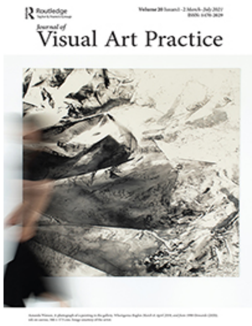

Routledge
Taylor & Francis Group

Journal of Visual Art Practice

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjvp20

From *Dirca* to design: printmaking with leatherwood (*Dirca mexicana*) bark paper

Zachary Hudson, Andrew Zandt, April Katz & William Graves

To cite this article: Zachary Hudson, Andrew Zandt, April Katz & William Graves (2021): From *Dirca* to design: printmaking with leatherwood (*Dirca mexicana*) bark paper, Journal of Visual Art Practice, DOI: 10.1080/14702029.2021.1981633

To link to this article: https://doi.org/10.1080/14702029.2021.1981633

Published online: 02 Nov 2021.

JOURNAL OF VISUAL ART PRACTICE
https://doi.org/10.1080/14702029.2021.1981633

RESEARCH ARTICLE

From *Dirca* to design: printmaking with leatherwood (*Dirca mexicana*) bark paper

Zachary Hudson[a], Andrew Zandt[b], April Katz[b] and William Graves[a]

[a]Department of Horticulture, Iowa State University, Ames, IA, USA; [b]Department of Art and Visual Culture, Iowa State University, Ames, IA, USA

ABSTRACT

Washi is paper made by hand from the bark of native Japanese shrubs. *Washi* is a common medium used for printmaking and paper crafts. Artists who have studied *nagashi-zuki*, a sheet-forming method unique to *washi*, often import Japanese fibers because alternatives with similar properties have not been identified. We propose *Dirca* L. (leatherwood), a shrub endemic to North America, as a source of fibers with properties similar to those plants traditionally used to make *washi*. The thinness and strength of the leatherwood paper allows it to withstand repeated bending, folding and creasing better than paper made from species of *Wikstroemia* (Japanese fiber), suggesting an alternative for use with various printmaking techniques and paper arts and crafts that involve folding, such as origami. We engaged printmakers and origami artists in creating original pieces using our leatherwood paper and evaluated how the paper responds to various printmaking techniques and complex folding. We identified *Dirca mexicana* as a source of fibers with similar properties to species of *Wikstroemia* used to make gampi *washi*. Handmade *D. mexicana* bark paper was successfully used as a paper medium for intaglio, lithography, relief, digital, and screenprinting printmaking techniques, as well as, complex folding origami sculptures.

KEYWORDS
Dirca; bark; printmaking; *washi*; *nagashi-zuki*; papermaking

Introduction

Korean Buddhist monks are credited with introducing Chinese paper and the art of papermaking to Japan during the fifth and sixth century. *Washi*, Japanese handmade paper, is a product uniquely Japanese (Hughes 1982) and valued for its strength, semi-transparency, and resistance to insects and aging. These desirable properties are provided by fibers from the barks of shrubs native to Japan in the genera *Broussonetia* L'Her. ex Vent., *Edgeworthia* Meisn., and *Wikstroemia* Endl. The properties have allowed *washi* to become a common medium used for printmaking, clothing, banknotes and explosives (Barrett 1983).

While teaching the authors how to make *nagashi-zuki* paper, Timothy Barrett, Director, Center for the Book, University of Iowa mentioned *nagashi-zuki* papermakers are generally interested in alternative species as a source of fiber. American artist Winifred

CONTACT Zachary Hudson zhuds714@alumni.iastate.edu

Lutz was once told by Japanese papermaker, Kubota Yasuichi, that he could not understand why Americans who studied *nagashi-zuki* insisted on importing Japanese fibers once they had returned to their home studios because the cost did not make economic sense. Yasuichi suggested there must be a plant native to the United States which would yield fibers comparable to kozo (species of *Broussonetia*), mitsumata (species of *Edgeworthia*), and gampi (species of *Wikstroemia*), and whose use would create a distinctive American style *nagashi-zuki* paper (Barrett 1983). Our search for a North American fiber similar to those native to Japan led us to *Dirca* L. because of its familial affiliation and the documented uses of its bark.

Edgeworthia, *Wikstroemia*, and *Dirca* belong to the same plant family, Thymelaeaceae. A common-name for the family is the fiber-bark or rope-bark family, aptly named because genera such as *Dais* L. (Koekemoer, Steyn, and P 2014), *Daphne* L. (Polunin and Stainton 1984; Paul et al. 2006), and *Eriosolena* Blume (Gamble 1902) are used around the world to create paper. Other genera of the family are used to create clothing and cordage (Gamble 1902; Polunin and Stainton 1984; Pooley 2006; Koekemoer, Steyn, and P 2014). Like other members of the family, species of *Dirca* have flexible wood and strong, fibrous, tear-resistance bark.

The strong, fibrous, tear-resistant bark of species of *Dirca* have been used by Native Americans to create cordage (Gilmore 1933; Smith 1933a, 1933b; Dellinger 1936). We propose *Dirca* L., a shrub endemic to North America, as a source of fibers similar to those native to Japan.

We are not the first investigators to identify a plant for papermaking based on familial affiliation and ethnobotanical use. Mitnan (*Thymelaea hirsute* (L.) Endl.) was chosen as a local bark fiber for paper production in Beer Sheva, Israel, because it is a member of the Thymelaeaceae, and the bark of the shrub is used by Bedouin people to make rope (Schmidt and Stavisky 1983). Although there is no documentation of species of *Dirca* used by Native Americans to make handmade paper, artists and researchers have successfully made paper from the bark of *Dirca palustris* (Barrett 1983; Bell 1995).

To evaluate if the bark of species of *Dirca* yields fibers comparable to fibers from the bark of shrubs native to Japan, we created handmade *Dirca mexicana* (Mexican leatherwood) bark paper using the *nagashi-zuki* sheet-forming method unique to *washi*. The quantity of paper needed for the project required 1.2 kg of dried bark. Some populations of species of *Dirca* are considered endangered. To avoid negatively impacting a native population, we chose to use *D. mexicana* due to access to several cultivated populations in Ames, IA (Figure 1) and Haymarket, VA, USA.

Emerging and professional printmakers from Iowa State University and the city of Ames, IA, were recruited to create an original design to print on our paper and a commercially available gampi paper. Printmakers were asked to print their design using at least one printmaking technique such as intaglio, lithography, relief, digital and screen-printing. Along with the prints, printmakers were asked to write a response comparing their experience using the two papers. Additionally, origami artists were provided with our paper to create sculptures of their choice. The origami artists were asked to write a response on their experience using the paper.

Lastly, the color of the paper was matched with a Pantone color. Mitsumata and gampi papers were chosen as a control based on availability. We do not declare gampi as the best paper for any printmaking technique, but we know it can be used.

Figure 1. Cultivated population of *Dirca mexicana* in Ames, IA, USA. Plants are around six years of age.

Materials and methods

Bark collection

Stems of *D. mexicana* were collected from garden populations in Ames, IA and Haymarket, VA, USA. Branches were scored and bark was stripped and hung to dry (Figure 2). The bark contains oxalate crystals which can cause contact dermatitis, use of gloves may be necessary. A total of 1.2 kg of dried bark was collected.

Bark preparation and papermaking

Dirca mexicana bark paper was made using the *nagashi-zuki* sheet-forming method. With the assistance of the University Print Society at Iowa State University, the paper was made at the Center for the Book, University of Iowa papermaking facility. Dried bark was soaked in water for 2 hours until it was no longer rigid. Black bark (outermost layer) was removed by scraping with the blunt side of a knife (Figure 3). If scraped too aggressively, the green bark can be removed, resulting in more white-colored paper. Frozen roots of *Hibiscus manihot* L were thawed and beaten flat with a mallet and introduced to water to create *neri*, a viscous mucilage used to deflocculate bark fibers and control drainage during sheet-formation (Figure 4). The green and white bark were boiled in an alkali 1.3% solution of sodium carbonate (w/v), an alternative to traditionally used wood ash, until the tissue was able to be pulled apart in the axial and radial directions (Figure 5), around 2 hours. We used 1.5 l of water per 100 g of dried bark.

Figure 2. Removed bark of *Dirca mexicana* hung on the line to dry.

Occasionally stir the bark to prevent clumping. After cooking, the bark is rinsed in water to remove alkali solution. Green and white bark were suspended in water and remaining pieces of black bark, defects, and debris were removed by hand (Figure 6). Unwanted pieces can cause defects to the paper and creates lower quality sheets. Balls, the size of an orange, of green and white bark are formed and squeezed so the fiber is wet but not dripping. The bark was beaten with hand mallets for 30 minutes to further separate fibers (Figure 7). If the fiber becomes dry, add cold water in small doses, 15 ml. Small amounts of green and white bark were added to a vat containing water and *neri*, and agitated to create a homogenous fiber solution. Enough fiber is added when you can no longer see the bottom of the vat. Agitate the solution to create a slurry of individual fibers. Sheets of paper were formed using a *su*, a bamboo woven mat, set inside a deckle mold. The mold was dipped into the vat and sheets formed by moving the mold in an oscillating sloshing motion away and towards the torso (Figure 8). At this step, you control the thickness of the paper. Each subsequent dip adds weight. With a sheet of paper adhering to it, the *su* is removed from the mold, inverted, and lowered over felt with a rolling motion. Additional sheets are placed on top of each other, separated by layers of felt (Figure 9). A stack of sheets of paper was placed into a screw press to remove excess water. Sheets were separated from the layers of felt and brushed onto the surface of a steam-heated dryer using a hand brush (Figure 10). No steps were used to control the color of the paper. The Pantone studio iphone application version 3.0.19 (Pantone, Carlstadt, New Jersey, USA) was used to identify the color of the paper based on a digital image.

Printmaking and origami

Participating printmakers were provided with sheets of *D. mexicana* and gampi papers, and given the freedom to choose the concept of their image, choose their preferred

Figure 3. Removal of black bark. Left bucket: bark tissue with outermost layer (black bark). Right bucket: green and white bark.

Figure 4. *Neri*, viscous mucilage formed when smashed roots of *Hibiscus manihot* are introduced to water.

Figure 5. Fiber separation of boiled green and white bark.

printmaking technique, and make any modifications to their printing ink. We required the artists to duplicate their print on both *D. mexicana* and gampi papers. Prints were created at the Printmaking Studio, College of Design, Iowa State University, or an artist's commercial or personal studio.

Participating origami artists were provided with sheets of *D. mexicana* and given the freedom to those the concept of their sculpture. Sculptures were created at the artist's personal studio. The weight of the gampi and *D. mexicana* papers were 10 g m^{-2}.

Paper evaluation

Qualitative data such as a printmaker's opinion towards the paper, modifications to ink, and appealing characteristics of the paper were collected using an artist response survey. Origami artists were prompted with questions to collect their evaluation of the paper.

Results and discussion

Papermaking

We were successful in creating handmade bark paper from the bark of *D. mexicana* using the *nagashi-zuki* sheet-forming method. Fifty-three 30 × 41 cm and fifty 28 × 37 cm sheets of *D. mexicana* bark paper were made at the Center for the Book, University of Iowa. The natural color is compared to mitsumata and gampi papers in Figure 12, and identified as Pantone rutabaga 12-0806 TCX. The texture of the paper was compared to Yupo (Yupo Corporation America, Chesapeake, VA), a synthetic paper made from polypropylene, and BFK Rives (Arjowiggins, Paris, France), a

Figure 6. Cooked green and white bark suspended in water.

Figure 7. Members of the University Print Society at Iowa State University beating green and white bark with hand mallets.

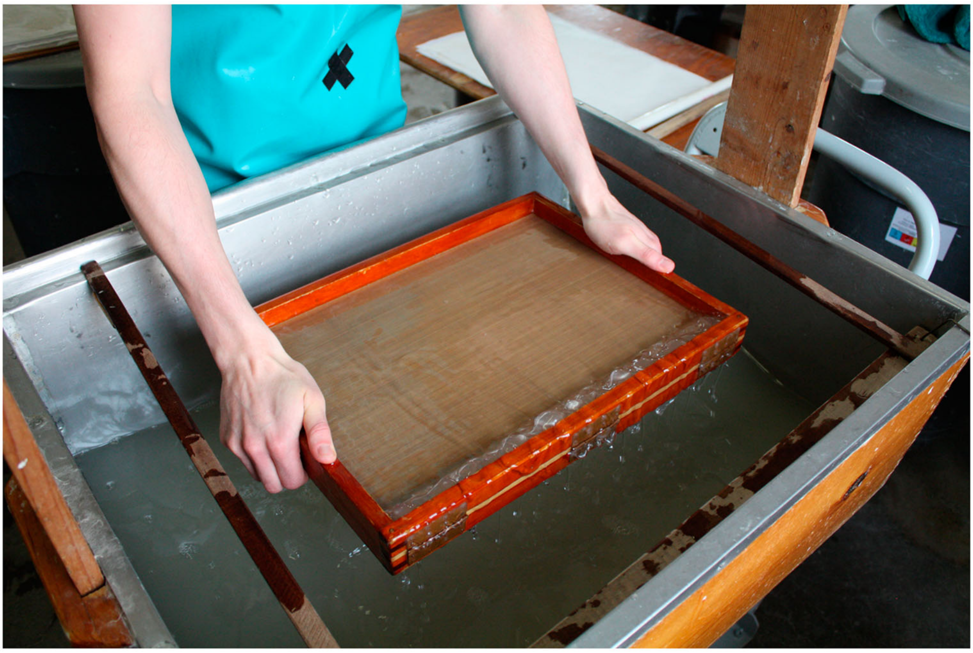

Figure 8. Sheet-forming using a *su* and deckle mold. The vat contains a slurry of individual bark fibers.

moldmade cotton rag paper. Evaluators described the texture of *D. mexicana* bark paper as between Yupo and BFK Rives, smooth with a visible texture. The weight of our paper is 10 g m^{-2}.

The boiling process removes non-fibrous components of the bark, such as lignin, which if present in final sheets, hastens degradation. Separation of fibers is critical for the quality of the final sheets. Undercooking or underbeating could result in clumps of fiber (Figure 11), resulting in lower quality paper. The goal is to align individual fibers parallel to each other, such an arrangement creates smooth, thin, strong paper. *Neri* does not provide any structural support to the paper (Figure 12).

Printmaking

Select prints representing each printmaking techniques used are shown in Figures 13–18. Intaglio, relief, lithography, digital, and screenprinting techniques were successfully used with our *D. mexicana* bark paper. One printmaker also used calligraphy ink, ink markers, gouache, and acrylic paint (Figure 14).

Origami

Origami sculptures created from *D. mexicana* bark paper are shown in Figures 19 and 20.

Artist evaluations

Participating printmakers valued the transparency, thinness and texture of the paper. The transparency of the paper was measured at 56%, similar to tracing paper. The

Figure 9. Couching of a sheet of *Dirca mexicana* paper onto a sheet of felt.

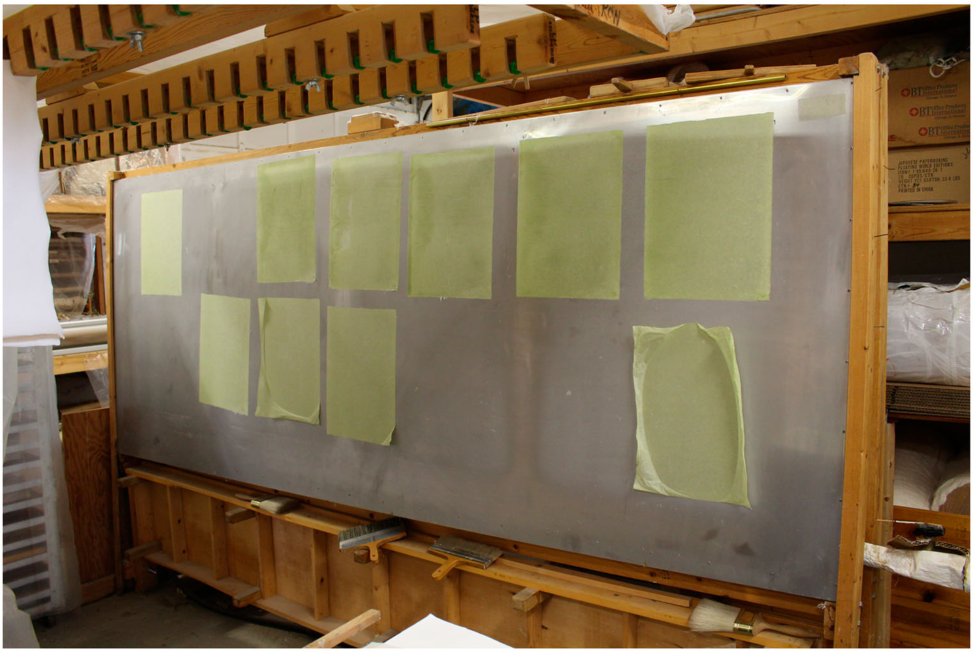

Figure 10. Drying sheets of *Dirca mexicana* paper.

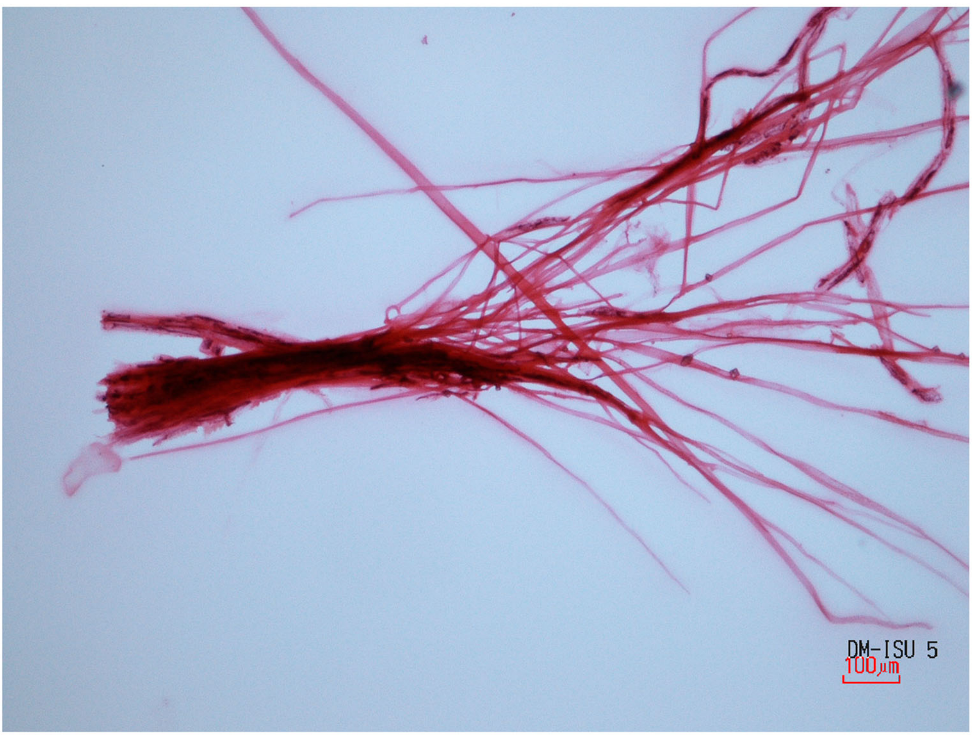

Figure 11. Bark maceration of *Dirca mexicana* stained with safranin. Fibers form bundled together and beating assists separation. Scale bar = 100 µm.

Figure 12. Natural color comparison between mitsumata, gampi, and *D. mexicana* papers.

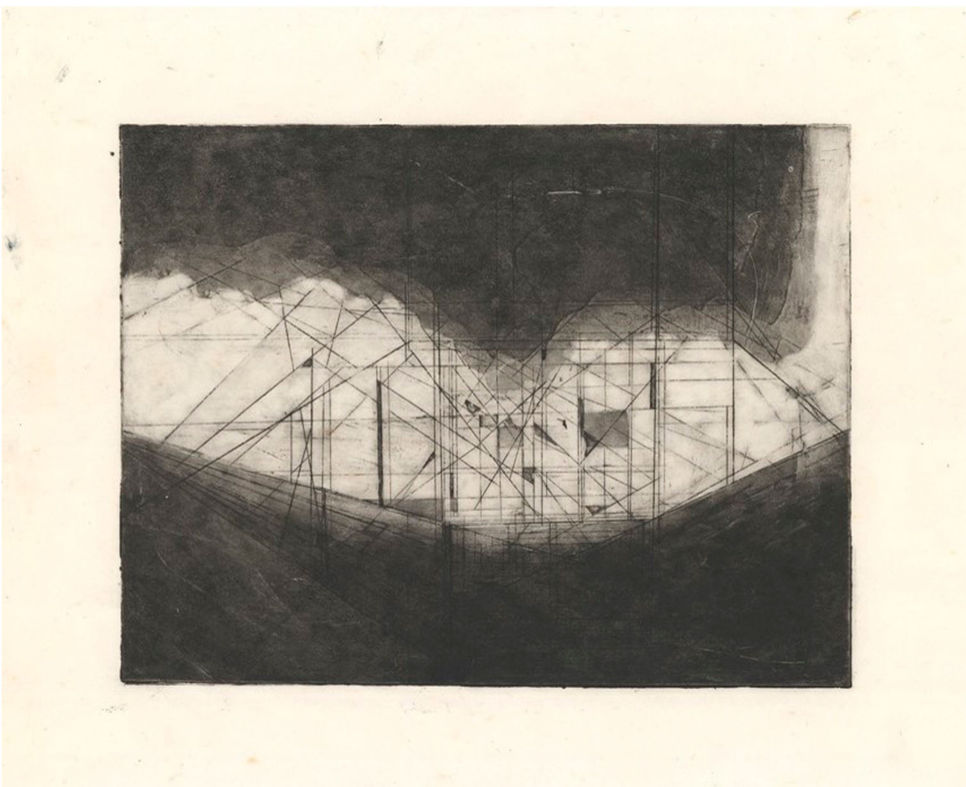

Figure 13. Hannah Becker, *Grand Ole Opre*, 2018. Intaglio on leatherwood paper, 18 × 23 cm. Solid areas of ink were more consistent compared to the same print on gampi paper.

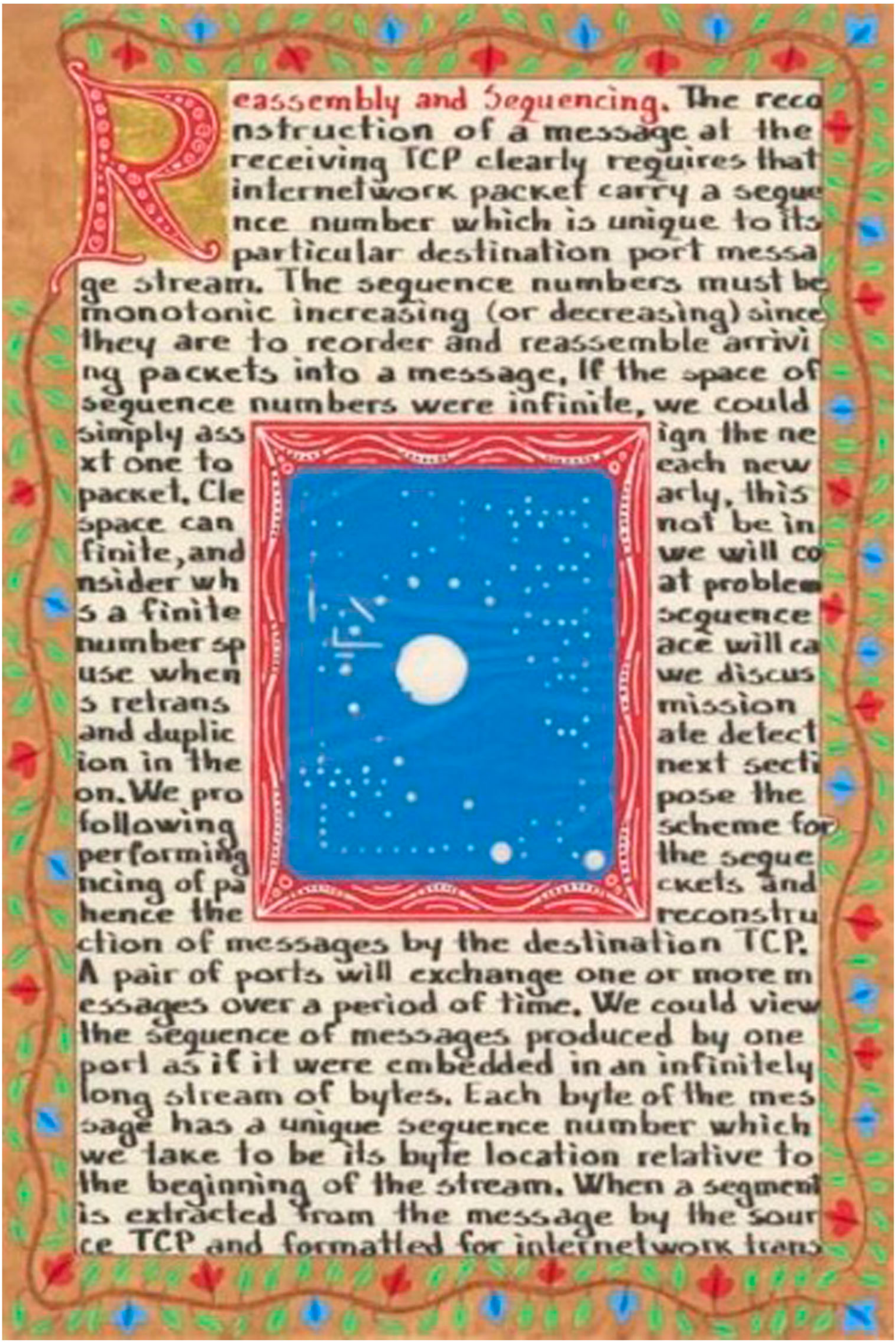

Figure 14. Tibi Chelcea, *A Protocol for Packet Network Intercommunication #1*, 2018. Relief with calligraphy ink, ink markers, gouache, and acrylic paint on leatherwood paper, 27 × 18 cm.

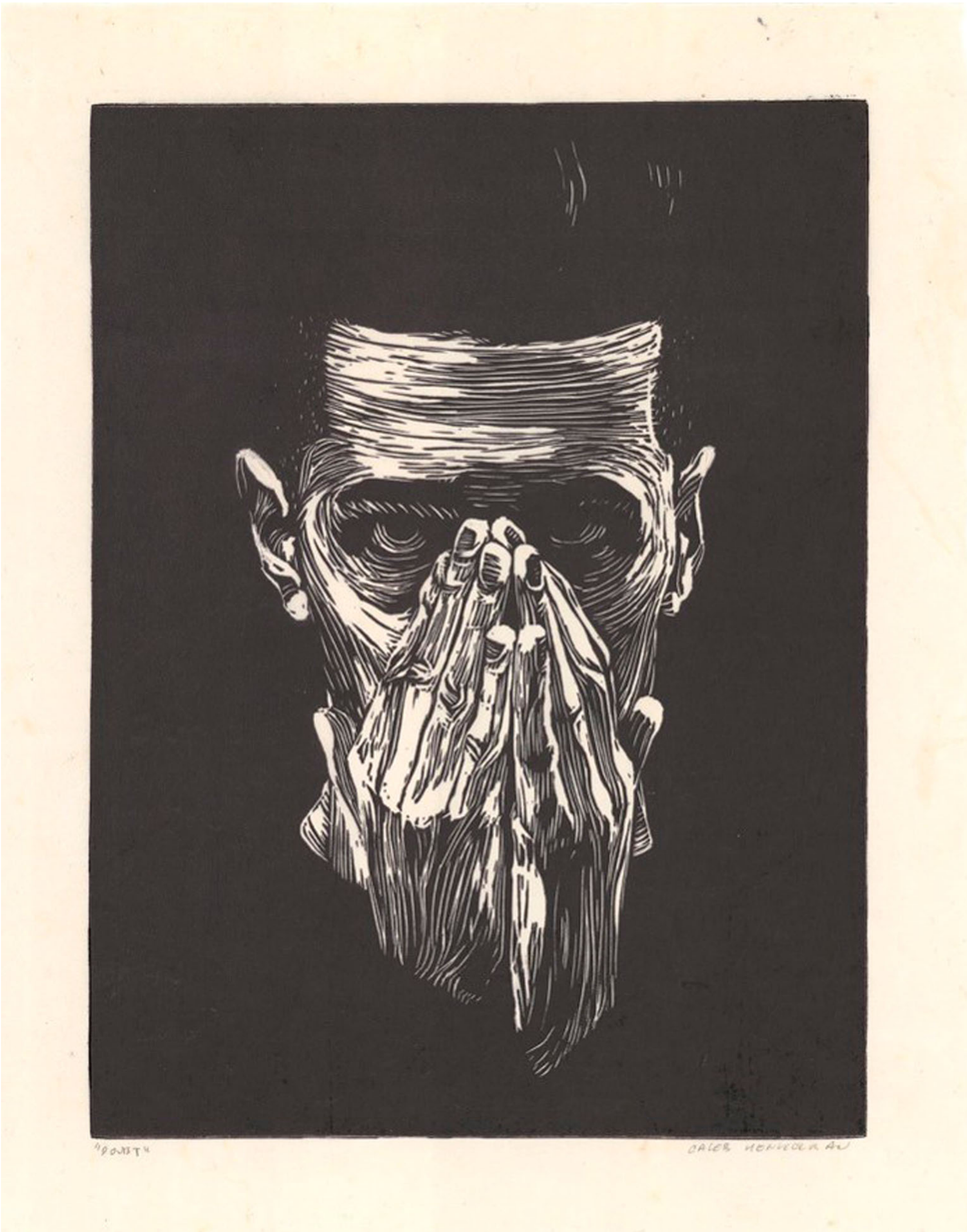

Figure 15. Caleb Henkelman, *Doubt*, 2018. Relief on leatherwood paper, 26 × 19 cm. Solid areas of ink were more consistent compared to the same print on gampi paper.

Figure 16. Zachary Hudson, *Swaying* Dirca, 2018. Lithograph on leatherwood paper, 30 × 27 cm.

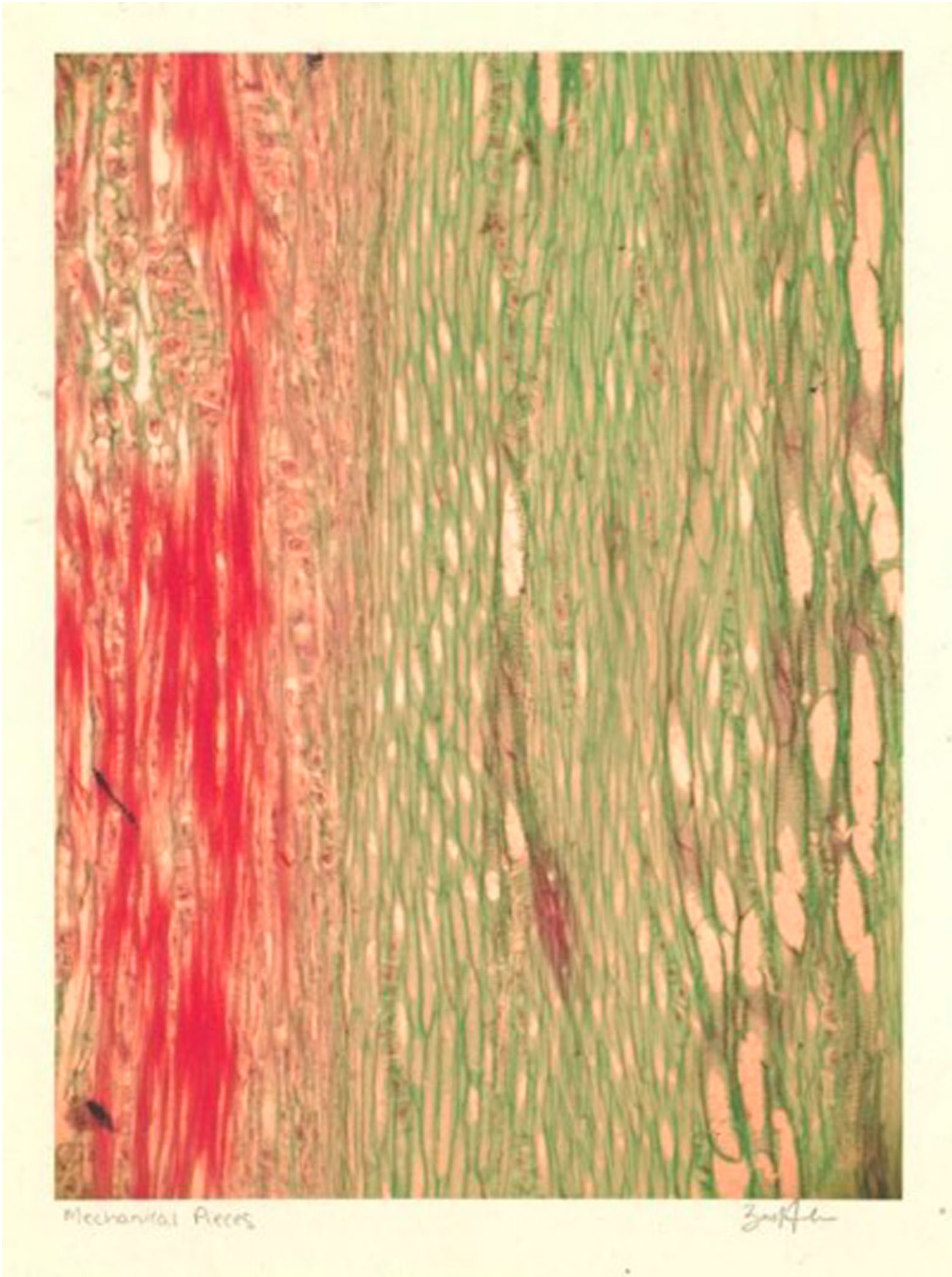

Figure 17. Zachary Hudson, *Mechanical Pieces*, 2018. Digital inkjet on leatherwood paper, 28 × 22 cm. The thinness of the paper caused the inkjet ink to bleed slightly, resulting in less crisp edges and clarity of values of the shapes.

Figure 18. Peter Lemken, *Luck's Got Nothing*, 2018. Screenprint on leatherwood paper, 40 × 30 cm.

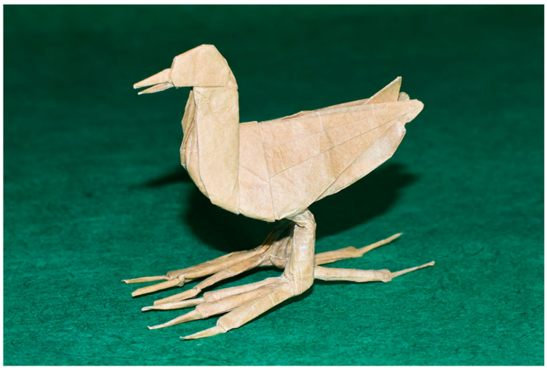

Figure 19. James Ojascastro, *Jacana*, 2019. 30 cm^2 sheet, no cuts, 6 × 5 cm.

transparency was of value because it allowed depth to be added to the print. Mixed experiences regarding the paper's response to ink were reported. Printmakers noted the thinness of the paper required less ink, which preserved the details of the print, such as shadows (Figure 21). Several printmakers experienced oversaturating the paper, which caused the ink to bleed through the paper (Figure 22). Printmakers using techniques like intaglio, relief, and lithography commonly print images onto paper which has been saturated with water. Printmakers noted wet *D. mexicana* paper become frail and was not needed to successfully print an image. The paper wrinkles if wet and allowed to air dry. When BFK Rives paper is saturated with water and allowed to dry, the dimensions of the paper and image shrink. Use of *D. mexicana* paper preserved the true dimensions of the print. Another response commented on the texture of the paper. The fibers which make up the paper create a visual texture which adds depth to the final print.

Participating origami artists were interested in testing the strength of the paper. Each artist chose a complex design that required ultra-thin and ultra-strong paper. The sculpture in Figure 19 required pleats the entire length of the street of paper to form spindly legs and toes. The artist noted that only the thinnest, strongest sheets of paper would yield good results. If the paper is too thick, the bird's feet will not look delicate, and if the paper is too weak, the paper will rip or shed fibers, potentially preventing completion of the design. The paper was treated with methylcellulose, a technique that aids in shaping and molding origami.

The sculpture in Figure 20 required complex repeated folding, which created a lot of tension in the center aperture. The artist compared our paper to O-gami, a paper designed for complex folding. When folded wet, *D. mexicana* bark paper tore, but if folded dry the paper did not tear, unlike O-gami.

Conclusion

Dirca mexicana bark paper, or leatherwood bark paper, was successfully used as a paper medium to print images using intaglio, relief, lithography, digital and screenprinting techniques. The paper is also receptive to calligraphy ink, ink markers, gouache and acrylic paint. Transparency, thinness and texture were identified as the attractive

Figure 20. Jared Needle, *Snowflake*, 2019. 29.2 cm^2 sheet, no cuts, 7.6 × 7.6 cm.

characteristics of the leatherwood paper. The transparency allows background images to be seen through the paper, which is an attractive characteristic for techniques such as chine-collé. The light weight of the bark paper allowed less ink to be used, which preserved fine detail in the printed image.

Intaglio, relief and lithography techniques are commonly printed on paper that has been saturated with water. Wetting the leatherwood paper causes the paper to wrinkle, but prints were successfully printed without wetting the paper. Another advantage of not needing to wet the paper is the print retains its original dimensions, unlike BFK Rives that shrunk in size as the paper dried.

Due to the light weight of the leatherwood paper, taping the paper to a heavier paper backing is required for digital printing. If not taped to a paper backing, the paper crumpled and was torn by the printer's feeding wheels.

The thinness and strength of the leatherwood paper indicate it may also be used for paper art which uses bending, folding and creasing, such as origami. Although some tearing did occur on the sculpture in Figure 19, the artist would recommend the paper for complex insect designs, with their numerous, thin appendages. Leatherwood has characteristics comparable to Origamido and O-gami abaca papers in their suitability for the complex origami designs.

We have identified *D. mexicana* (Mexican leatherwood) as a source of fibers similar to species of *Wikstroemia* (gampi) native to Japan, creating an American Asian-styled handmade bark paper, leatherwood paper, which may be used as a paper medium for a variety of printmaking techniques, as well as paper art which involves bending, folding and creasing.

Special note

We ask that if you choose to create handmade bark paper from any species of *Dirca*, please be mindful of your impact when collecting bark. While the United States Fish

Figure 21. *Test Print Thinness*, 2018. Collagraph on leatherwood paper.

Figure 22. *Test Print Oversaturation*, 2018. Lithograph on leatherwood paper.

and Wildlife Service does not list any species of *Dirca* as threatened or endangered, some state governments, such as Florida and Maryland, consider some populations of species of *Dirca* as imperiled or endangered. We ask you do not collect from wild populations. Cultivated plants can be grown for the purpose of collecting bark.

Acknowledgements

The authors thank the Department of Art and Visual Culture, Iowa State University for the use of the printmaking studio. Dr Chris Currey allowed the use of hydroponic tubs for sifting. Iowa State University Focus: Artist Grant Program provided funding to frame and exhibit final prints. University Print Society at Iowa State University for assisting with the preparation of bark and forming of sheets of paper. Center for the Book, the University of Iowa for allowing us to use their facilities to create our paper. Timothy Barrett for teaching us how to create paper using the *nagashi-zuki* sheet-forming technique. Participating printmakers and origami artists.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Zachary Hudson earned a PhD in the Department of Horticulture at Iowa State University. Zachary worked with Tim Barrett, Director, Center for the Book, at the University of Iowa to create handmade paper from the bark of plant species *Dirca mexicana*. Tim Barrett trained Zachary in nagashi-zuki, a sheet-forming method unique to Japanese handmade paper.

Andrew Zandt earned an MFA in the Department of Art and Visual Culture with a focus on printmaking. Andrew's printmaking work has been included in numerous juried exhibition across the Midwest, USA, including the Parkside National Small Print Juried Exhibition in Parkside, Wisconsin, and the Annual Paper In Particular National Juried Exhibition in Columbia, Missouri.

April Katz is a Merrill Professor Emerita at Iowa State University and graduate advisor to Andrew. Katz's prints have been exhibited throughout the US and are in numerous collections, including the Nelson-Atkins Museum of Art, Kansas City, Missouri; Fogg Art Museum, Harvard University; and the Corcoran Gallery, Washington, DC.

William Graves is Dean of the Graduate College & Professor at Iowa State University, and graduate advisor to Zachary.

References

Barrett, T. 1983. *Japanese Papermaking: Traditions, Tools, and Techniques*. New York: Weatherhill, Inc.

Bell, L. A. 1995. *Plant Fibers for Papermaking*. McMinnville, OR: Liliaceae Press.

Dellinger, S. C. 1936. "Baby Cradles of the Ozark Bluff Dwellers." *American Antiquity* 1: 197–214.

Gamble, J. S. 1902. *A Manual of Indian Timbers*. London: Sampson Low, Marston & Company.

Gilmore, M. R. 1933. "Some Chippewa Uses of Plants." *Papers of the Michigan Academy of Science, Arts, and Letters* 7: 119–143.

Hughes, S. 1982. *Washi, the World of Japanese Paper*. Tokyo: Kodansha International.

Koekemoer, M., H. M. Steyn, and S. P. 2014. *Guide to Plant Families of Southern Africa*. Seriti Printing: Pretoria.

Paul, A., A. Arunachalam, M. L. Khan, and K. Arunachalam. 2006. "*Daphne Papyraceae* Wall. ex Steud. ó [sic] a Traditional Source of Paper Making in Arunachal Pradesh." *Natural Product Radiance* 5: 133–138.

Polunin, O., and A. Stainton. 1984. *Flowers of the Himalaya*. Delhi: Oxford University Press.

Pooley, E. 2006. *Forest Plants: In the Forest and in the Garden*. Durban: The Flora Publication Trust.

Schmidt, J., and N. Stavisky. 1983. "Uses of *Thymelaea Hirsute* (Mitnan) with Emphasis on Hand Papermaking." *Economic Botany* 37: 310–321.

Smith, H. H. 1933a. "Ethnobotany of the Forest Potawatomi Indians." *Bulletin of the Public Museum of the City of Milwaukee* 7: 1–230.

Smith, H. H. 1933b. "Ethnobotany of the Menomini Indians." *Bulletin of the Public Museum of the City of Milwaukee* 4: 1–174.