Journal of Natural Science Illustration

GUILD OF NATURAL SCIENCE ILLUSTRATORS

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Note from the Editor

Fiat lux. "Let there be light." UC Santa Cruz, my alma mater, adopted this Latin phrase as their motto in the early 1970s. For some, *fiat lux* has religious meaning. But I've adopted this simple phrase as my personal and business motto too. As a lifelong science illustrator—from my first student drawings to my latest gig at *The Seattle Times*—I am constantly looking for ways to shed light on truths, the share the beauty of our natural world, reveal how things work, and explain complex processes via visual storytelling.

The fields of science and art are inextricably intertwined. Leonardo and Galileo knew this. Today, we know this, as we work alongside scientists, authors, and journalists to help tell their stories. As humankind struggles to understand abstract concepts such as climate and ecological shifts, the evolution of pathogens, food production, or the latest advances in medicine and technology, illustrators will continue to play a pivotal role in translating information, building trust, and engaging with communities around the world.

In this issue, I invite you to explore the many ways in which art illuminates science and nature. Nancy Halliday, one of GNSI's founding members, has written a glowing review of Linda Feltner's book, *Drawing Nature* (one of Linda's exploratory sketches also graces our cover!). Caroline Erolin provides a delightful primer on linocut, wood engraving, and etching, and how to combine academic training with artistic expression. Our last two articles focus on the next generation of science illustrators. Catherine Hu shares her experience mentoring illustration interns, including the talented Sorin Sukumaran. Yale Peabody Museum's Natural Science Illustration Program celebrates its 15th anniversary and shares a diverse collection of student works.

I wish you and your family a joyous winter season. Keep your spirits bright and wits sharp; we have important work to do in the year ahead.

Yours,

—Fiona Martin, Managing Editor

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Cover: A color map. Although the color of the raven (*Corvus corax*) appears shiny black, a closer inspection reveals a color sheen on specific feather groups. In outdoor light, at a certain angle, the feathers reflect cerulean, ultramarine, or olive green among the black. The open-wing study is not a painting of local color but is a color map for later reference. Canson Montval Watercolor Sketchbook®, graphite and watercolor, 140 lb. (300g) cold press. © 2021 Linda Miller Feltner

Back cover: GNSI Visual SciComm Conference save-the-date.

NATURAL SCIENCE ILLUSTRATORS

The Guild of Natural Science Illustrators is a nonprofit organization devoted to providing information about and encouraging high standards of competence in the field of natural science illustration. The Guild offers membership to those employed or genuinely interested in natural scientific illustration.

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Nature and Anatomy

From the Computer to the Printing Press

— *Caroline Erolin*

Like many GNSI members I have always had a passion for wildlife and art. Whilst studying fine art and illustration at university, my natural tendency was to create detailed wildlife art. This did not sit well with most of my tutors at the time, they were of the opinion that fine art had to be conceptual to have any real value. It was my life drawing lecturer who really helped me develop my observational drawing skills as a scientific illustrator—not just technically, but also through visits to the a local medical school to improve my anatomical understanding.

Figure 1: *All that Glitters,* linocut print.

My inclination for realistic, detailed artwork and nascent interest in human anatomy eventually drew me towards the profession of medical illustration. I trained as a medical artist at the Unit of Art in Medicine at the University of Manchester, undertaking an MPhil there in the early 2000s. After graduating, I worked in the Unit for three more years as a medical illustrator and learned the skills of forensic facial reconstruction pioneered by anatomical art expert Richard Neave. In 2005, I moved from Manchester, England to Dundee, Scotland, where I joined the University of Dundee as a research assistant before becoming a lecturer in Medical Art.

Nearly 20 years and a PhD later, I am still in Dundee, now as Programme Lead for the Medical Art MSc. In addition to running the programme—a mix of teaching and administration—I also undertake occasional research projects, such as investigating the use of virtual reality models in anatomy education.[1] I value these projects as they allow me opportunity to create my own artistic works as part of the process, something I have less and less time for these days between teaching and sitting on committees. However, even on these occasions, I must be mindful as an academic that these artistic works have research value and facilitate asking and answering research questions or hypotheses. The visual component created for a research project is very much a tool, rather than an end in its own right. As such, I came to realise my professional identity has changed from that of an artist to an academic.

There is nothing inherently wrong with this change of course, but this realisation, combined with so much digital working and teaching during the height of the pandemic, led me to start my own art practice again. In my university role, much of my work is digital. In my personal work I wanted to get hands-on with traditional materials again, and was drawn to printmaking—at first linocut, then etching and wood engraving. I had done a little printmaking as part of my Art Foundation year at university and have fond memories of my time in the print room. During the pandemic I started using single-colour lino printing as this process is relatively straightforward compared to other techniques. When I developed an interest in slightly more advanced processes such as wood engraving and etching, I enrolled in a series of evening courses at the Dundee Contemporary Arts print studio to learn these techniques.

As I noted at the beginning of this article, I have always been a wildlife and art lover. Now free from the shackles of my old lecturers' opinions on fine art, and free to choose my subject matter, I have returned to illustrating wildlife and nature. Nonetheless my years of working alongside an anatomy department

have left their mark, and many of my bird and mammal subjects have an anatomical twist. Many other prints feature creatures that are often overlooked or under-appreciated, such as insects and amphibians.

In the following sections I discuss three works of art, each created in a different printing media (linocut, wood engraving, and etching). Through these examples I demonstrate how I apply medical and scientific illustration skills with artistic expression to create each piece.

Figure 2: Initial sketch for *All that Glitters* linocut print.

LINOCUT: *ALL THAT GLITTERS*

All that Glitters is a linocut print of a magpie and her nest (*Fig. 1, previous page*). As both a nature and anatomy lover, I am interested in themes around life cycles, which often appear in my work. In this print, I wanted to go beyond the life and death duality motif that I have used before. I added a third element, the eggs, which have the potential of life yet remain fragile and occupy a liminal state. Magpies are well known for being attracted to shiny things. In this print however, the magpie ignored objects humans may regard as valuable, and instead collected objects we might consider litter, inadvertently highlighting the potential dangers of pollution to wildlife.

Linocut is a form of relief printing that is carved by hand out of a flat block of linoleum. The surface is then rolled with ink and printed by hand using either a traditional press or burnished with a wooden spoon, glass baren, or other tool.

Some of my design considerations and a step-by-step guide to the process I followed to create this print are described below.

Materials used:

- Pencils
- Tracing paper
- Bone folder—to rub the pencil sketch onto the lino.
- Permanent fine liner pen
- Medium-grit sandpaper
- Watered-down acrylic paint
- Lino block—I use traditional grey hessian-backed lino. It is more environmentally friendly than some linoleum-, vinyl-, or rubber-faced lino blocks and I like how it cuts. However, it is important that the lino is fresh as it can become brittle with age.
- Lino tools—I use Pfeil® linocut tools, as these are high quality and can be sharpened as needed. I used a variety of sizes, but especially the small 1/11 and 0.5/11 U-Gouges to obtain the required detail.
- Oil-based relief ink
- Paper—there are many great papers for printing. For this print I used Thai mulberry paper, a thin (40 gsm) but strong paper perfect for hand printing.
- Brayer—to roll and transfer the ink.
- Glass baren—for printing. A wooden spoon or printing press can also be used.

Design considerations

During my research I noted that Eurasian magpies typically create a domed nest. However, for this design it was important that the eggs be visible, so I altered the nest to be less scientifically accurate but more aesthetically pleasing.

The skull is based on a combination of several photographic references.

Since I created this art primarily for myself with no client or research question to concern me, I was free to take a somewhat surreal turn and included twigs up each side of the composition that develop into trees in the background at the top of the scene.

Figure 3 (left): Lino block and Pfeil linocut tools partway through cutting.

Figure 4 (middle): Finished lino block, ready to print.

Figure 5 (right): Used lino block with glass baren and brayer.

Process:

1. I started with a pencil drawing in my sketchbook, initially focused on the nest, bird and skull (*Fig. 2, previous page*). Later, I foraged for some twigs from the garden and drew these from observation at about life size up each side of the composition.

2. To prepare the lino block, I gave it a light sanding with medium-grit sandpaper and stained it with watered-down acrylic paint. This helped me to see the cut marks as the print progressed.

3. I transferred the design to the lino using the carbon transfer method. First I traced the drawing from my sketchbook with a 2B pencil onto tracing paper. I then turned this over and rubbed the design with a bone folder to transfer the pencil onto the lino. Finally, I drew over the pencil lines with a permanent fine liner. This method results in the lino block being a reverse image of the initial sketch, meaning that once printed it is the right way around again.

4. Next came the carving. I use Pfeil linocut tools in a variety of sizes, but especially the small 1/11 and 0.5/11 U-Gouges to obtain the required detail (*Fig. 3*). Within a single-colour lino block, carved areas will remain white (or the colour of the paper) and uncarved areas will print the colour of the ink used, most typically black. The completed lino block can be seen in Figure 4.

5. Once carving is complete the block is ready to print. For this print I used a black oil-based ink and printed onto a Thai mulberry paper in a natural off-white colour with plant fibres visible in the paper. I rolled out the ink with a specialized print brayer to build up thin layers of ink on the lino block. Then I placed the paper over the carved surface of the block. Using a glass baren specially designed for hand printing, I burnished the back of the paper (*Fig. 5*).

6. I let the resulting print dry for about a week, after which I hand-tinted small areas of the magpie's wings with metallic watercolour paint.

SAFETY CONSIDERATIONS

Lino printing is a relatively safe process. However, there are some considerations to be mindful of:

- The lino cutting tools used are sharp and care should be taken to always cut away from your fingers.
- Oil-based inks generally do not cause skin irritation, but gloves can be worn if individuals have allergies or sensitive skin.[2]

WOOD ENGRAVING: *AMONG THE LILIES*

Among the Lilies is a wood engraving of a toad. Toads are one of my favourite creatures, but many people may overlook them or find them disgusting. Wood engraving is a form of relief printing. Like linocut, the carved areas will not pick up ink and remain white, while the uncarved areas will pick up ink and print. For this print I wanted to use the properties of wood engraving, a technique which lends itself to finely detailed work, to create a detailed rendering of a toad and capture the different textures present in its skin.

Following are some design considerations and a step-by-step guide of the process I used to create this print.

Materials used:

- Pencils
- Tracing paper
- White carbon paper
- Coarse and fine sandpaper
- Watered-down India ink—to stain the wood.
- Wood block—wood engraving uses the end grain (cross section) of various densely growing hardwoods. My personal favourites for engraving are lemonwood and boxwood. Boxwood can often be purchased as rounds (transverse cuts through trunks or branches) giving a more natural and organic shape to the block.
- Wood engraving tools—known as gravers. I use a variety of shapes and sizes.
- Oil-based relief ink
- Paper—there are many great papers for printing. For this print I used a130 gsm Simili Japon paper. For hand burnishing wood engravings, thin papers tend to work best.
- Brayer—to roll and transfer the ink.
- Hardwood burnisher—for printing. I used a hardwood burnisher specifically designed for hand printing wood engravings. However, a wooden spoon or printing press can also be used.

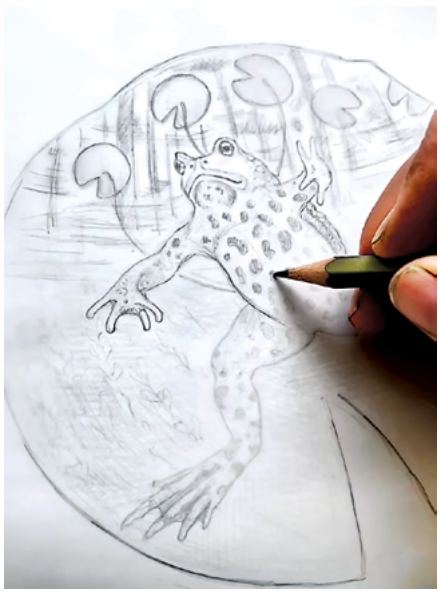
Process:

1. For this print I chose to use a boxwood round in the shape of a lily pad (*Fig. 6*).
2. Before starting the engraving, I first prepared the block by sanding it with progressively finer sandpaper. For the later stages I used 1,000– to 3,000-grit paper. Wetting the surface of the wood with hot water and letting it dry between each sanding raises the grain of the wood, meaning that the fibres swell to the surface and can be sanded back more fully to produce a high-gloss surface.
3. Next, I stained the surface of the wood with watered-down India ink. This allowed me to see the engraved lines more clearly.
4. I drew around the wooden block and prepared my sketch within this outline. To transfer the design to the prepared wood, I first traced the drawing onto a sheet of tracing paper (*Fig. 7*). I then placed this over the block with a piece of white carbon paper in between. Using a sharp hard pencil I then traced over the drawing once more to transfer it onto the block.
5. I carefully carried out the engraving process itself with specialized tools known as gravers. These are designed especially for wood engraving and come in a variety of shapes and sizes (*Fig. 8*).
6. With the engraving complete, the block was ready to print. For this print I used a black oil-based ink and printed onto a 130 gsm Simili Japon paper which has a smooth surface ideal for capturing the details of wood engraving. I rolled out the ink with a specialized print brayer with thin layers of ink built up on the block (*Fig. 9, following page*). Then I placed the paper over the

Figure 6 (left): A boxwood round in the shape of a lily pad.

Figure 7 (middle): Transferring my toad design to the wood block.

Figure 8 (right): The finished engraving, ready to print.



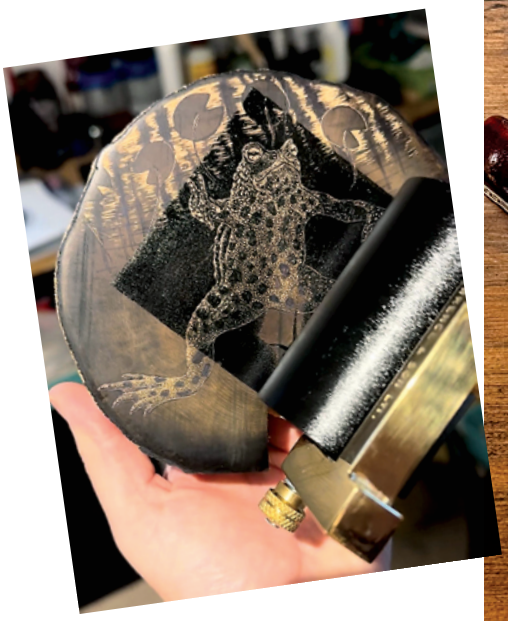


Figure 9 (left): Inking up the toad wood engraving.

Figure 10 (right): The final wood engraving printed, with a pair of gravers.

inked block and used a hardwood burnisher to rub the back of the paper and transfer the design. The final print can be seen in Figure 10.

SAFETY CONSIDERATIONS

Lino printing and wood engraving are a relatively safe process. However, there are some considerations to be mindful of:

- The engraving tools used are sharp and care should be taken to always cut away from your fingers.
- Oil-based inks do not generally cause skin irritation, but gloves can be worn if individuals have allergies or sensitive skin.

ETCHING: *MEMENTO MORI*

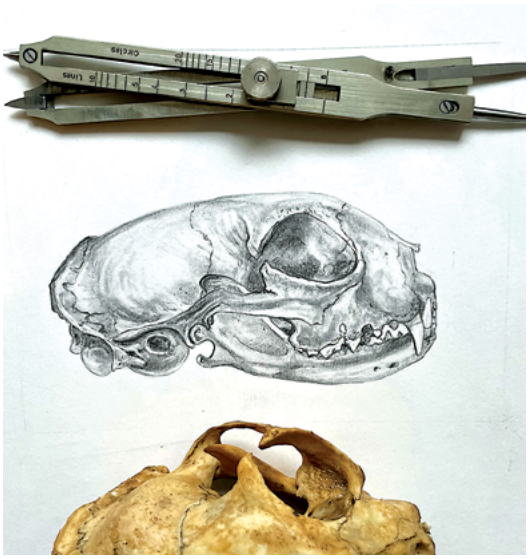
Memento Mori is a zinc plate aquatint etching of a Maine coon cat and skull superimposition. This print is based on a photograph of my Maine coon who lived to the good old age of 14 years, along with observational drawing of his skull.

Etching is a type of intaglio print process. Intaglio printing is the opposite of relief printing; the surface of the plate is wiped clean, and the ink is forced into the recessed lines and textured areas. Considerable pressure is required to print an etched plate by squeezing damp paper into the ink-filled recessed lines and textures. A specialized etching press is ideal, but cheaper die-cutting machines can be adapted for use with this technique.

Following is a step-by-step guide of the process I used to create this print.

Materials used:

- Pencils
- Proportional dividers—not essential but can be a useful tool when creating a measured drawing.
- Zinc plate—different metals can be used with etching, but I used zinc for this example.
- Metal file—for filing down the edges of the zinc plate so they don't cut the paper.
- Brasso®—metal polish for the zinc plate.
- Whiting powder (powdered calcium carbonate) mixed with dishwashing liquid—to degrease the zinc plate.



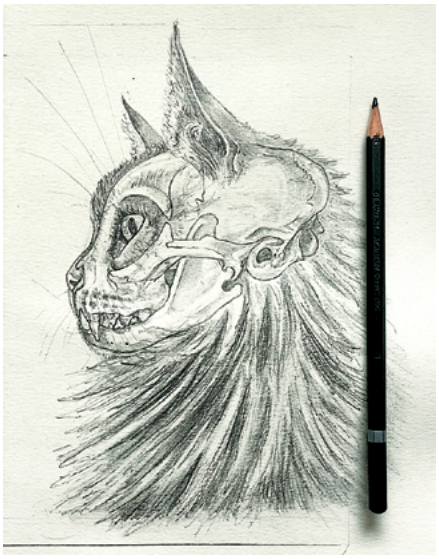


Figure 11 (left): Measured observational drawing of cat skull, with proportional dividers shown above.

Figure 12 (middle): The drawing with skull imposition ready to trace.

Figure 13 (right): Zinc plate with both the white carbon outline and scratched lines visible, prior to etching.

- Hard ground—I used Charbonnel® liquid ground for this print.
- Tracing paper
- White carbon paper
- Adhesive plastic—thin sticky-backed plastic film (such as a clear self-adhesive book cover) to protect the back of the plate and prevent it from etching.
- Copper sulphate mixture—approximately 2:1 copper sulphate to table salt mixed with water.
- Airbrush—to apply the aquatint.
- Lascaux® aquatint spray—to apply over the line etching using an airbrush.
- Lascaux® stop-out resist—to protect areas of the zinc plate and prevent etching.
- Lascaux® remover—to remove the aquatint and stop-out.
- Oil-based etching ink
- Scrim—to rub the ink into the etched plate.
- Paper—there are many great papers for printing. For this print I used Fabriano Rosaspina® 285 gsm paper. Thick papers are best for etching.
- Printing press—etching requires a press to print properly. I used a Gunning® Etching Printing Press No. 2.

Process:

1. Before starting the drawing for this print, I needed a good reference. I used a portrait of my own Maine coon cat who had passed away some years before, along with his skull which I have as a memento. Maine coons have particularly large and robust skulls, so it was important to me to have an accurate reference. I used my vintage proportional dividers to create an accurate measured drawing as reference (*Fig. 11*).

2. As with most of my prints, I first drew the design in my sketchbook, making sure to superimpose the skull accurately over the portrait (*Fig. 12*).

3. Before transferring the design to the zinc plate, however, I first had to prepare the plate. This involved filing down the edges, polishing, and degreasing.

4. Then I applied a thin hard ground. This protects the plate from the copper sulphate that is used to etch the metal. Next I covered the back of the plate with a thin adhesive-backed plastic film.

5. Once the ground was dry, I transferred the image using white carbon paper. This acted as a guide for me to gently scratch the image into the ground, exposing the metal (*Fig. 13*).

6. Then I placed the zinc plate in a bath of copper sulphate solution for a few minutes to etch the exposed lines.

7. Once the linework was etched and the plate cleaned of the hard ground, I added additional tone through a process known as aquatinting. An acrylic spray aquatint mix is applied over the line etching using an airbrush. This covers the plate with tiny dots. Where the dots are present, the plate is protected from being etched. Gaps between the dots can be further etched to create tone.

8. I used an acrylic stop-out resist along with marker pens to protect certain areas of the plate from being etched (*Fig. 14*). Similar to the hard

Figure 14 (left): Zinc plate partially protected with stop-out resist and marker pen.

Figure 15 (right): Final etching print.

ground used before, any areas covered with the acrylic or marker pen are resistant to etching. Resist materials can be progressively built up in layers to create different tones. Areas of the plate that are exposed for longer will print darker.

9. Once both the lines and tones were etched, I cleaned and prepared the plate for printing. First I scraped ink over the surface of the plate with a wedge of card. Next I rubbed the surface with scrim fabric, which simultaneously wipes clean the surface of the plate whilst also pushing ink into the recessed etched areas. Then I gave the plate a final wipe with a smooth piece of tissue paper to polish the lightest areas.

10. I printed the inked plate using a Gunning Etching Printing Press No. 2. For this print I used a brown-black oil-based etching ink and printed onto (damp) cream Fabriano Rosaspina 285 gsm paper. The resulting print can be seen in Figure 15. Figure 16 (*following page*) shows the print alongside both the etching plate and the skull.

SAFETY CONSIDERATIONS

Etching involves the use of several chemicals which can cause skin and eye irritation if not used correctly. Personal protective equipment should be worn. Please keep these precautions in mind:

- When using the Charbonnel liquid ground, it is important to do so in a well-ventilated space. Prolonged skin contact can cause irritation, so gloves are recommended. Avoid contact with eyes as it can cause severe eye irritation.[3]
- Although copper sulphate is a safer alternative to traditional acid-based etching, it can still cause skin irritation, so gloves and an apron should be worn. Avoid contact with eyes and consider wearing protective eyewear. Good ventilation is important, as small amounts of hydrogen gas are produced from the solution.
- Lascaux aquatint spray and Lascaux stop-out resist are both solvent-free and based on an acrylic copolymer. They are generally nontoxic, but gloves can be worn if individuals have allergies or sensitive skin.[4,5]
- Lascaux remover can cause skin irritation and eye damage. Gloves should be used and contact with eyes avoided.[6]
- Oil-based inks do not generally cause skin irritation, but gloves can be worn if individuals have sensitive skin or are allergic.

Figure 16: Final print along with the etching plate and cat skull.

CONCLUSION

Printmaking can be broken down into lots of discrete steps, from preparing the block and paper, carving/engraving, to printing and editioning. This methodological approach makes it relatively easy to fit around work and childcare. Even a half hour after work allows one to quite literally chip away at a piece. It's amazing what just a small amount of daily practice can achieve. Giving myself space to be creative has given me a sense of balance between the various aspects of my art practice. I can now say with confidence that I am both an academic and an artist.

I hope this article provides readers insight into the variety of printmaking techniques available and inspiration to try some of the techniques themselves!

RESOURCES

Caroline's website: *erolinstudios.com*

Instagram: *www.instagram.com/erolinstudios*

Endnotes

1. Caroline Erolin, Luke Reid, and Seaneen McDougall, "Using virtual reality to complement and enhance anatomy education," Journal of Visual Communication in Medicine 42, no. 3 (2019): 93–101, *doi.org/10.1080/17453054.2019.1597626*
2. The Material Safety Data Sheet (MSDS) for the oil-based ink I use is available at: *intaglioprintmaker.com/wp-content/uploads/2024/06/Caligo-Safe-Wash-Relief-Ink-MSDS.pdf*
3. MSDS for Charbonnel liquid ground: *intaglioprintmaker.com/wp-content/uploads/2022/08/Charbonnel-Ultraflex-Liquid-Ground-MSDS.pdf*
4. MSDS for Lascaux aquatint spray: *intaglioprintmaker.com/wp-content/uploads/2022/08/Lascaux-Aquatint-Spray-Resist-2095-MSDS.pdf*
5. MSDS for Lascaux stop-out resist: *intaglioprintmaker.com/wp-content/uploads/2022/08/Lascaux-Stop-Out-Resist-2092-MSDS.pdf*
6. MSDS for Lascaux remover: *intaglioprintmaker.com/wp-content/uploads/2022/08/Lascaux-Remover-2098-MSDS.pdf*

Below: Cover of *Drawing Nature: The Creative Process of an Artist, Illustrator, and Naturalist*, by Linda Miller Feltner. Published by Princeton University Press, Princeton, NJ, 2024.

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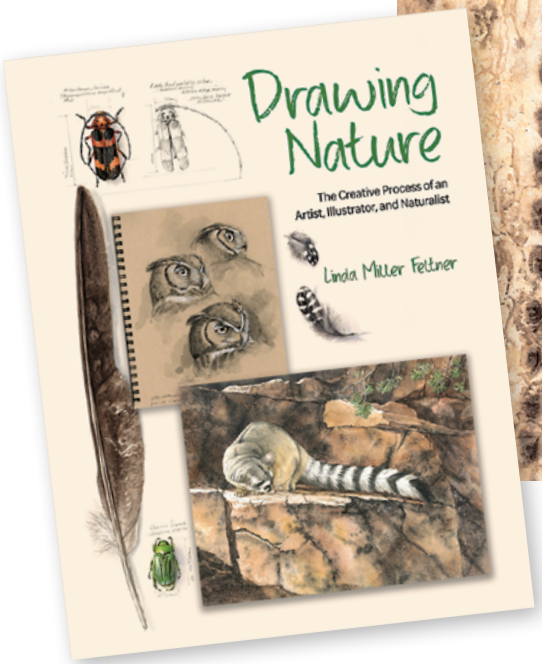
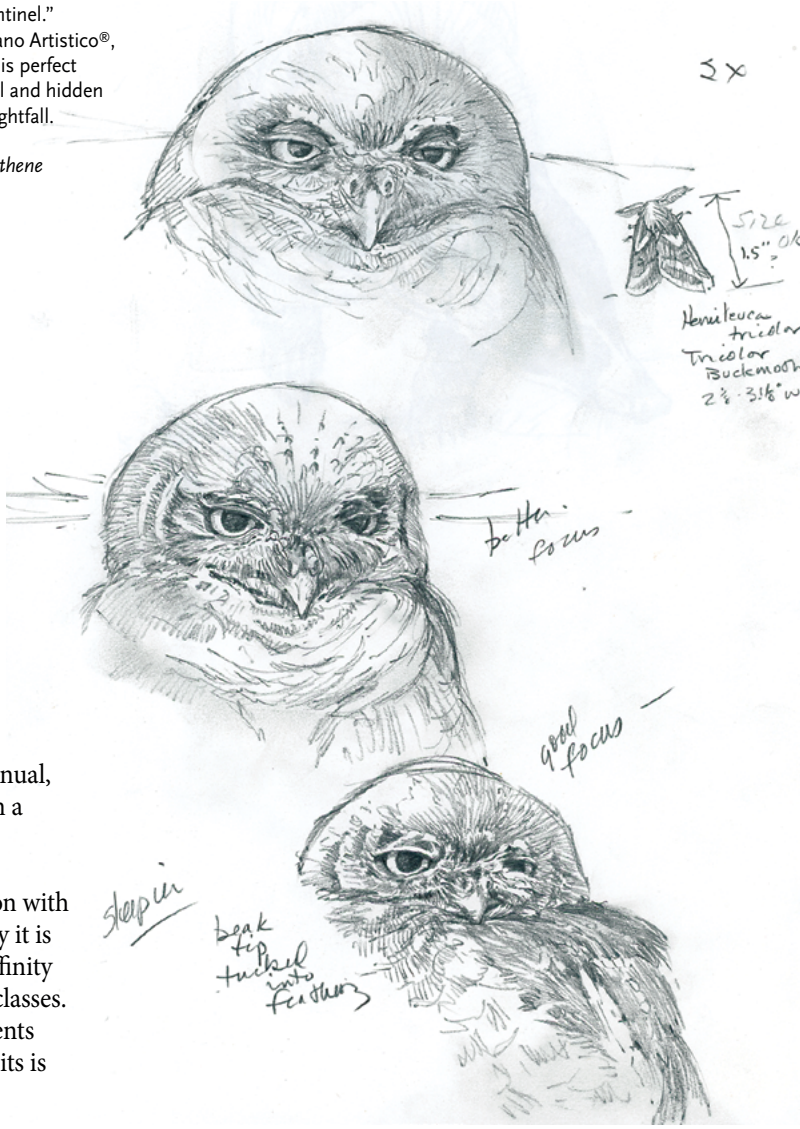


Above: "Saguaro Sentinel." Watercolor on Fabriano Artistico®, 2014. A old Saguaro is perfect for a roosting elf owl and hidden insect waiting for nightfall.

Right: Elf owl (*Micrathene whitneyi*).



Book Review

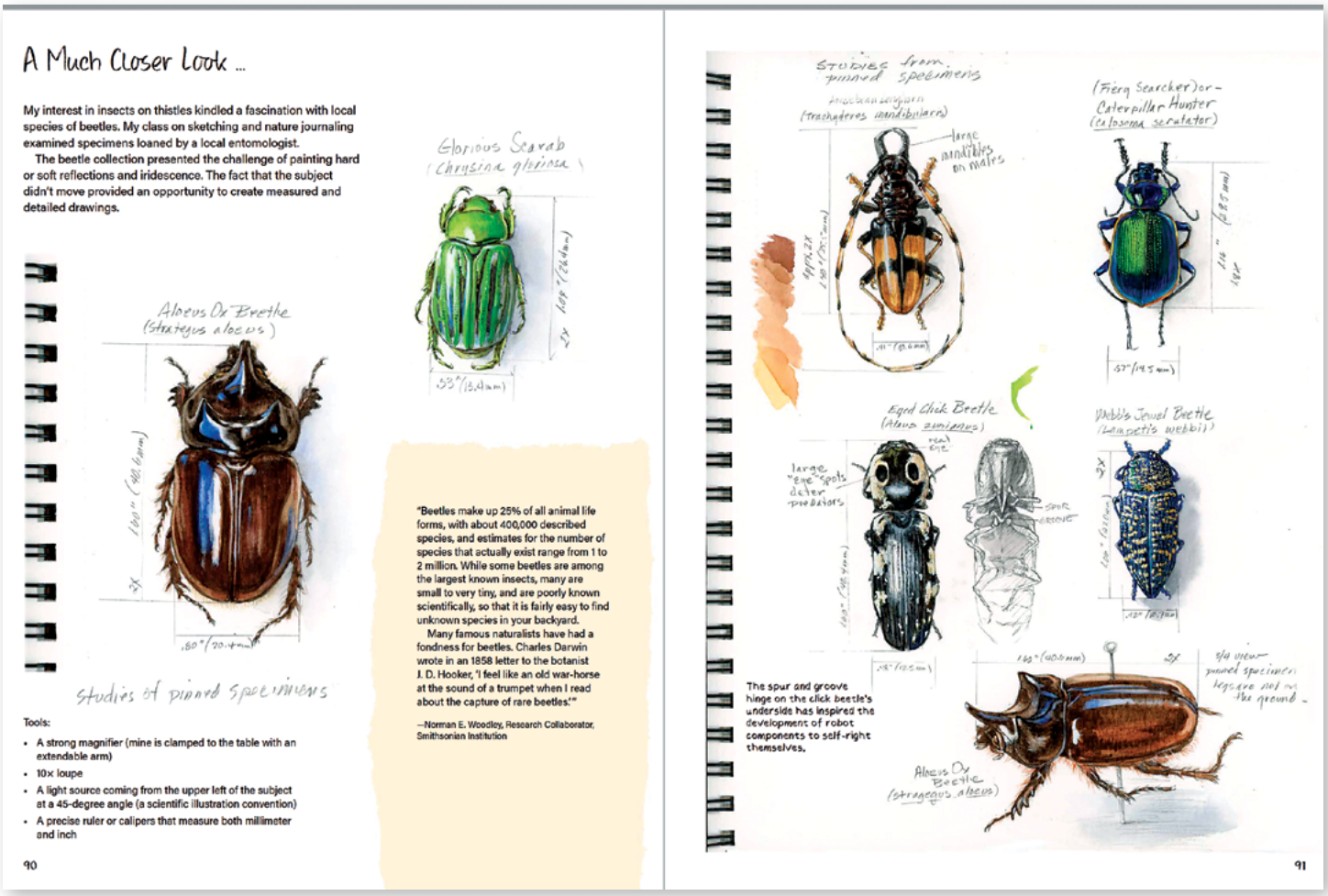
Drawing Nature: The Creative Process of an Artist, Illustrator, and Naturalist

BY LINDA MILLER FELTNER

— Reviewed by Nancy Halliday
Member, SAA, GNSI, NAGMA

The title seems to indicate this is yet another drawing instruction manual, but the author, Linda Miller Feltner, instead invites us to join her on a lifelong journey in artistic fulfillment through personal discovery.

The inspiration behind Feltner's prolific career is her childlike fascination with nature. She begins the book by examining a shed feather and asking why it is curved and how that might benefit its wearer. Feltner has a particular affinity for birds and will bring live raptors from a rehabilitator to her drawing classes. Although she offers some drawing tips such as proportional measurements and cognizance of internal structures, the primary purpose for these visits is



Above: Reflections on Arizona beetles. Watercolor (pages 90–91).

Left: A ringtail in the classroom, a nocturnal native of Arizona.

for the students to fully realize the crucial necessity of drawing from the living animal. She cajoles her students to keep their pencils on the paper, for even the most unfinished gesture drawing can reveal the distinctive fluidity of an animal's motion.

Feltner then explains how raw sketches can be refined for inclusion in a painting. Museum specimens and photo references are invaluable for providing those important details that add to the credibility of an image. As the work progresses, she suggests the use of tracing paper overlays for corrections and additions, thus eliminating erasing and losing the spontaneity of the initial drawing beneath. Planning more complex paintings requires careful notan and value studies before color ever touches paper.

Feltner's paintings are executed primarily in transparent watercolor and sometimes gouache, but much of her career has involved producing commissioned illustrations on scratchboard. She outlines the steps involved in accepting an assignment, learning as much as possible about a subject (even to wading in a swamp to gather information), then collaborating with the curator/writer/designer and making many revisions as the work progresses and each stage is approved. Feltner's list of clients is impressive. She has done small illustrations for numerous publications to large interpretive signage and murals for local, state, and national parks, sometimes including portrayals of massive landscapes. She is involved in conservation efforts and has donated her artwork to natural restoration efforts.

Not many artists would be willing to divulge their entire creative process, from the wellsprings of their deepest inspiration through the steps to final production. They might lack the command of language to do so, or feel too vulnerable by such exposure, leaving the artwork to speak for itself. Feltner not only enthusiastically shares her artistic journey, but she personalizes it by her own script that graces many of the pages.

This delightful romp through an artist's life is a feast for the eyes and an inspiration for the soul.

Above left: The boxing caterpillar.

Above right: Regal horned lizard (*Phrynosoma solare*).

Below right: Contemplating insects on a thistle. Ink and watercolor.

Drawings and studies are on Canson Montval Watercolor Sketchbook, 140 lb (300 g) cold press, unless otherwise noted.

Figure 1 (left): Catherine's first attempt at botanical illustration. Michigan lily (*Lilium michiganense*) in watercolor. © 2021 Catherine Hu.

Figure 2 (below): Catherine's most recent scientific illustration featuring the pharaoh cicada (*Magicicada septendecim*) in gouache and watercolor. © 2024 Catherine Hu.

Nurturing the Next Generation of Scientific Illustrators

— Catherine Hu

Becoming a scientific illustrator was an unexpected but delightful addition to my career and life. I have never thought of myself as a particularly creative person, even now. I remember that even in elementary school, I struggled in art classes to come up with any original ideas, while watching others produce wildly imaginative work. I was great at copying, though. My grandma once told me when I was two or three years old, she set me up with some paper and pencils in front of a vase with flowers. She left and returned a while later, discovering I had drawn a pretty impressive reproduction of the scene for a child my age. I went through the rest of my childhood and young adult years taking art classes here and there but never felt seriously inspired or motivated.

At the very beginning of my conservation career, I interned and lived on-site at Shaw Nature Reserve in Missouri, where I spent six months doing ecological restoration. With over 2,000 acres to explore, I was surrounded by new plants each day. I had to learn about them quickly, so after work I'd take hikes to capture photos of new-to-me plants and research them later. I got permission to collect samples, which I pressed, dried, and taped into a notebook. Eventually I realized that what I really needed to do was to spend time observing each species, not only the flower color or leaf shape, but also the relative length of the stamens to the petals, the ratio of the width to length of the leaves, slight differences in shades of green—is it a yellow-green or a blue-green? This made me pick up my paintbrush again (*Fig. 1*).

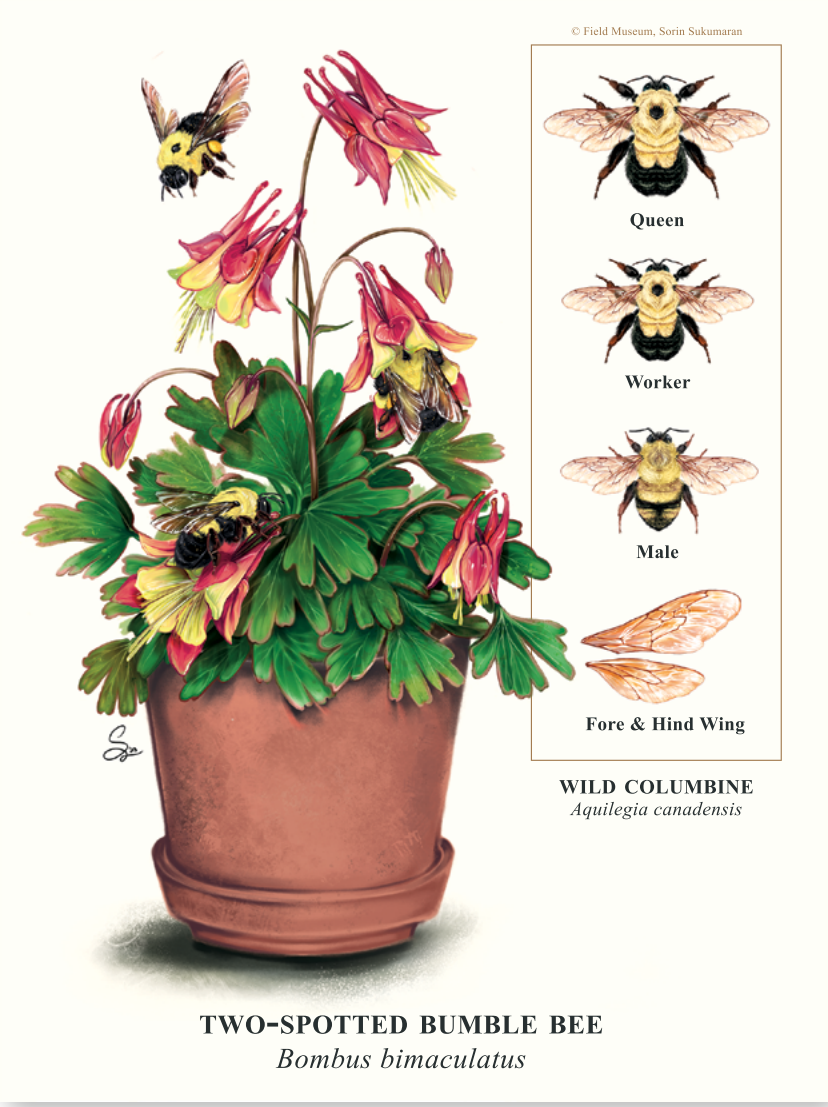
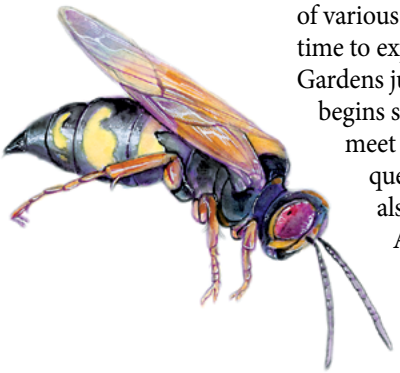


Figure 3: Two-spotted bumble bees (*Bombus bimaculatus*) with wild columbine (*Aquilegia canadensis*), native plants they depend on. Digital illustration. © 2023 Sorin Sukumaran

After the internship, I landed a full-time restoration job and continued painting. Slowly with practice, my style transitioned from loose watercolor to more scientific. I started incorporating other parts of the plants' life cycles besides the flowering stage. This then led to illustrating the relationships between plants and wildlife. These self-assigned art projects helped me immensely in learning about the entire natural history of the species. An added benefit I experienced was the calmness that painting brought to my mind. When I reached the flow state, hours passed and I found myself lost in the layers of colors and brushstrokes (*Fig. 2*).

I began working at Chicago's Field Museum as an ecologist in the summer of 2022, hoping there would be a way for me to incorporate art somehow. And then the opportunity appeared: our team in the Keller Science Action Center received a grant from the Maxwell/Hanrahan Foundation to expand conservation impacts through the arts by hosting one early career natural science illustrator intern at the museum. I do not do illustration as part of this job, but having experience in both art and ecology prepared me to supervise this intern. In Fall 2023, we had our first illustrator intern; in 2024, we received the grant again. This is a 3- to 4-month part-time internship for an undergraduate or graduate-level student, either in school or recently graduated. So far the artwork has been focused on pollinators and native plants in the Chicago Wilderness region and is intended to raise the public's awareness of these topics. There is also an opportunity for the intern to exhibit their work in some way.

My greatest hope is for the intern to have as many experiences as possible in the art and science worlds. The internship is short so every moment counts. In the first week, we dive into detail about the projects so they can start researching and sketching. To aid this process, I schedule introduction meetings between relevant staff and the intern. We go on tours



of various collections in the museum. They are given time to explore exhibits and wander the Rice Native Gardens just outside the museum. Artwork creation begins seriously after the initial couple of weeks. I meet weekly with the intern to answer technical questions and look over drafts. The intern also regularly meets with *Peggy Macnamara*, Artist-in-Residence at the museum, to receive feedback and guidance on the artwork as well as mentoring.

Last year we hired *Sorin Sukumaran* (They/Them), a recent graduate of the School of the Art Institute of Chicago (SAIC). They produced four large, scientifically accurate pieces featuring four native bumble bees with a plant or two that they depend on (*Figs. 3, 4*). In addition, Sorin painted 24 watercolor pieces that we published in the *Beginner's Field Guide to Pollinators in Chicagoland*. These illustrations were a little more loose in style, suggesting rather than showing all the details, and were meant to be appealing to a younger audience. We've created postcards and stickers from the artwork, and they are always the most popular items at tabling events (*Figs. 5, 6*). Last October, the museum hosted a "Return to Nature" event in the gardens, where Sorin presented the new pollinator-themed artwork to over a hundred conservation-minded folks in the region.

As for the experience, Sorin said this internship solidified that they want to pursue scientific illustration, that it was amazing to meet scientists and creative people at the museum (whether or not it was their day job), and that these art pieces were "some of the best work I've ever created." It is our hope this internship continues to offer a creative space for early-career artists to explore the intersection of art and science while broadening the impacts of environmental conservation.

Figure 4 (left): Rusty patched bumble bees (*Bombus affinis*) with wild bergamot (*Mondard fistulosa*), a native plant they depend on. Digital illustration. © 2023 Sorin Sukumaran.

Figure 5 (above): Cicada killer (*Sphecius speciosus*). Part of a series of watercolor illustrations of pollinators reproduced as stickers. © 2023 Sorin Sukumaran

Figure 6 (right): Monarch butterfly (*Danaus plexippus*). Part of a series of watercolor illustrations of pollinators reproduced as stickers. © 2023 Sorin Sukumaran

RESOURCES

Sorin's website: *zephyrenn.weebly.com*

Peggy's website: *www.peggymacnamara.com*

Catherine's website: *sedgeshaveedgesart.com*

Internship postings on the Field Museum careers website: *www.fieldmuseum.org/about/careers*

Eastern painted turtle (*Chrysemys picta*). Watercolor. © 2024 Haley Grunloh

Yale Peabody Museum
Natural Science Illustration Program

— by Dorie Petrochko

September 2024 marks the fifteenth year of the Yale Peabody Museum's Natural Science Illustration Program. The program was launched in 2009 by four professional artists and members of the Guild of Natural Science Illustrators: Cindy Gilbane, Susannah Graedel, Dorie Petrochko, and Jan Prentice.

Three of our founders earned their certificates in Botanical and Natural Science Illustration at the New York Botanical Garden. Dorie, Linda, and Jan were also long-time Peabody volunteers which led to their eventual collaboration with the museum. Classes were originally taught at the museum in New Haven and then at Yale's West Campus Educational Center in Orange, Connecticut. In more recent years, the program has grown to include students from 38 U.S. states and 12 countries, as well as 16 instructors.

Founders and instructors of the Yale Peabody Museum's Natural Science Illustration Program. Bottom row: Jan Prentice, Dorie Petrochko. Top row: Linda Miller, Susannah Graedel, Cindy Gilbane.

Classes have always been natural science–based, and students of all levels of ability are encouraged to participate. The program offers both online and in-person classes including Drawing, Watercolor, Colored Pencil, Pen and Ink, Mixed Media, Drawing and Painting Birds, Insects, Gems and Minerals, Vertebrate Anatomy, Plant Morphology, Digital Illustration, Marketing for Artists, Composition and Design, and others. Students taking classes at the museum may take advantage of the opportunity to use museum specimens from the Peabody's vast collections as inspirations for their work.

Classes are challenging and the results are impressive. The program enjoys a large following of students, many of whom have previous art or science backgrounds. One student commented, "Each course has nudged me beyond what I thought myself capable of. I cannot say how valuable and important this program has become in my life."

Students practice painting feathers. © 2024 Yale Peabody Museum Natural Science Program

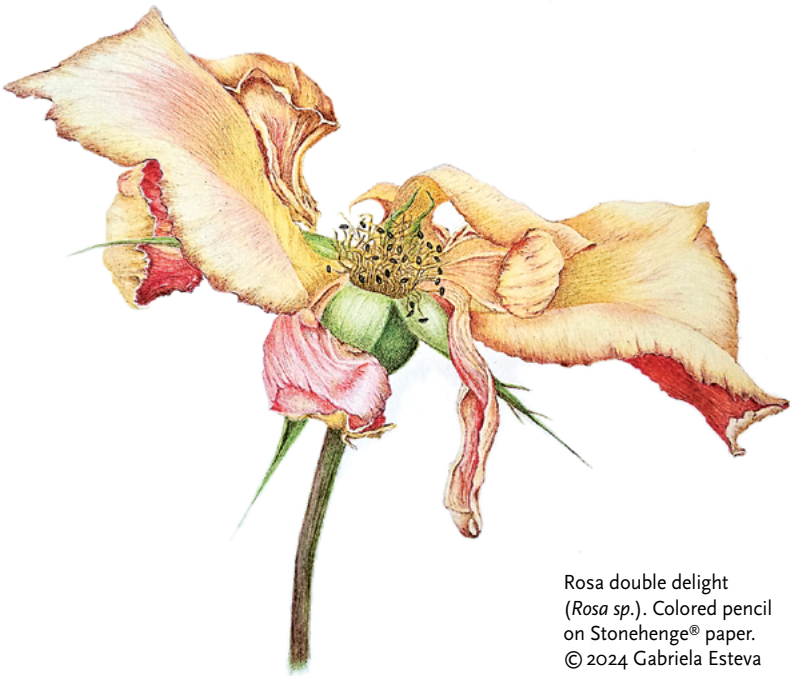
LEARN MORE about Yale Peabody Museum's Natural Science Illustration Program at *peabody.yale.edu/education/adult-programs/nsi*

Violet-tailed sylph hummingbird (*Aglaiocercus coelestis*). Colored pencil on Dura-Lar® film. © 2024 Marylou Connolly

Painted bunting (*Passerina ciris*). Colored pencil on paper. © 2024 Pamela Riddle

Bee balm (*Monarda didyma*). Colored pencil on Dura-Lar film. © 2024 Ally Alloway

Indian corn. Digital rendering. © 2024 Kim Burris



Rosa double delight (*Rosa sp.*). Colored pencil on Stonehenge® paper. © 2024 Gabriela Esteva

Death's head hawk moth (*Acherontia atropos*). Colored pencil on Dura-Lar film. © 2024 Mary Kwok

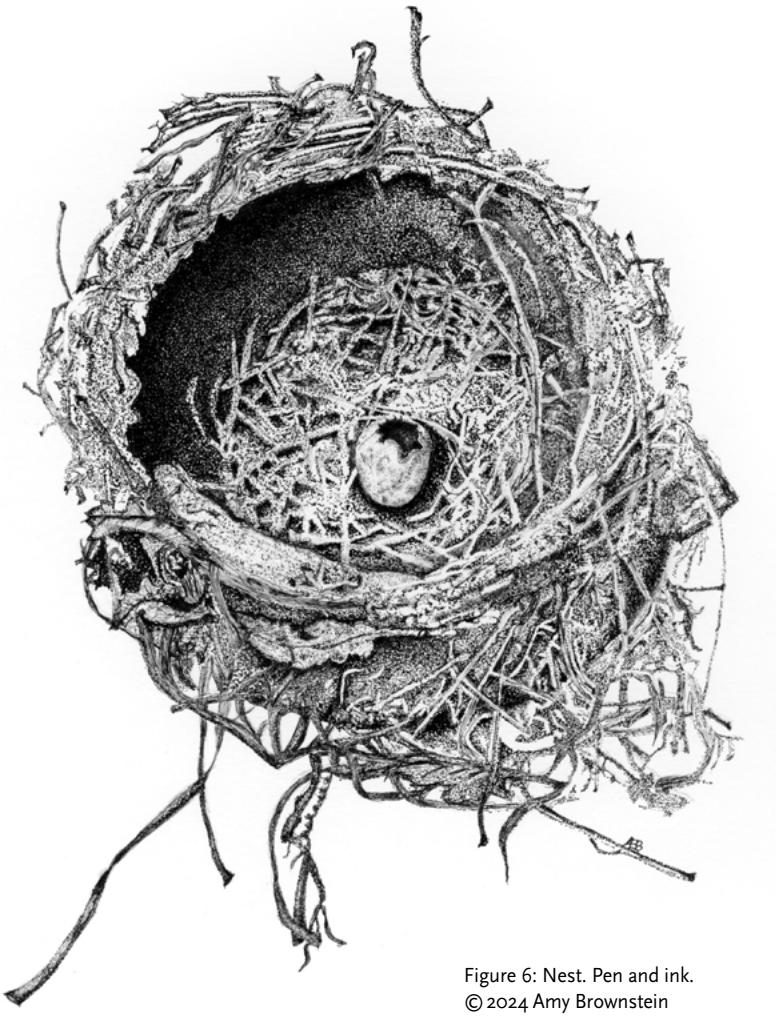


Figure 6: Nest. Pen and ink. © 2024 Amy Brownstein

Sioux quartzite, selenite crystal, and copper ball. Graphite. © 2024 CJ Rocky

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