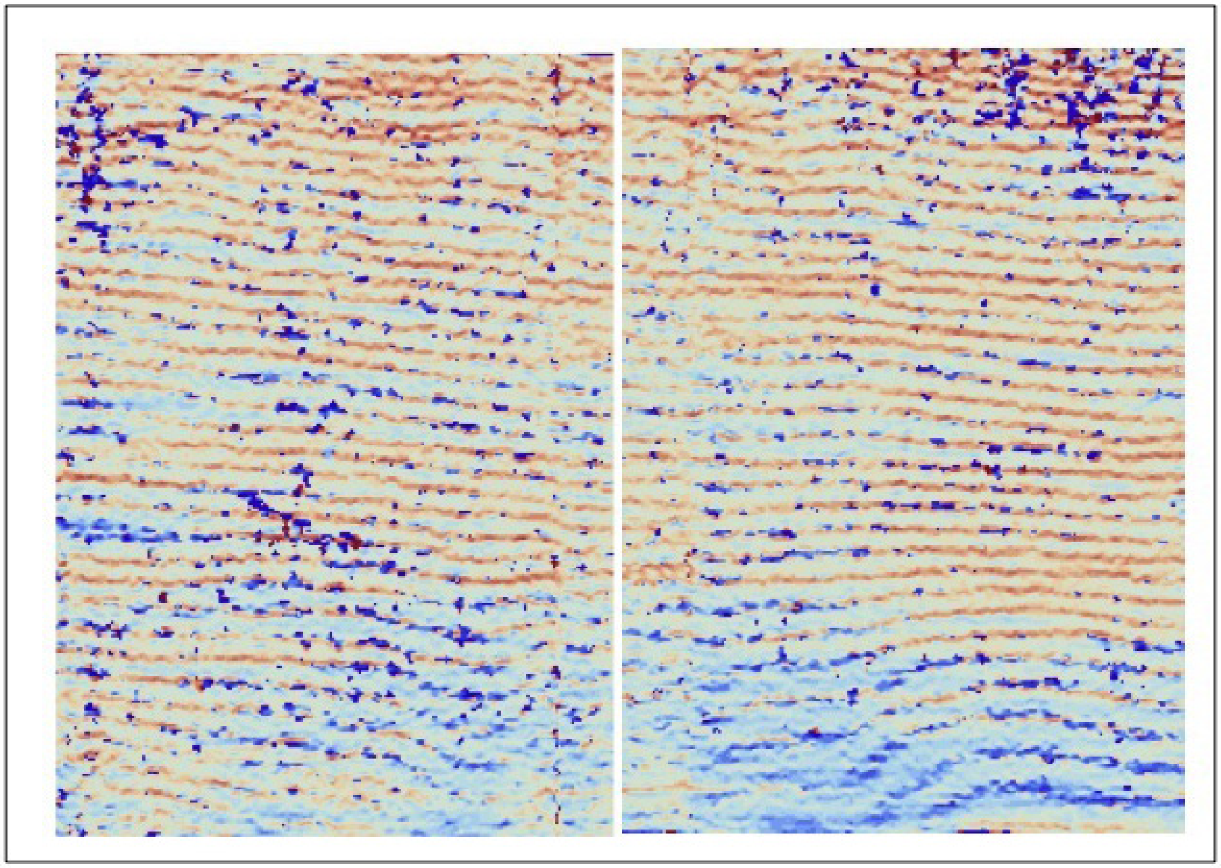

Fig. 8. The frequency of laid lines across a sheet of paper fluctuates in a pattern unique to the mold from which it was formed. The variations in density can be mapped using color and intensity differences. These maps show two adjacent halves of the same 16th-century Austrian paper. Processed image: Sara Gorske.

legible. Dahm referred to a recent talk by Becca Goodman in this year's AIC conference in which she addressed the ethics associated with creation and presentation of these digitally altered images and reviewed current terminology in use for describing them, and suggested marking tools such as watermarks to prevent misinterpretation of individual files. Dahm and others noted the speed with which images can be disseminated online, and that extra care is needed to accurately present and label the information we share. The consistent presentation of a reference image alongside an IR or MA-XRF map image, for example, can help the legibility and interpretation of these images and maintain their context. McGlinchey Sexton discussed the most effective balance between providing too much information and showing enough to be accurate and concise. Including a caption or interpretive text that is linked to the image(s) is best practice to avoid inaccurate conclusions being drawn by scholars, private collectors, and other stakeholders not familiar with interpreting these images.

Ellis reflected on past misinterpretations of x-radiographs and IR images of underdrawings in paintings, and fears the same type of misinterpretation by non-conservators is now occurring with some reflectance transformation imaging studies. She proposed that as our colleagues become more capable in interpreting these images of paper artworks the situation should improve, but that a vital step forward would be more widespread publishing of technical studies by conservators in non-conservation literature. She acknowledged the challenging nature of translating our work to a different language and format. The urgency of this mission was underscored by Smith, who cautioned that the recent trend in art history toward "materiality" may drive scholarly publications about works on paper forward without the valuable contribution of a conservator's perspective. As conservators, we need to reach out more to encourage a cross dialogue between our fields.

Dahm also discussed the development of a new digital asset management system at the Art Institute of Chicago that allows access by curators to all images of the collection, including technical images previously only accessed by conservation staff. To prevent the misinterpretation of these potentially complex images, the conservation department has drafted a legal disclaimer of sorts associated with the technical images that prohibits their dissemination without consultation from a conservator. Binder followed by saying that a similar initiative is under way at the Fine Arts Museums of San Francisco.

In response to requests to describe reactions from curatorial colleagues or clients to information revealed by conservation imaging, Binder spoke first about how the ease of sharing images with their microscope setup has facilitated an ongoing dialogue with her curatorial colleagues and led to conservators being more involved in contributing to curatorial publications, educational material, and other content. She feels like everybody can be sure they are "seeing the same thing" when looking at details of artworks, and be on the same page. Smith discussed how the project with Oberlin was designed to answer very specific questions from the curators about each drawing, and so the documentation of watermarks and any additional information that was revealed was met with eager discussion that will hopefully be documented in an upcoming online catalog. McGlinchey Sexton explained that her private and institutional clients display a wide range of interest and knowledge of looking at details of things and understanding the nonvisible imaging as well. Sometimes they simply want her interpretation that they can present to a collections committee or to have a record of condition. Her job, she feels, is to make sure people can understand as much as they want without overloading them with too much information.

Ellis expressed that she had received some push back from the Leonardo scholarly community in reaction to technical images in her recent studies, along with a general mistrust of science applied to art historical research. She reflected that she does not believe her research supplants connoisseurship and close looking, and should not be used as a stand-alone tool. She hopes this work can help move away from a reliance on Briquet (1907) for dates due to known inaccuracies of this resource, and wants to support traditional art historical and codicological research. Ellis also went into greater detail regarding the availability of the open source software demonstrated in her presentation. Test runs of the tutorials guiding use of the software are under way, but release may take another year. Ellis reported that the first moldmate match in the *Arundel* was just confirmed by the laid line density maps, and that she will keep everyone posted on progress.

Dahm provided additional information regarding the date range assigned to *The Faun Musician*, as well as the attribution of the underlying drawings to Picasso. She reviewed precedents in the technical literature on Picasso and compelling details from the study of *Faun* that support the attribution, and encouraged those interested to contact her or Francesca Casadio at the art institute for further information about the study.

Throughout the discussion, the value of magnification as a primary tool for paper conservators was reinforced by several panelists and colleagues. McGlinchey Sexton recounted how having her microscope set up on-site has helped her communicate key observations about artistic process and condition to her clients. A practical challenge for a portable system is the correlation between increased weight and better stability of the microscope, and McGlinchey Sexton acknowledged that the stands sold by the Dino-Lite company are not sufficiently stable and require modification. Another recommended portable microscope was the Zarbeco MiScope, which Smith mentioned had been used at Harvard to create student tutorials to identify process techniques in architectural drawings. Several commentators discussed current microscope ocular adaptors for smartphones, for portable streaming or capture, such as those made by LabCam or Am Scope that can be effective for replicating a system similar to that of Binder and Dodson if you don't have a camera adapter on your microscope, although the capture of raw image files is not possible.

Binder and Dodson offered advice to those trying to replicate their system now, stating that they have since purchased a larger iPad and another adapter to increase the magnification of their scope. They still wish to have an easier reference scale and would like to explore cameras with now-standard Wi-Fi capabilities. Dodson cautioned the impulse to use the highest-resolution cameras, as the limitation for resolving these magnified images is the lens within the microscope. Thus, as a general rule, there is no benefit to using a camera exceeding 16–20 megapixels (note that current USB microscope cameras are typically 5–12 megapixel systems). Binder appreciates the versatility of their system and that they can swap out and upgrade individual components.

Another portable and stand-alone mount compatible with various devices and cameras that was strongly recommended was the Manfrotto "Magic Arm" with a standard head that clamps to the side of a table.[2] This setup is currently used with a UV documentation set up at the University of Pennsylvania, as well as by reading room librarians for digital consultations with a smartphone for video or image capture. At the New York Public Library, some of the reading rooms are currently using a HoverCam Solo 8 Plus Document Camera to allow remote viewing of objects by patrons. The camera is also being used to examine some objects requested for digitization.

The discussion concluded with current challenges posed by remote work and restricted access to collections and resources in response to the Covid pandemic. The moderators and several panelists reflected on being asked to evaluate artwork remotely for acquisition, loan, and/or treatment. Binder has prioritized educating those present on-site to provide better-quality video and images that are actually useful, and shared the hope that in trying to find new ways to safely supervise installations and do these things remotely, we can pave a future with a greener conservation footprint. McGlinchey Sexton acknowledged that her more remote geographic location in Colorado has made her more accustomed to communicating with images; however, she observed that an unexpected benefit of this time has been the increased comfort of her clients to capture and share helpful video of artworks or conference in this way.

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NOTES

1. Pablo Picasso, *The Faun Musician*, June 7–11, 1947. Brush and black ink and gouache on cream wove paper, folded. Gift of Dorothy Braude Edinburg to the Harry B. and Bessie K. Braude Memorial Collection, Art Institute of Chicago, 1998.720: https://www.artic.edu/artworks/150824/the-faun-musician
2. The Manfrotto "Magic Arm" system includes a Manfrotto 244N Variable Friction Magic Arm (MA244N), with a Manfrotto 635 Quick Action Super Clamp (MA635) at one end to attach to the table and at the other end a Manfrotto TwistGrip Tripod Adapter Clamp for Smartphones. Alternatively, Manfrotto has other styles of clamps for camera mounts. This system was shared by Sarah Reidell, Margy E. Meyerson Head of Conservation, University of Pennsylvania Libraries, Philadelphia, Pennsylvania.

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