Journal of Natural Science Illustration

GUILD OF NATURAL SCIENCE ILLUSTRATORS

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A Note From...

Camille Werther, Production Editor, JNSI

Greetings from your Journal team! We are pleased to bring you this summer issue of the Journal. As part of the new editorial staff, I would like to mention how much we have enjoyed working with each other and the senior editors. Clara Richardson, Gail Guth, and Britt Griswold have been generous with their time and knowledge, and we are grateful for their dedication and patience with us as we learn how to pull issues like this together for you.

We think you will find in it some exciting examples of visual communication of information about the natural world. Inside, Xavier Pita shares with us the use of customized digital watercolor brushes in illustrations for the Corroios salt marsh and tide mill project. Bruce Kerr details a rendering of invasive species in digital media. Sally Cox demonstrates pop-up cards, which can be used for studio promotions or exhibits. In addition, we have a member spotlight of Rick Simonson, whose company, Science Lab Studios Inc., offers science communication services. We are also pleased to bring you the student portfolio gallery for CSUMB, and a collection of sketches by David Nielsen.

Every issue we publish is only possible because of our generous contributing authors. We are always looking for authors who are willing to share their knowledge. Do you have a different technique or a project that might interest our members? Please consider sharing what you are doing! Our staff can work with you to produce an article, and you can add a publication credit to your CV. If you have an idea, or sketchbook pages to share, contact one of our editors at the email address below. We look forward to hearing from you!

— Camille Werther
journal@gnsi.org

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Cover: The 600-year-old Corroios tide mill in Portugal. Painted digitally using Photoshop, Illustrator, and SketchUp. © Xavier Pita

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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The Corroios Salt Marsh and Tide Mill

— Xavier Pita

The Corroios salt marsh is one of the richest natural habitats in the Tagus River estuary area in Portugal (*Figure 1*), with its beauty contrasting the highly urbanized surroundings.

The Corroios salt marsh is classified as a national ecological reserve where hundreds of species of birds—such as the gray heron (*Ardea cinerea*), the pied avocet (*Recurvirostra avosetta*), and the flamingo (*Phoenicopterus roseus*)—live, feed, or rest during migration. Several species of fish and aquatic invertebrates, including the short-snouted seahorse (*Hippocampus hippocampus*), the European eel (*Anguilla anguilla*) and the common cuttlefish (*Sepia officinalis*) (*Figure 2*), can be found in the flooded areas of the marsh and the adjacent bay using the area for breeding and as a nursery.

On the western part of the marsh sits the Corroios tide mill. This 600-year-old mill is one of the last operating tide mills in Portugal; it encapsulates many of the technical and architectural solutions that characterize this type of mill. The first historical reference to the tide mill dates to 1403. Originally built with only three pairs of millstones, the mill underwent successive expansions to its structure in order to increase production due to increasing demand for flour and derived products. In the 1980s, the mill was bought by the Seixal City Hall, and it has since become an extension of Seixal's Ecomuseum. Using only natural power sources, the mill shares with the salt marsh the fact that their routines must be intimately connected to the rhythm of the tides.

A SOURCE OF INSPIRATION

The idea for this project came from the first time I visited the area in the Spring of 2012. I was amazed by the richness and beauty of both the salt marsh and of the tide mill, but I also realized that not much information about either of them was available to visitors to the museum. I thought that with such a privileged location within the salt marsh, the tide mill could make a perfect venue to promote education about the salt marsh and the tide mill itself.

At the time, I was working on my master's degree in scientific illustration, and I thought that this could make a great project for my dissertation. I imagined several profusely illustrated outdoor panels, placed in the surrounding area of the tide mill, with information about the salt marsh and its biodiversity. Inside the tide mill, panels describing the mechanisms and tools would help visitors to better understand how the tide mill works.

I contacted Seixal's Ecomuseum about the idea and with their support I started to develop the project.

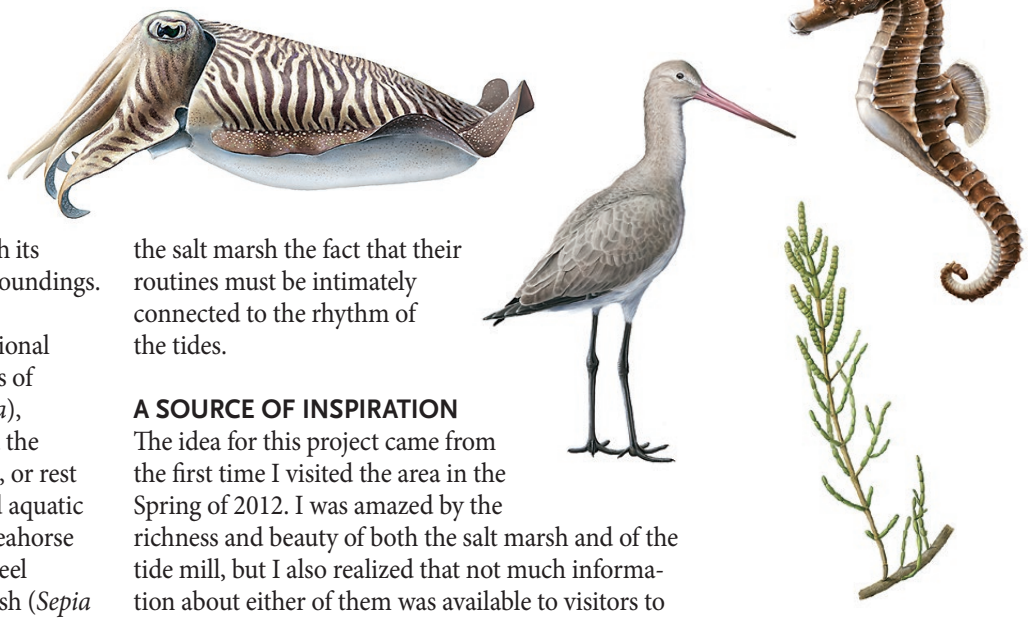


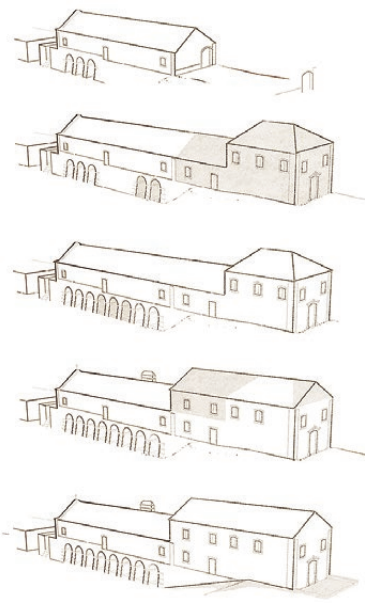
Figure 1: *(top)* Map with location of the Corroios salt marsh and the Corroios tide mill: grayscale locator and color detail of the area. A tidal mill allows rising water to pass through its structure and then harnesses the release of that water as the tide receeds.

Figure 2: *(above)* Some species that can be found in the salt marsh: common cuttlefish (*Sepia officinalis*), black-tailed Godwit (*Limosa limosa*), short-snouted seahorse (*Hippocampus hippocampus*), and *Sarcocornia fruticosa*.

Figure 3: *(above)* The Corroios tide mill, with the distinctive eight arches that house the milling mechanisms.

Figure 4: *(far right)* Different materials and textures had to be rendered in the illustration of the grain hopper.

Figure 5: *(below & top right)* Line work and monochromatic images were used for more schematic illustrations or secondary information.



ESTABLISHING A PLAN

One of the first steps was to define with the Ecomuseum a layout of the general contents of the panels.

The goal was to have each panel dedicated to a particular theme or subject. For the salt marsh, we decided that I would showcase a sample of the biodiversity that can be observed in the area. The plan was to have an introductory panel with the geographic contextualization of the salt marsh, and then a series of panels with representative species of the biological communities, namely individual panels for plants, birds, fishes and invertebrates (*see Figure 9 on page 6*).

For the tide mill, the goal was to create panels with information that would complement or expand on what visitors could see at the mill. I thought of having panels addressing the historical evolution of the mill, how a tide mill works, adding details about the hydraulic organs of the mill, the milling mechanisms, and finally the miller's tools.

And last but not least, we planned a panel explaining how the tides work, a theme common to both the salt marsh and the tide mill.

With the backbone of the project established, it was possible to define more specifically what illustrations were needed for each panel. This process required some deeper research and input from specialists to ensure the scientific accuracy and relevance of what we were planning to illustrate. Valuable feedback came from Dr. Cláudia Silveira, Historian at the Seixal Ecomuseum; Dr. Pedro Salgado, Scientific Illustrator; and Dr. José Lino Costa, a Biologist who had conducted several studies on the salt marsh.

Given that the panels and illustrations were meant for the general public, we also established early on that their style should be appealing and allow for an easy decoding of the images. The main illustrations were going to be rendered in color to approximate the appearance of the real subjects (*Figure 4*). In contrast, schematic illustrations with secondary information would be done in line work or in grayscale, helping to establish a visual hierarchy in the panels (*Figure 5*).

COLLECTING INFORMATION

Information about the subjects came from various sources. Specimens for reference were collected at the salt marsh itself or examined in museums (*Figure 7*). For some species, however, specimens were not easy to obtain. In these cases, the morphological information came from identification guides and other literature.

For the tide mill illustrations, the Ecomuseum had architectural and historical drawings of the tide mill building and cartography of the salt marsh that could be used as references. The Ecomuseum's library and collections also provided valuable information like videos and photos of the former miller performing tasks at the mill. Throughout the several visits to the tide mill, I also made several sketches and collected photos and measurements, which were afterwards used as reference for the illustrations.

Interestingly, one of my main sources of information about the tide mill structures ended up being the ruins of several abandoned tide mills that can be found in the area of the estuary. These broken-down buildings offered the possibility for me to see their

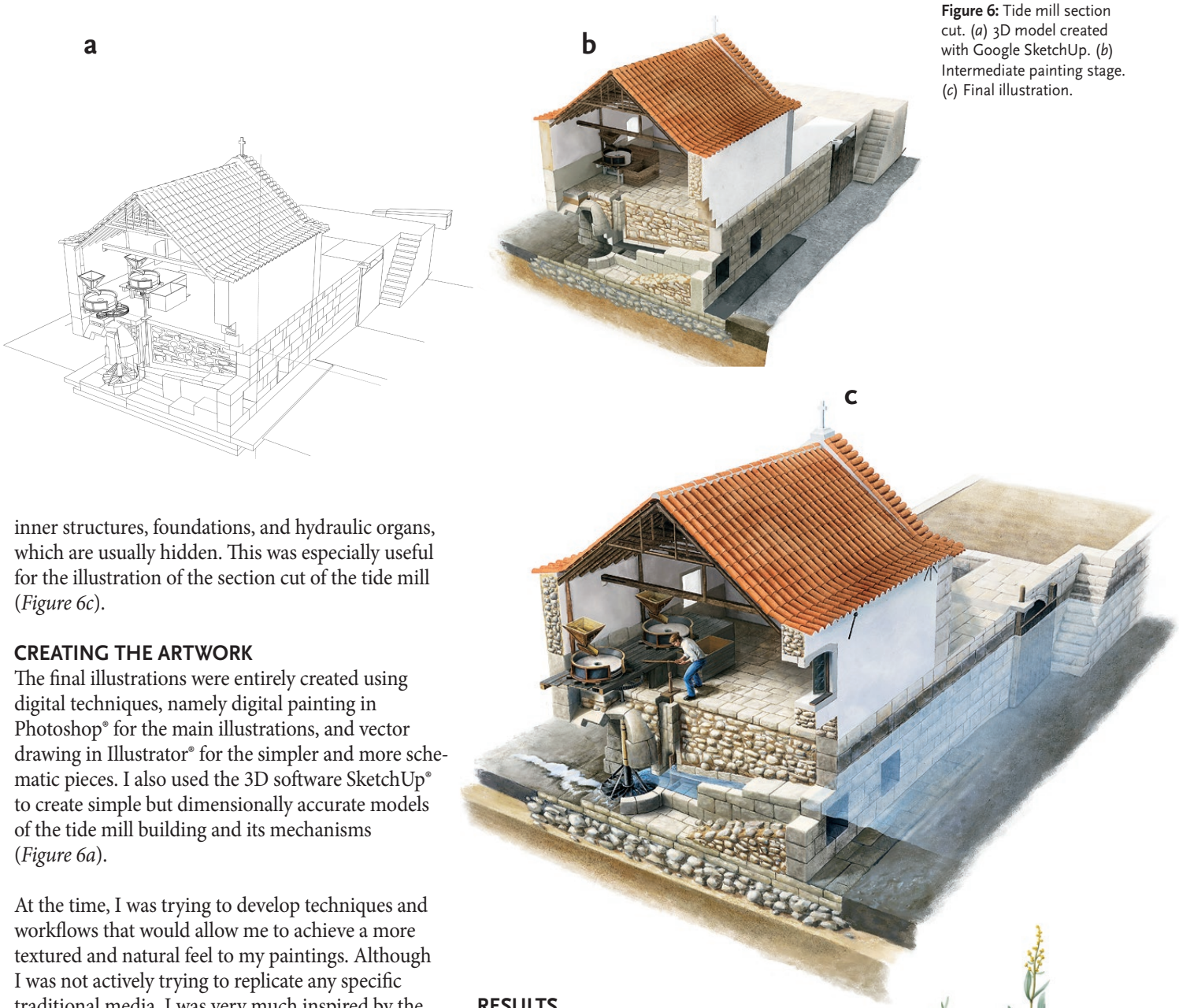


Figure 6: Tide mill section cut. (*a*) 3D model created with Google SketchUp. (*b*) Intermediate painting stage. (*c*) Final illustration.

inner structures, foundations, and hydraulic organs, which are usually hidden. This was especially useful for the illustration of the section cut of the tide mill (*Figure 6c*).

CREATING THE ARTWORK

The final illustrations were entirely created using digital techniques, namely digital painting in Photoshop® for the main illustrations, and vector drawing in Illustrator® for the simpler and more schematic pieces. I also used the 3D software SketchUp® to create simple but dimensionally accurate models of the tide mill building and its mechanisms (*Figure 6a*).

At the time, I was trying to develop techniques and workflows that would allow me to achieve a more textured and natural feel to my paintings. Although I was not actively trying to replicate any specific traditional media, I was very much inspired by the look and feel of watercolor painting. Experimenting with the brush tool in Photoshop, in a process that involved a lot of trial and error and a few happy accidents, I created a set of customized brushes that I used throughout the project. To enhance the watercolor feel, I would overlay the painting with watercolor textures that I had created (*Figure 8*).

The use of 3D was particularly useful for the tide mill illustrations, as the 3D models allowed me to get a better understanding of the building's structures and to explore different perspectives. It also made it easier for me to experiment with section cuts, which were fundamental to show the structures and mechanisms hidden inside the building. Once I was happy with the 3D model, I would use it to create accurate sketches that would be painted afterwards.

RESULTS

The results of the project were close to 60 illustrations, which were used to create five panels about the salt marsh, six panels about the tide mill, and one panel about the tides.

The panels about the salt marsh have since been used in a temporary exhibit about the salt marsh titled *There is Life in the Salt Marsh*, which also incorporated artworks from scientific illustrators Mafalda Paiva and Pedro Salgado.

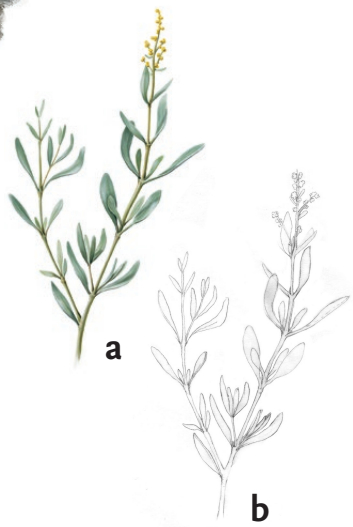


Figure 7: Sea purslane (*Halimione portulacoides*). (*a*) Final illustration. (*b*) Pencil sketch.

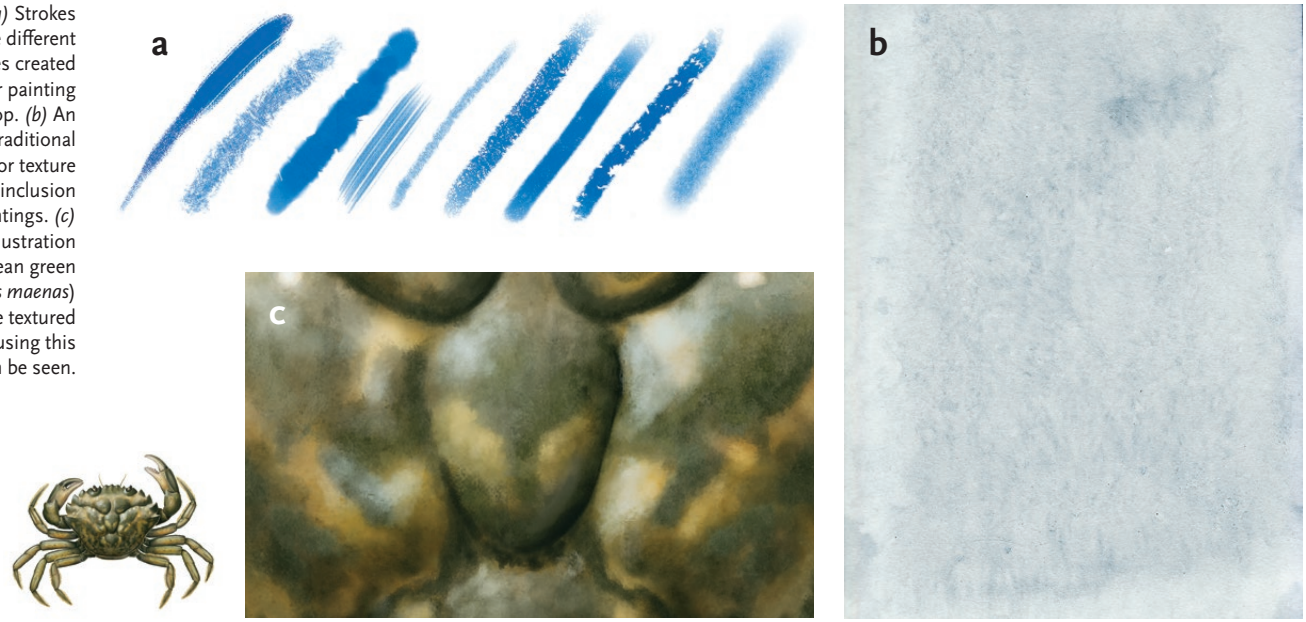
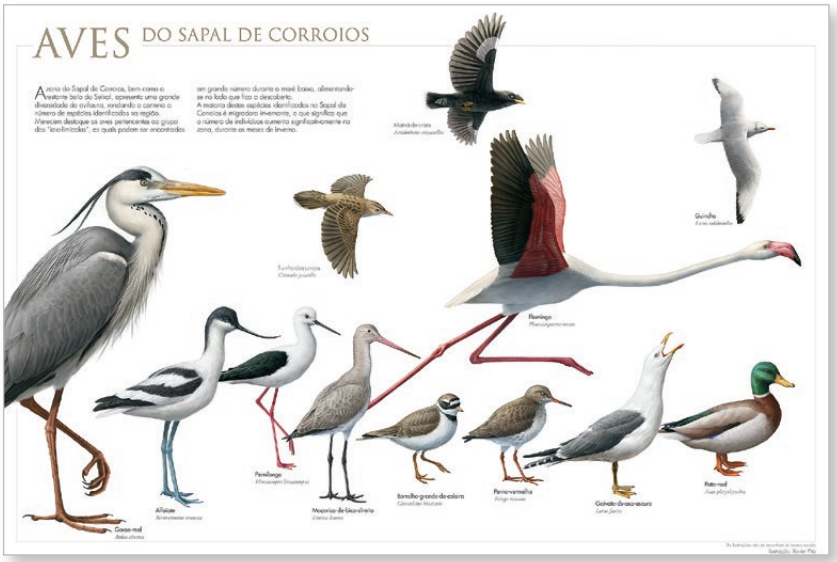


Figure 8: *(a)* Strokes from the different digital brushes created for computer painting in Photoshop. *(b)* An example of a traditional watercolor texture scanned for inclusion in the paintings. *(c)* Detail of the illustration of the European green crab (*Carcinus maenas*) where the textured result of using this technique can be seen.



And while the ultimate goal of physical display panels about the tide mill has not yet been realized, the individual illustrations of the tide mill have been used in publications of the Ecomuseum.

Although the use of the panels and illustrations is different from what was initially planned, their main goal is still being fulfilled: to help visitors better understand and appreciate the richness of the Corroios salt marsh and tide mill.

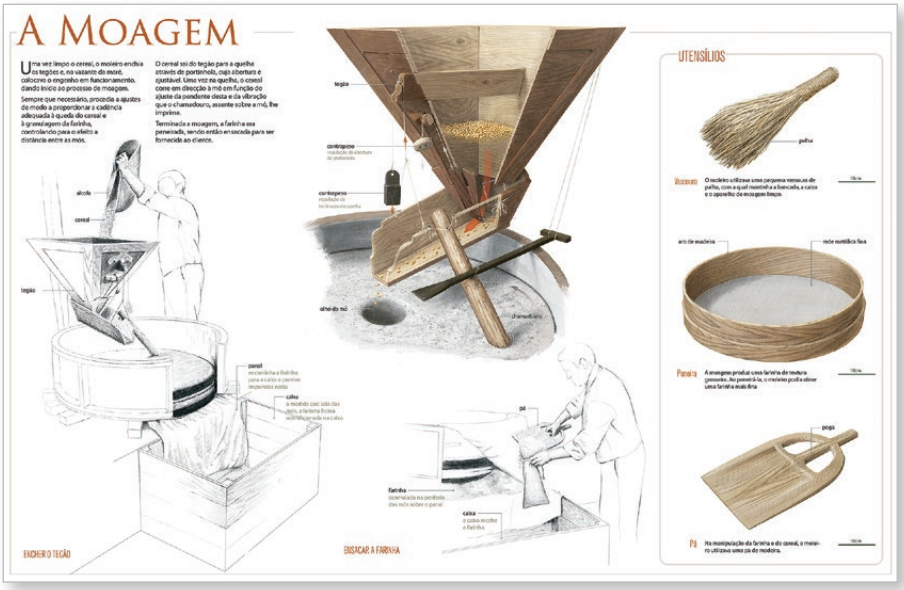
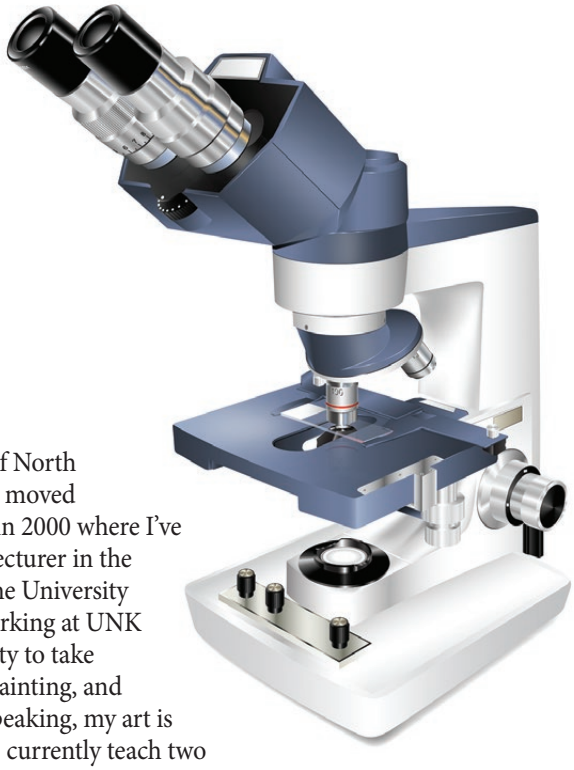


Figure 9: Examples of the panels produced. *(left) Birds of the Corroios Salt Marsh. (below) The Grain Milling.*

ABOUT THE AUTHOR: Xavier Pita is a Scientific Illustrator at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia, where he works closely with scientists, creating illustrations that explain and highlight their latest research.

Xavier has a background in civil engineering, a deep interest in multiple fields of science, and an ever-growing passion for visual communication.

Member Spotlight:
RICK SIMONSON



I was born in Minneapolis and grew up on a farm near Benson, Minnesota. Growing up on a farm certainly nurtured my interest in the natural world; I've always loved drawing and being outside.

My parents were always very supportive of everything I wanted to do, always encouraging my interests in art and science. Mom would often buy drawing paper and pencils for me; Dad built a great drawing table board that I still use. When I was a little kid, I would often make drawings of different types of animals and staple the sheets together to make simple books. I would create a book about spiders and one about snakes and so on. I never guessed that I would be doing the same type of work as a career.

After high school I attended Concordia College in Moorhead, Minnesota, where I majored in biology and minored in chemistry. I did take one or two art courses but didn't really consider pursuing it as a career; I was more into science at that point. I earned my Bachelor of Arts degree from Concordia in 1995. Next I attended graduate school where I did research in cell biology and protein biochemistry at the University of Nebraska–Lincoln. I finished my time in graduate school at the University of Nebraska at Kearney where my research shifted toward molecular biology. In 1999, I earned my Master of Science degree; by this time I was focused completely on biology. Like so many biology students, I next considered a PhD. I applied to a few programs and interviewed with professors who wanted me to work in their labs.

Here is where my path took a turn: I decided not to pursue a PhD, my heart just wasn't in it. I knew exactly what more graduate work in molecular biology would entail, and there were other things I wanted to pursue. I loved biology but I could only do the lab work for so long until I became bored. While I had an interest in research, I didn't want it to be my primary focus. I needed something to fuel my creative side. I actually remember thinking to myself, "I want to draw more."

I only abandoned pursuing a PhD in science, I didn't abandon my love of science—far from it actually. My next step was to take a position as a Molecular Biologist at the University of North Dakota. After a brief time, I moved back to Kearney, Nebraska in 2000 where I've been working as a Senior Lecturer in the Department of Biology at the University of Nebraska at Kearney. Working at UNK has given me the opportunity to take many courses in drawing, painting, and design—so, academically speaking, my art is catching up to my science. I currently teach two courses in scientific illustration. One is on campus for undergraduates and the other is online for graduate students.

Discovering scientific illustration for me came as a result of a lot of soul-searching. I knew I wanted to do more drawing; I just didn't know exactly what I wanted to do with it. Then one day in 2003 I was looking through a biology textbook and it dawned on me: someone had to draw these textbook figures… I bet I could do that! Is it a real profession? I started searching online and came across the GNSI website

Figure 1: (*above*) Compound light microscope. Adobe Illustrator. © 2006 Science Lab Studios, Inc.

Figure 2: (*below*) In my studio working on a new drawing.

and discovered scientific illustration. The conference that year was in Denver—I could drive to that! So that's what I did.

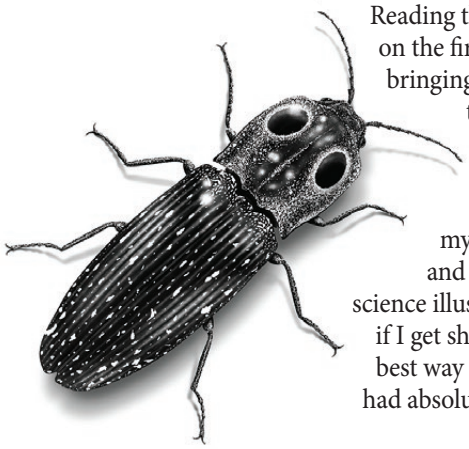


Figure 3: Eyed click beetle (*Alaus oculatus*). Adobe Illustrator and Photoshop. © 2008 Science Lab Studios, Inc.

Reading the schedule, I noticed a portfolio sharing on the first day. I had my apprehensions about bringing my portfolio, but I decided I'm going to be all in on this. I had been to science conferences before; in the sciences there are plenty of egos and people who are less than cordial. So, I brought my portfolio fully expecting to be mocked and humiliated. After all, these are the best science illustrators in the world! I won't be surprised if I get shunned, but that was OK: sometimes the best way to learn and progress is to take risks. I had absolutely no idea what to expect.

Of course, anyone reading this who has been to a GNSI conference knows that the professionals in this group are incredibly welcoming of new people and extraordinarily generous with their knowledge and expertise. So, the portfolio sharing was the exact opposite of what I was preparing myself for. It was a great experience.

Something else happened that I will never forget: when I first walked into the conference the first person who came over and talked with me was Elaine Hodges. She was the first real Scientific Illustrator I met. Only later did I realize that she was a Scientific Illustrator at the Smithsonian and a founding member of the GNSI. I talked with her several times at that conference and at many future conferences. She had a huge impact on me. Since then I have been an active GNSI member. I attend most of the annual conferences, have given numerous presentations and workshops, served as a conference Workshop Coordinator, and served as a member of the Education Committee. I have also served as the Vice President of the Great Plains Chapter and maintain the chapter website.

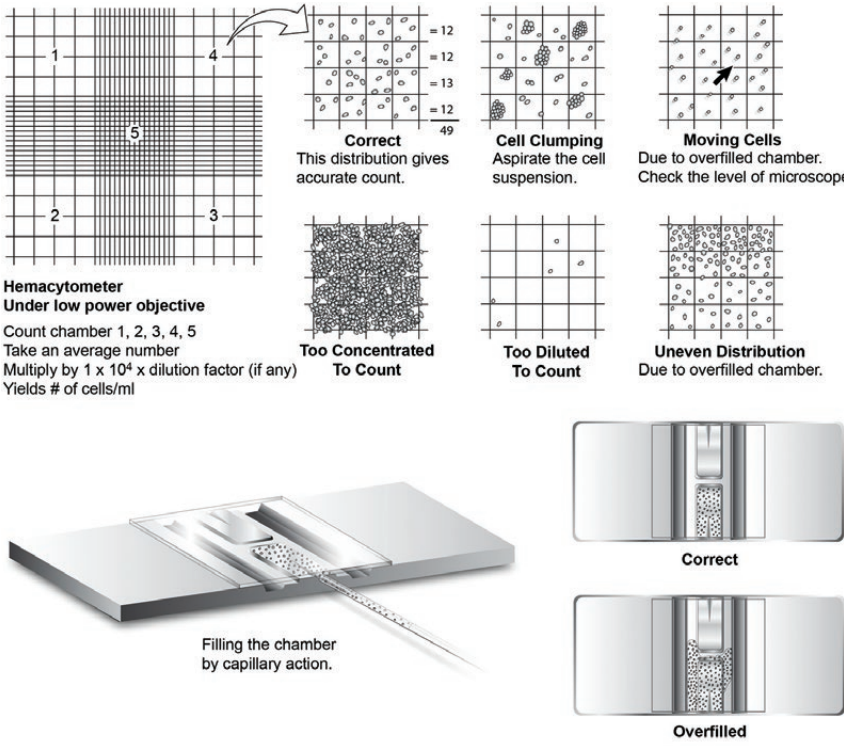
I'm not sure if I've really had one big break; it's more like a lot of small breaks. It's been a gradual progression. Early on I spent about five years focusing my efforts on textbook illustrating. I love how textbooks merge illustrations with text, photographs, and graphic design to communicate scientific concepts. My work has been featured in a wide variety of textbooks published by many of the major publishers.

After a while I decided that I wanted to do a wider diversity of projects. My work now focuses on the visual communication of science, with a direct application to science research or education. I work with scientists, educators, publishers, and science companies. I love to visually explain concepts and show how processes work. Most of my recent work involves drawing procedures, equipment (microscopes, thermocyclers, centrifuges, etc.), and hands holding equipment. Being a biologist, I also love drawing animals and plants. I consider myself to be a generalist. I am interested in illustrating the entire range of scientific subjects and I enjoy using different types of media. I find inspiration from many different industries such as industrial design, architecture, comic books, and concept art.

Adobe Illustrator® is my main tool for most illustration projects; I also regularly use Adobe Photoshop® and Corel Painter®. But most of my illustrations start with hand-drawn sketches; I love sketching with mechanical pencils and Copic® markers. Occasionally I create finished illustrations with graphite, ink, colored pencil, and watercolor, but the majority of my finished, professional work is digital.

I'm the President, Project Manager, and Scientific Illustrator for my company, *Science Lab Studios Inc.* It began as a scientific illustration business but has since expanded to offer a wider range of science communication services. It's now a company that offers publishing services, scientific illustration, logo and graphic design, and science merchandise. Besides illustrating, I have grown to really enjoy the strategy and project management aspects of running a business. I enjoy large projects in which scientific illustration is one part. In the beginning I was doing everything myself. But I quickly learned that the

Figure 4: Hemacytometer. Adobe Illustrator. © 2009 Science Lab Studios, Inc.



projects I was interested in were too much for one person. Now I regularly hire other creative professionals, often people who have skills that I don't. I like collaborating with people who have different expertise such as scientists, educators, designers, artists, and entrepreneurs. I often hire other GNSI members to work on projects. I've also had students do internships with my company.

Over the past few months I've been working with Embi Tec, a company that makes innovative lab equipment for research and education. I've been creating illustrated protocols for their MiniOne lab kits. It's been a really fun project! Here are a few of the other projects that have my interest at the moment: working with an ecology professor on an environmental science comic book, a variety of custom lab manual projects, figures for research publications, as well as logo designs for labs and businesses. I'm also working with a t-shirt company to create a brand of science shirts.

There are many projects I want to pursue in the future. I have a lot of ideas for different publishing projects. I dabble in animation and 3D illustration. Product design and 3D printing are areas I may get into. I'd really like to do more concept art and infographics work too.

You can see more of my illustration work at *simonsonillustration.com* and what my company does at *scilabstudiosinc.com*. If you are a freelancer looking for more work or a student wanting an internship, feel free to contact me at *rick@scilabstudios.com*. Maybe we can work on a project together!

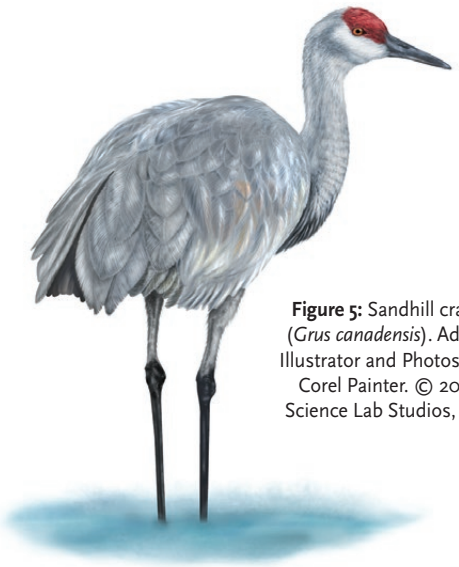


Figure 5: Sandhill crane (*Grus canadensis*). Adobe Illustrator and Photoshop, Corel Painter. © 2012 Science Lab Studios, Inc.

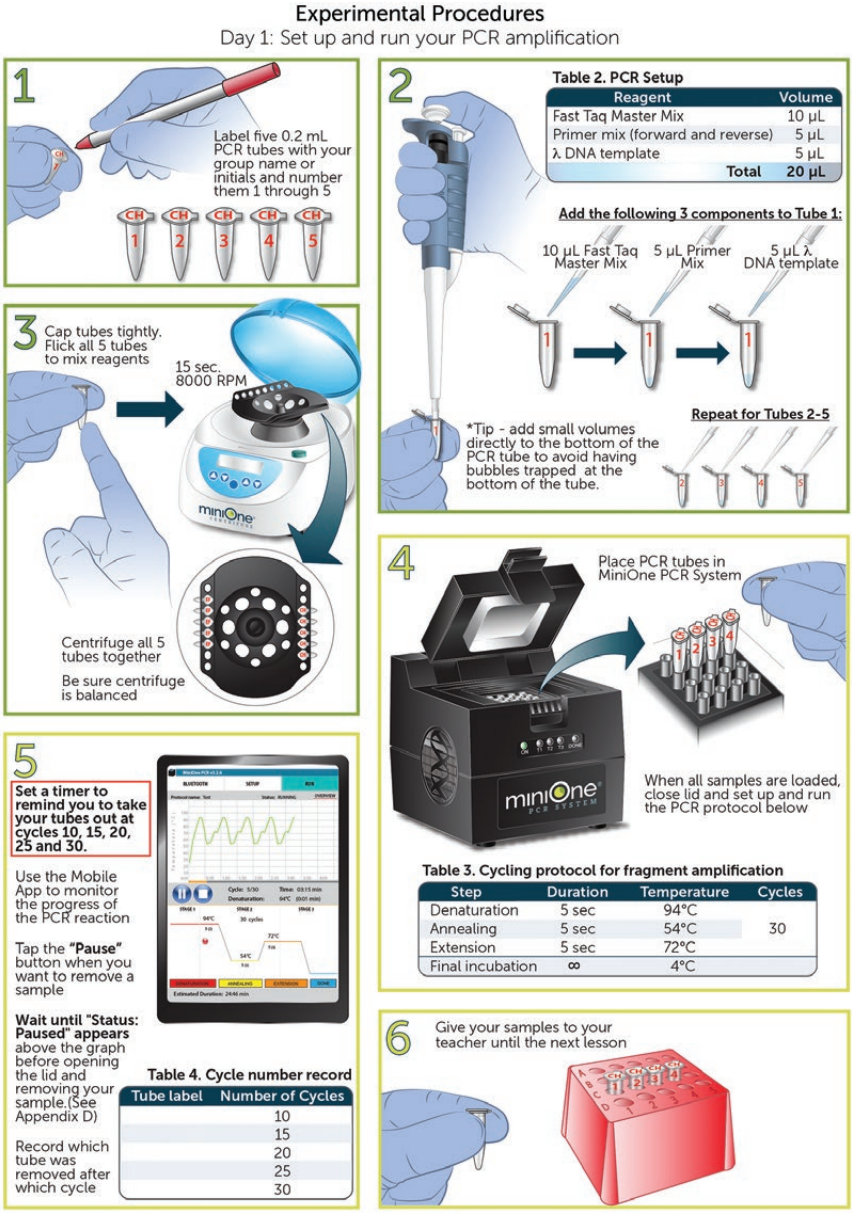


Figure 6: (*above*) PCR Cycle Count Day 1 Experimental Procedure. Adobe Illustrator. © 2019 Embi Tec

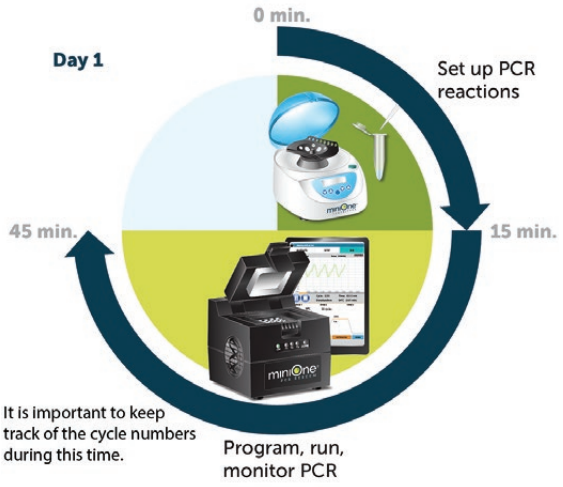


Figure 7: (*left*) PCR Cycle Count Day 1 Experimental Timing. Adobe Illustrator. © 2019 Embi Tec

Nest. Gouache on hot press watercolor paper, 300 lb. © 2019 Amy Koehler

Plumage of the Little Blue Heron (*Egretta caerulea*). Colored pencil on dura-lene. © 2019 Deanna Derosia

CSUMB Final Portfolio Exhibit

— Elena Hartley and Stephanie Kinkel

The Pacific Grove Museum of Natural History buzzed with excitement on Friday, May 3, as attendees celebrated the annual opening of this year's Illustrating Nature exhibit.

The show, which ran through June 16th, 2019, featured work from students in the Science Illustration Certificate Program at California State University, Monterey Bay (CSUMB). In its tenth year at the museum, this carefully curated exhibit included infographics, paintings, maquettes, conceptual illustrations, and field sketches created by the 15 members of this year's cohort.

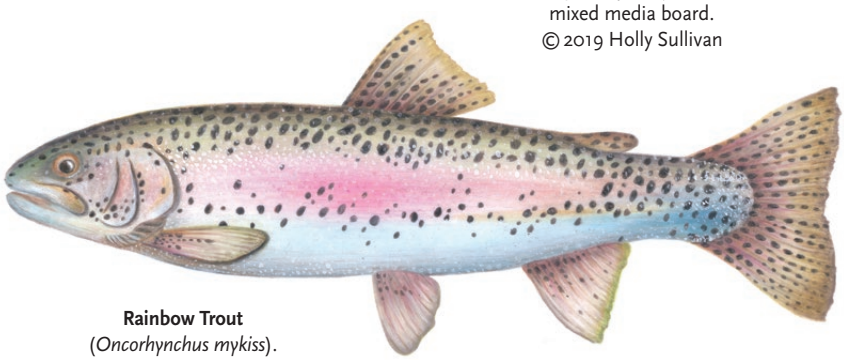
During their first meeting in late September of 2018, the students enthusiastically revealed their eclectic interests in rocks, plants, microbial life, turtles, fungi, jellyfish, conservation, and yes—dinosaurs. Gelling nearly immediately, the group collaborated extensively to study techniques ranging from graphite to gouache. Enrolled in courses such as field sketching, zoological and botanical illustration, and digital media, these students came away from the program with a truly varied toolkit to convey their particular passions. Their works, while beautiful and compelling, are designed to increase scientific literacy and tell visual stories.

A hallmark of this intensive, year-long program is the quality of instruction. Amadeo Bachar, Ann Caudle, Andrea Dingeldein, Jane Kim, and Jenny Keller are experienced illustrators and educators who provide ample opportunities for growth and creativity. In addition to the fervent commitment from full-time professors, visits from guest speakers further advance students' understanding of the field. A children' s book illustrator, full-time freelancer, journal editor, copyright lawyer, sculptor, and others help round out students' understanding of how to build a business with their newly honed skills.

As summer began, students moved beyond the campus to satisfy program requirements by completing ten-week internships. Whether working at the Smithsonian in DC, a vineyard in Paso Robles, or with NOAA in Hawaii, the opportunities are as diverse as the individuals themselves. As evidenced in their exhibit, the styles and subjects of each student retain their individual aesthetics and sense of wonder at the natural world.

SPECIAL THANKS
to the CSUMB College of Science and the College of Extended Education and International Programs, as well as the Pacific Grove Museum of Natural History for their support of and steadfast commitment to the program.

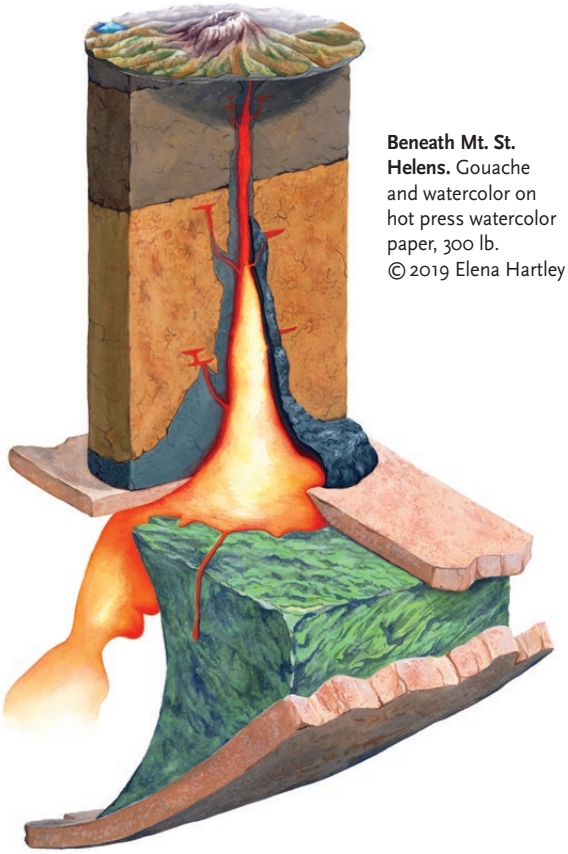
Crow Funeral. American Crow (*Corvus brachyrhynchos*). Acrylic on mixed media board. © 2019 Holly Sullivan



Rainbow Trout (*Oncorhynchus mykiss*). Colored pencil on dura-lene. © 2019 Anisha Parekh

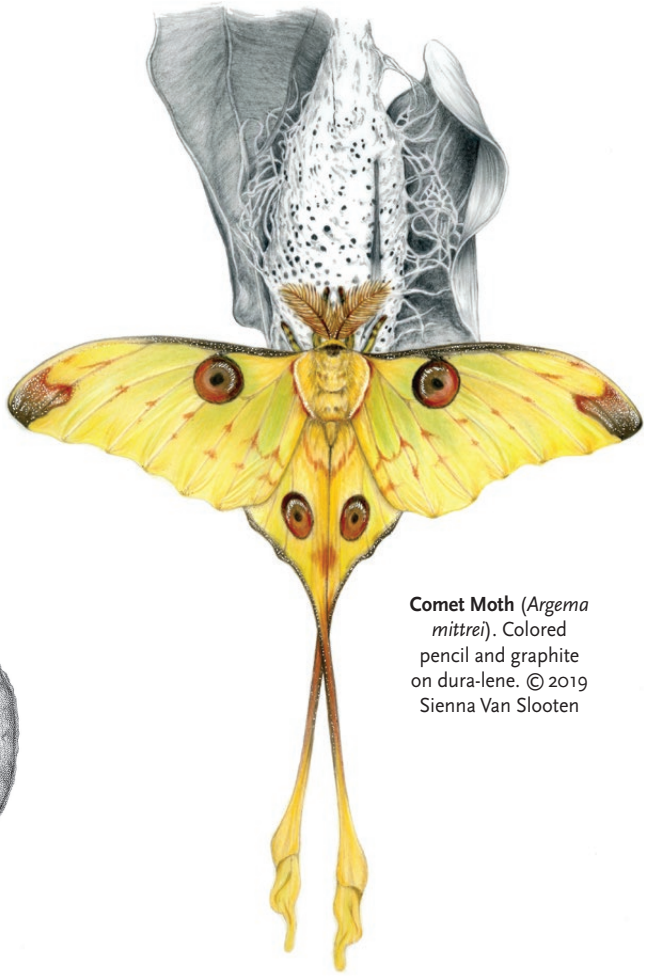
Coastal Collection. Gouache on hot press watercolor paper. © 2019 Stephanie Kinkel

California Tidepools. Green sea anemone (*Anthopleura xanthogrammica*), ochre seastar (*Pisaster ochraceus*), leather chiton (*Katharina tunicate*), lined chiton (*Tonicella lineata*), red nudibranch (*Rostanga elandsia*), tidepool sculpin (*Oligocottus maculosus*), blue mussel (*Mytilus edulis*), rockweed (*Fucus* sp.), eel grass (*Zostera* sp.), red abalone (*Haliotis rufescens*), black abalone (*Haliotis cracherodii*). Colored pencil on hot press watercolor paper, 300 lb. © 2019 Nick Bezio

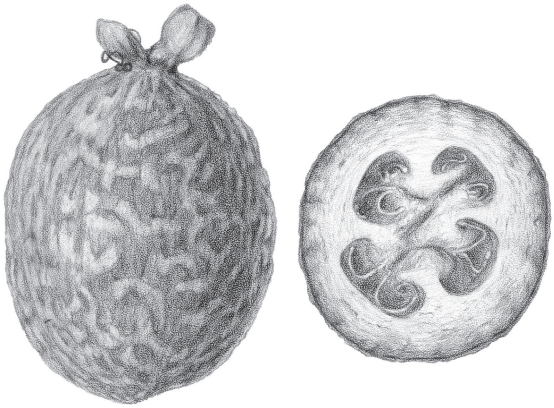


Beneath Mt. St. Helens. Gouache and watercolor on hot press watercolor paper, 300 lb. © 2019 Elena Hartley

Purple Striped Jellyfish (*Chrysaora colorata*). Ink and engraving on scratchboard. © 2019 Adina Blackwood



Comet Moth (*Argema mittrei*). Colored pencil and graphite on dura-lene. © 2019 Sienna Van Slooten



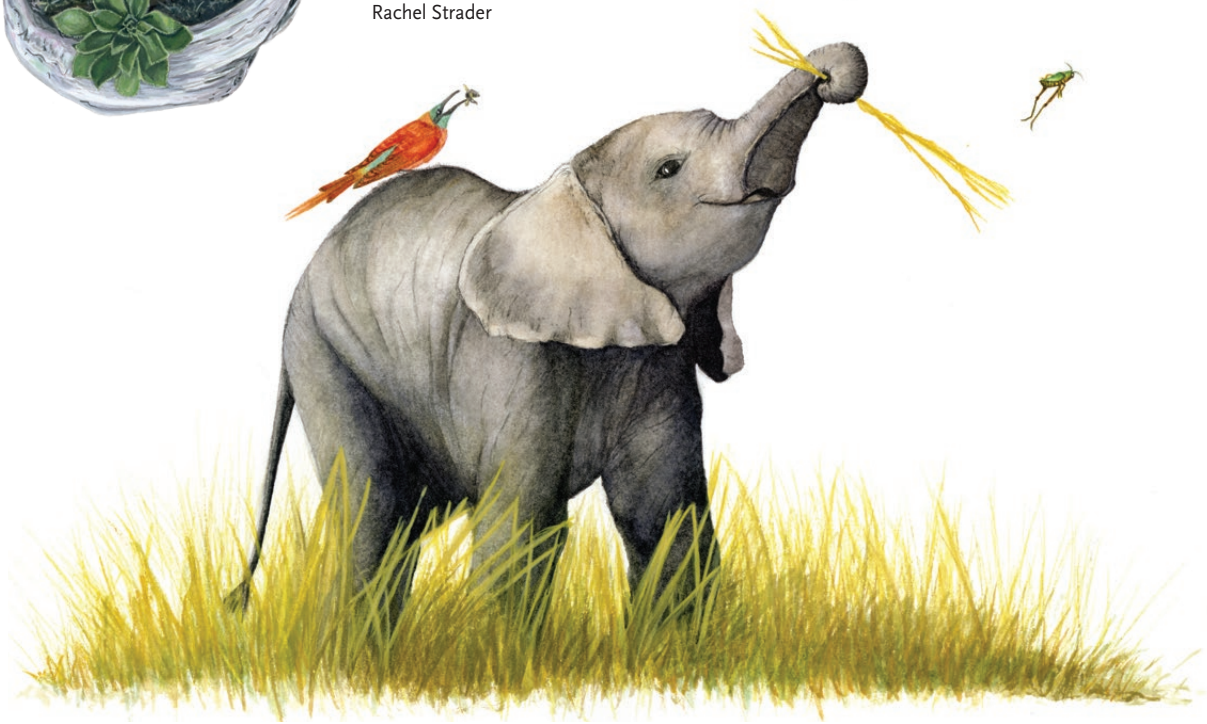
Feijoa. Pineapple guava (*Acca sellowiana*). Colored pencil on coquille board. © 2019 Molly B. Wise

(*left*) **Phainopepla in Mistletoe.** Phainopepla (*Phainopepla nitens*), and mistletoe (*Phoradendron californicum*). Watercolor on cold press watercolor paper, 140 lb. © 2019 Nicholas Wilson

(*right*) **What We Leave Behind.** Gouache on hot press watercolor paper, 140 lb. © 2019 Emily Matteson

Development of Flight. Velociraptor (*Velociraptor mongoliensis*), microraptor (*Microraptor gui*), and European bee eater (*Merops apiaster*). Pen and ink on bristol board. © 2019 Rob Soto

Coastal Centerpiece: Succulents and Abalone. Assorted succulents and abalone (*Haliotis* sp.) Gouache on hot press watercolor paper, 300 lb. © 2019 Rachel Strader



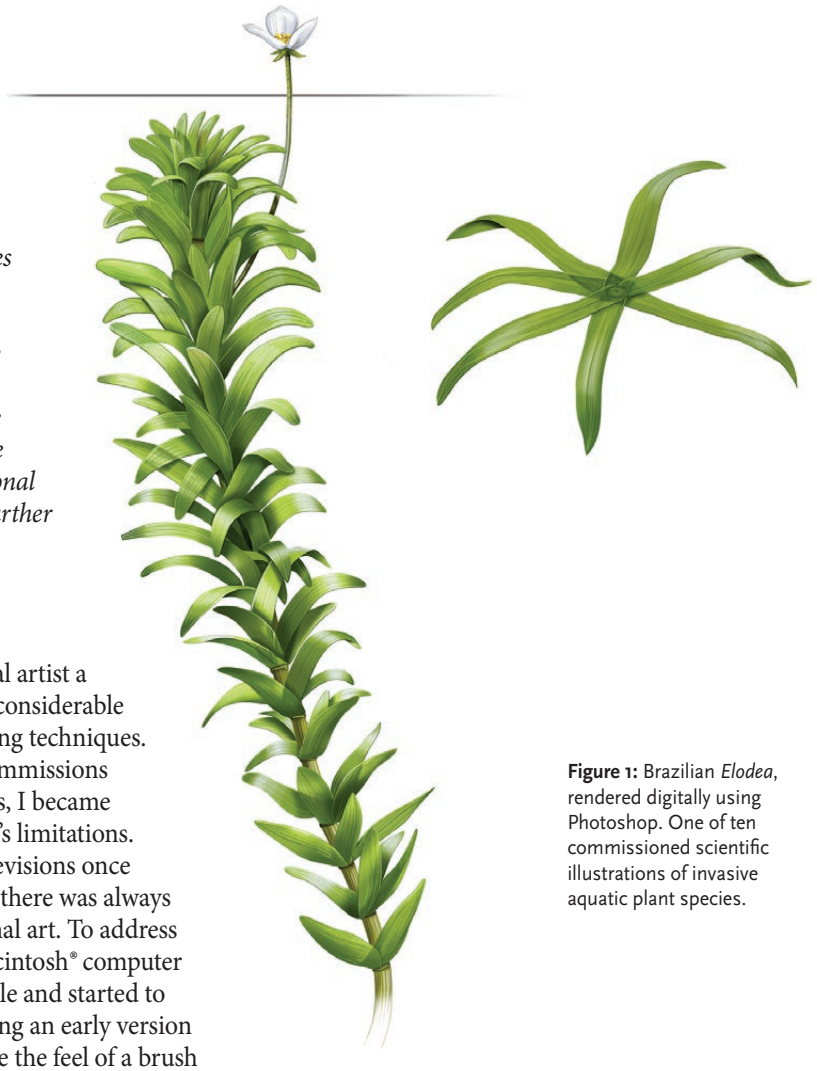
Opportunistic Behaviors. African bush elephant (*Loxodonta africana*) and carmine bee-eaters (*Merops nubicoides*). Watercolor and gouache on hot press watercolor paper, 300 lb. © 2019 Jess Soriano

DID YOU KNOW...
CSUMB also offers summer classes in science illustration? These skills enrichment classes are open to all experience levels. Visit ***csumb.edu/scienceillustration*** to find out more!

Michigan Invasive Aquatic Species

— *Bruce Kerr*

*Traditional media techniques can be adapted for use in digital media to create a rich, varied texture that can be duplicated in print as well as electronic media. The techniques shown here, as applied to a recent commission (*Figure 1*), were originally developed while working as a commercial and scientific illustrator. This article will attempt to provide a bridge between the digital and traditional worlds for those interested in further exploring the digital medium.*



All art created by Bruce Kerr, © MDEQ

Figure 1: Brazilian *Elodea*, rendered digitally using Photoshop. One of ten commissioned scientific illustrations of invasive aquatic plant species.

ARTIST BACKGROUND

While working as a commercial artist a number of years ago, I gained considerable experience in airbrush rendering techniques. After completing a series of commissions under duress to meet deadlines, I became painfully aware of the medium's limitations. It was often difficult to make revisions once the final art was initiated. Plus there was always the risk of damaging the original art. To address these concerns, I bought a Macintosh® computer when they first became available and started to experiment, eventually acquiring an early version of a digitizing tablet to replicate the feel of a brush or pen rather than a mouse. As computers improved in processing speed, I upgraded my system and eventually produced an illustration for publication completely on the computer. The client requested a change at the last minute, which I was able to turn around much more quickly and easily than using an airbrush, with the end results being indistinguishable. Though I continue to this day to work in a variety of traditional media, it was at that point for me that the computer supplanted the airbrush.

OVERVIEW

Recently, I was commissioned to create ten scientific illustrations of invasive aquatic plant species for use in promoting public awareness and training in the state of Michigan. A lack of high quality photos and/or illustrations and a desire for a consistent style across all of the species initiated the project. Another key consideration was the variety of output formats for the final art, both for digital distribution and for printed posters, billboards, and handouts. Given the breadth of media, I chose to create the illustrations digitally to control the colors as much as possible and provide maximum flexibility to manage changes that might arise over the course of the three-month timeframe.

TECHNICAL CONSIDERATIONS AND TOOLS

When considering color gamut, I chose Adobe Acrobat's® RGB 1998 as it had the greatest color range and was compliant with the greatest number of digital authoring and output platforms. To create the artwork, a Wacom Cintiq® drawing tablet was employed as it affords a more realistic drawing feel than a traditional drawing tablet where the drawing hand is disconnected from the image on the screen.

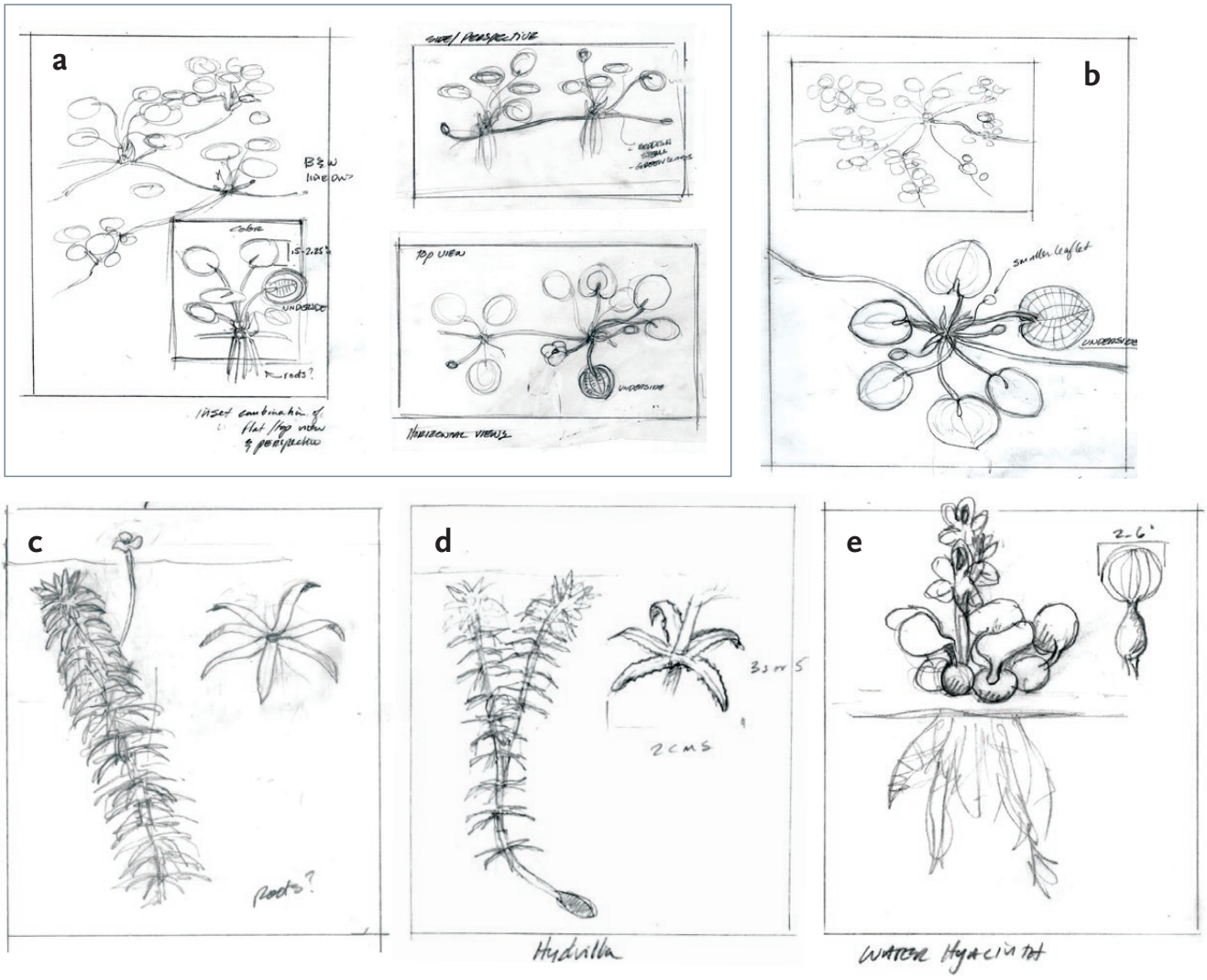


Figure 2 (*a*) Thumbnail sketches of various views sent to the client for review. (*b*) Detailed sketch of the approved view showing composition. (*c–e*) Composition sketches.

Additionally, the stylus is touch- and tilt-sensitive and includes a variety of tools to enhance workflow. Other tools included a basic HP® desktop scanner, an HP 600 DPI color laser printer and a Spyder5® Pro color calibration tool used to measure the color accuracy of my monitors. This last component was critical to ensure photo reference, color palettes, and artwork all matched as closely as possible. My workstation is a basic HP Pavilion Laptop with an Intel® i3 processor maxed out with 16GB of RAM to give Photoshop® enough working memory. The computer is complemented with a wireless mouse and keyboard for better access to keyboard shortcuts which are critical to working quickly and an additional 24" monitor for viewing work at a larger scale than the Wacom tablet could afford. For backup purposes, a 1TB external USB drive was used on a daily basis. Google Docs was used for additional storage while providing the client easy access to all work, finished or in-progress.

ILLUSTRATION CREATION PROCESS

The client provided two to three defining characteristics for each plant which were used to start thumbnails. At the time of project initiation, only a few of the species were found in scattered locations across the state, so all of the references were photographic. To confirm accuracy, pencil sketches and completed illustrations were shared with environmental monitoring groups within the state, a county conservation district, as well as a conservation expert in Canada. I am also familiar with a number of the plants, as they are unfortunately readily available in local plant nurseries or local aquarium shops.

Armed with my references, I created a set of thumbnails using a Number 2 pencil on tracing paper for one of the species (*Figure 2*). These were scanned and PDFs sent to the client for review.

Once a decision was made regarding side or top views, thumbnails of the main view and detailed insets demonstrating distinguishing characteristics were then created for the rest of the plants to ensure visual interest with composition and consistency. Many of the plants on the list bore a striking resemblance to native species, so quick field identification was important. Examples of these are shown in Figure 2 panels c, d, and e.

European Frogbit Illustration Process

Once all thumbnails were approved, the client and I agreed to take one species to final art to establish a base style and to make sure our working methods were in sync. European frogbit was chosen due to its recent discovery in small lakes in Michigan, making the artwork a higher priority than the others. A detailed graphite layout and a colored pencil study were completed and sent to the client (*Figure 3, panels a and b*).

COLOR PALETTE

Once the pencil sketch was completed, a color palette using a Pantone® swatch book with CMYK and RGB conversions was created. These swatches represented dark, medium, and light tones based upon photos from a variety of resources to ensure the colors fit in the range of normal colors expressed by the plant in a variety of environments. These would be starting points for custom palettes for each of the plants.

All colors were stored in Photoshop's Library feature, which allows the user to share palettes between illustrations. Figure 3 panel c shows what the palette looked like after doing several illustrations, adding colors as needed.

At this point, I also completed one frogbit leaf using the palette I had created to make sure everything was working as expected (*Figure 3, panel d*).

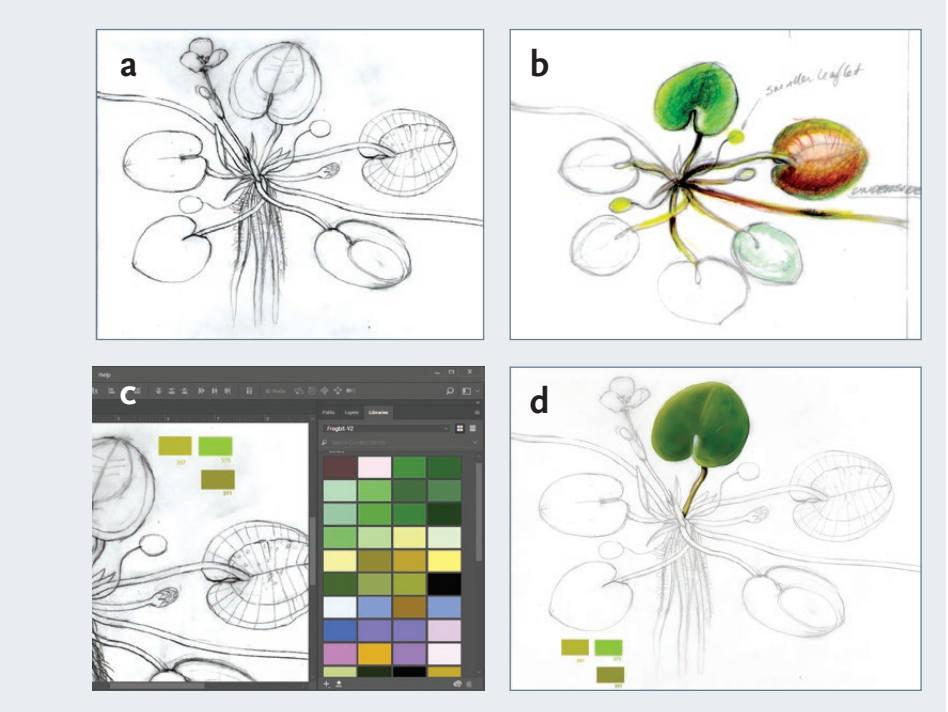


Figure 3: (*below*) (*a*) Detailed graphite sketch. (*b*) Color pencil study. (*c*) Color palette with saved colors after several completed illustrations. (*d*) Completed color on one frogbit leaf.

CUSTOM BRUSH CREATION

A set of custom brushes were created, which were stored in a library to be used across all ten illustrations. Brushes were developed to create random patterns, simulate texture, spraying in masses of color, or adding detail.

One of the species, water lettuce, featured suede-like hairs on the surface of its leaves, requiring the creation of a custom brush. I started by creating several brush strokes freehand in Photoshop (*Figure 4, panel a*). Once I found patterns I felt worked, I selected a grouping with the cursor tool (*Figure 4, panel b*). Clicking on the Edit menu at the top of the screen, and I chose Define Brush Preset (*Figure 4, panel c*). Within the Brush Preset window, I then chose Angle Jitter to rotate the images as I applied them, giving the texture a more random appearance (*Figure 5, panel a*). The final inset art is shown in Figure 5, panel b.

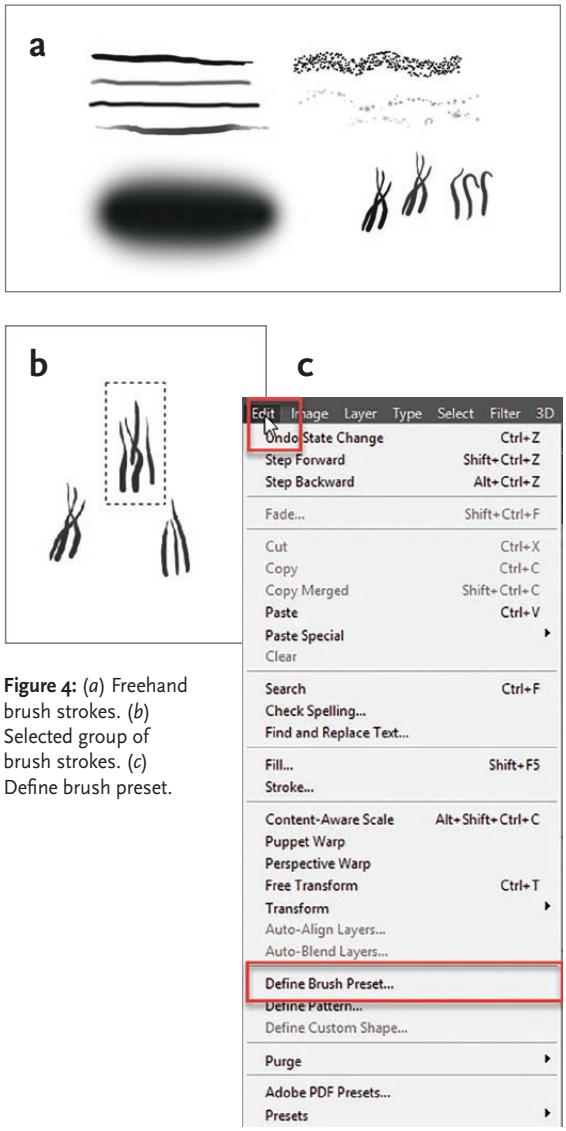
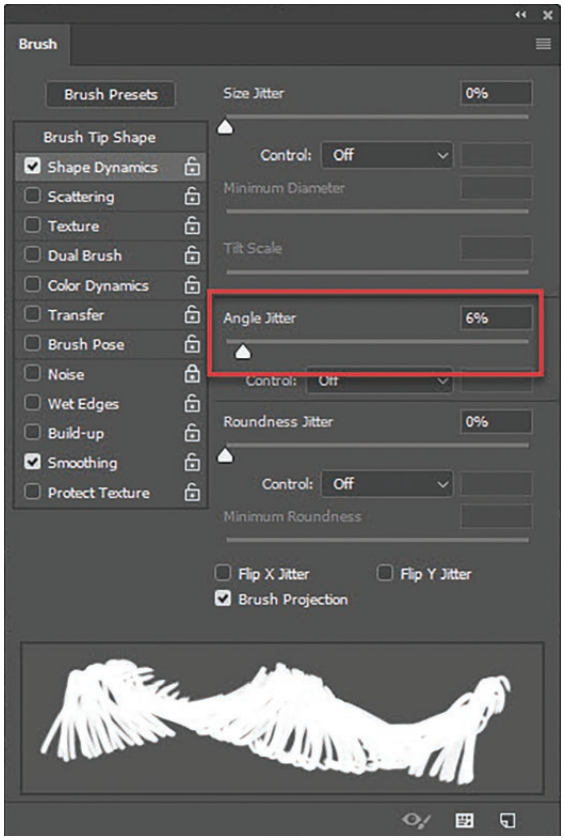


Figure 4: (*a*) Freehand brush strokes. (*b*) Selected group of brush strokes. (*c*) Define brush preset.



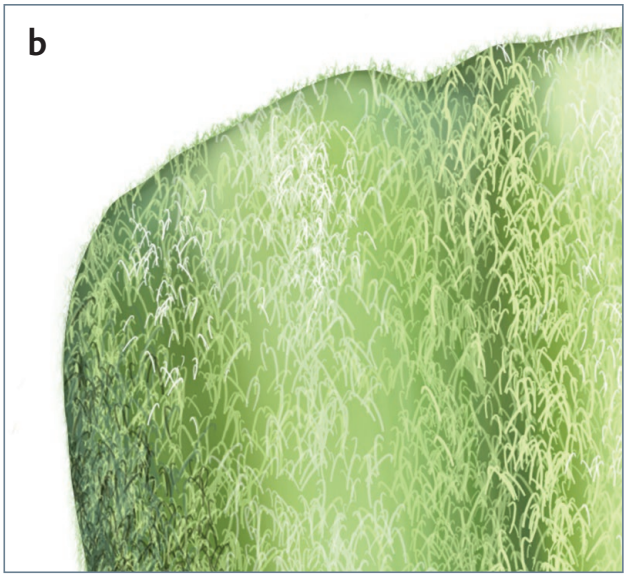
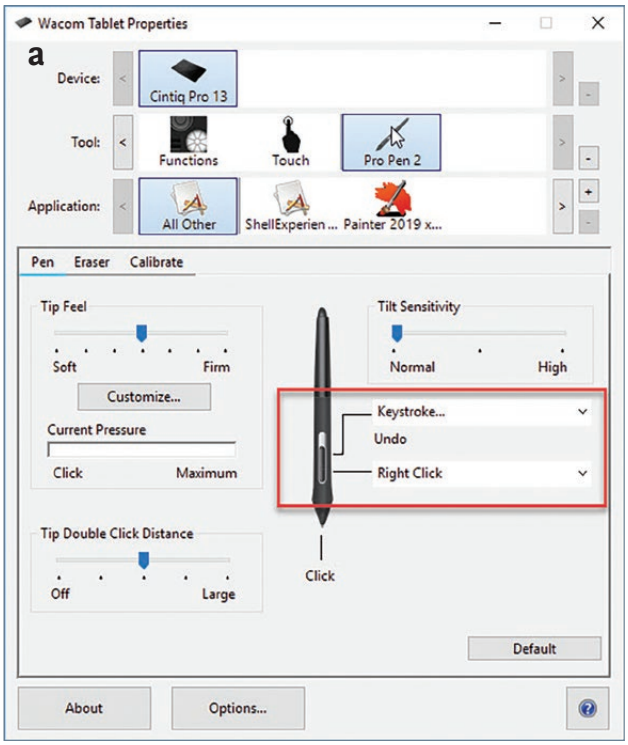


Figure 5: (*a*) Angle Jitter selected. (*b*) Final leaf texture.



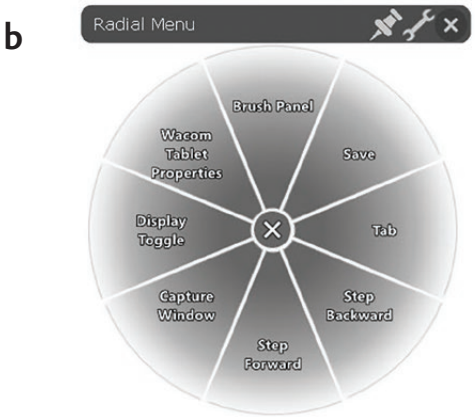


Figure 6: (*a*) Wacom setup menu. (*b*) Wacom radial menu.

WACOM WORKFLOW

One final step before proceeding further was to set the Wacom Cintiq workflow for maximum efficiency. The stylus has two buttons which are assignable. The front button was set to display my brush palette, and the back button to the Photoshop keyboard shortcut for multiple levels of undo (Ctrl + Alt + Z). This flexibility allows me to try multiple solutions, saving them as I go onto a new layer or erasing several strokes back to the original state. The Wacom stylus also has an erase button, located at top end of the tool, per a traditional pencil eraser. Keyboard shortcuts also allowed me to quickly choose varying levels of erasing intensity for this tool, as well as paint opacity for the brushes. Figure 6 shows (*a*) screen captures of the Wacom setup menu and (*b*) an example of the radial menu which appears on the screen for easy access to a variety of choices as needed while working. Learning to "paint" digitally with two hands—one hand on the stylus and the other on the keyboard to access Photoshop shortcuts—speeds up productivity considerably.

ARTWORK CREATION

After establishing the workflows, a set of layers was created for each of the main sections of a particular structure: one for the main color, one for color modification such as darks or lights, and a third layer for details. All the layers that pertain to a particular

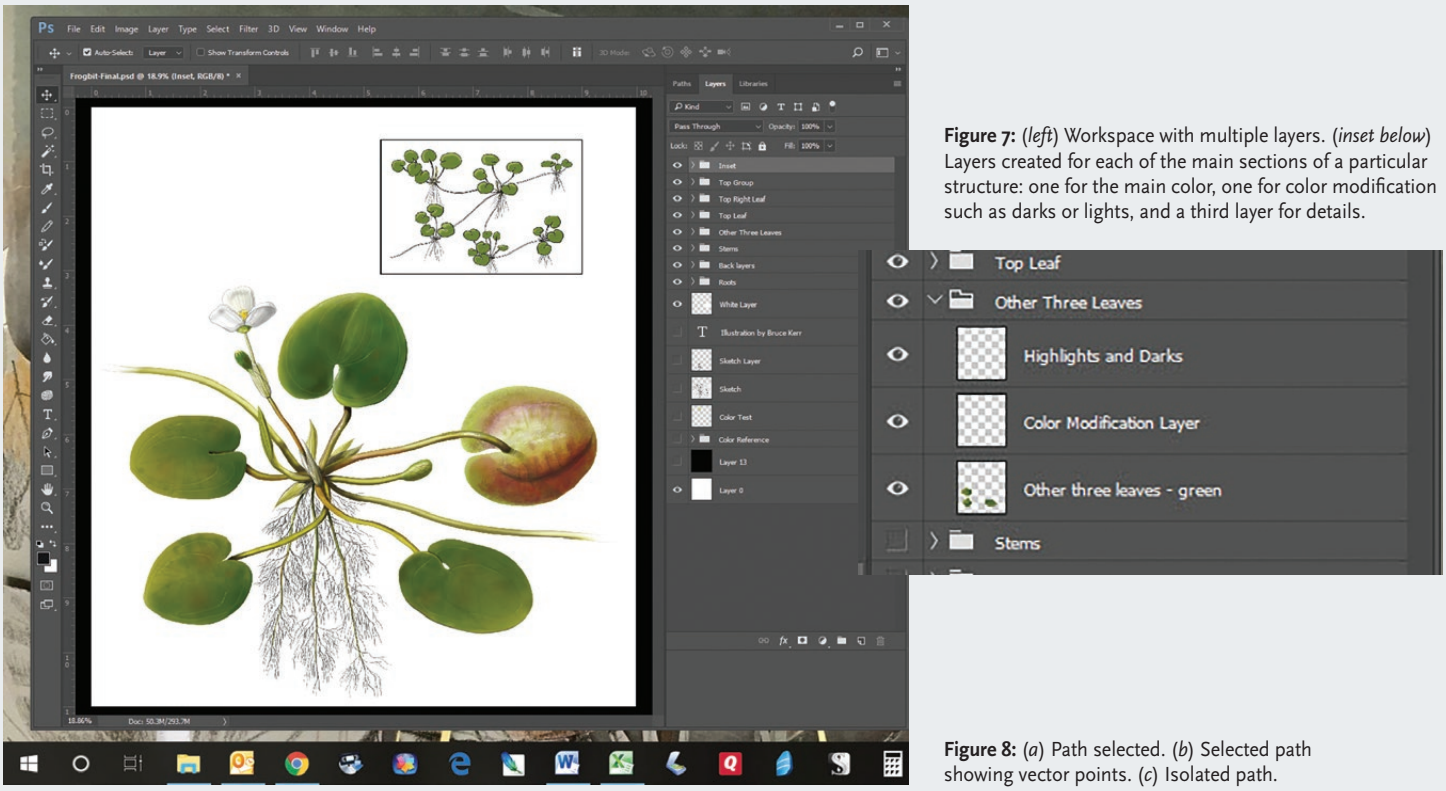


Figure 7: (*left*) Workspace with multiple layers. (*inset below*) Layers created for each of the main sections of a particular structure: one for the main color, one for color modification such as darks or lights, and a third layer for details.

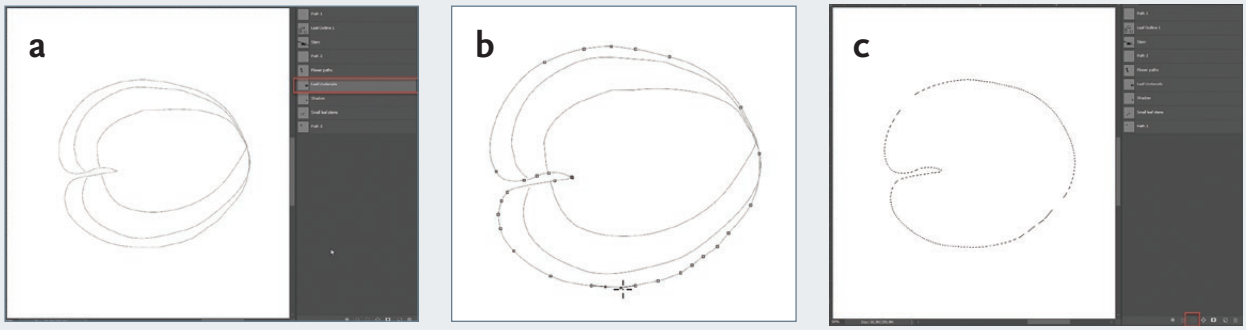


Figure 8: (*a*) Path selected. (*b*) Selected path showing vector points. (*c*) Isolated path.

structure or grouping of structures are placed into a folder and named for that particular structure (*Figure 7*).

USING DIGITAL STENCILS

When I used a traditional airbrush in the past, one technique that I employed for rendering sharp edges called for the use of a self-adhesive waterproof frisket film into which holes were cut to control where the paint would be applied. The process began with a detailed pencil drawing being transferred onto illustration board over which a sheet of frisket would be placed. Each of the areas in which color is to be sprayed is cut out using a razor knife, creating a stencil. Completing the artwork requires lifting the stencils, spraying paint into the exposed areas, and replacing them once the paint had dried. This process can be a very time-consuming and painstaking process with some extremely detailed illustrations requiring manipulating many small pieces of frisket.

Though the technique in Photoshop is similar, the process of saving and activating stencils is much quicker and the stencils themselves stay in place, eliminating color leaks. And with the ability to undo multiple layers of action, a much smaller number of stencils are required to capture the same effect.

To create a stencil, I start by using the Path tool, drawing around a particular shape and then saving it as a vector outline. This digital stencil is very flexible in that it can be used for a number of purposes, such as creating positive or negative masks, locally controlling color modification tools, as well as combining with other masks to cover larger areas. I create all of my paths at the same time for working efficiency.

To access a particular path, I click on its title in the Path box (*Figure 8, panel a*). (*b*) Using the Arrow tool, I then choose the outline I want to use as a stencil. A path can contain any number of outlines so I choose

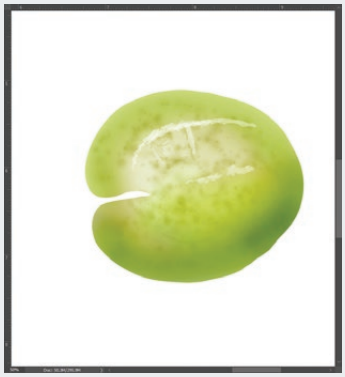


Figure 9: With the mask activated, the leaf was then rendered by applying flat color while leaving some paper white.

Figure 10: I then added another layer in which I used a texture tool to add a mottled red to simulate the underside of the leaf.

Figure 11: Shadowing and highlights created the appearance of a thickening of the leaf, which acts as a float.

Figure 12: A stem was added with a slight shadow to set it off from the rest of the leaf.

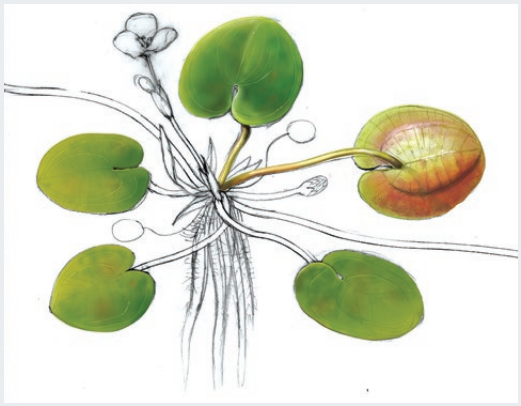


Figure 13: The other leaves were then rendered.

Figure 14: All the stems were rendered.

Figure 15: Flower and stalk were rendered using paths to control the edge.

to group them by a particular shape. The selected path displays the control points. (*c*) The mask is then activated by clicking the selection icon at the bottom of the Path window.

With the mask activated, the leaf was then rendered by applying flat color while leaving some paper white (*Figure 9*). Due to the Cintiq's limited size, I would often work on a structure in isolation, zooming out or turning on layers around it to judge color. This was another reason why my color palettes and brushes were established early in the project so that I knew colors and textures were consistent without stopping to compare them. I then added another layer in which I used a texture tool to add a mottled red to simulate the underside of the leaf (*Figure 10*). Shadowing and highlights created the appearance of a thickening of the leaf, which acts as a float (*Figure 11*). A stem was added with a slight shadow to set it off from the rest of the leaf (*Figure 12*). The other leaves were then rendered (*Figure 13*). All the stems were rendered (*Figure 14*). The flower and stalk were rendered using Paths to control the edge (*Figure 15*) while the roots and other details were rendered freehand (*Figure 16*).

Once all the main sections were painted, the entire piece was reviewed and detailed to completion. An inset was added to show the connective nature of these plants, which create large mats of vegetation that overwhelm native species.

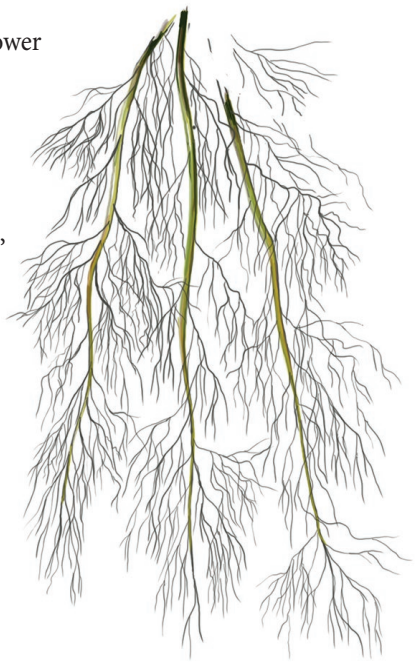


Figure 16: Roots and other details were rendered freehand.

Final Illustration with Inset

PROOFING AND FILE CONVERSION

I printed the final file to a color laser printer that had been calibrated to ensure color accuracy. A supplemental black background (*Figure 17*) helped me to prepare for conversion of the file to JPEG and PNG formats, the latter of which required a transparent background. The black works as a key color to knock out the background as the file is converted. An added bonus is that the black revealed overspray or areas that needed to have white placed behind it to increase the density of the color.

Once this stage was completed, the final Photoshop file was posted online with the digital versions and the illustration was considered completed (*Figure 18*).

OTHER CHALLENGES

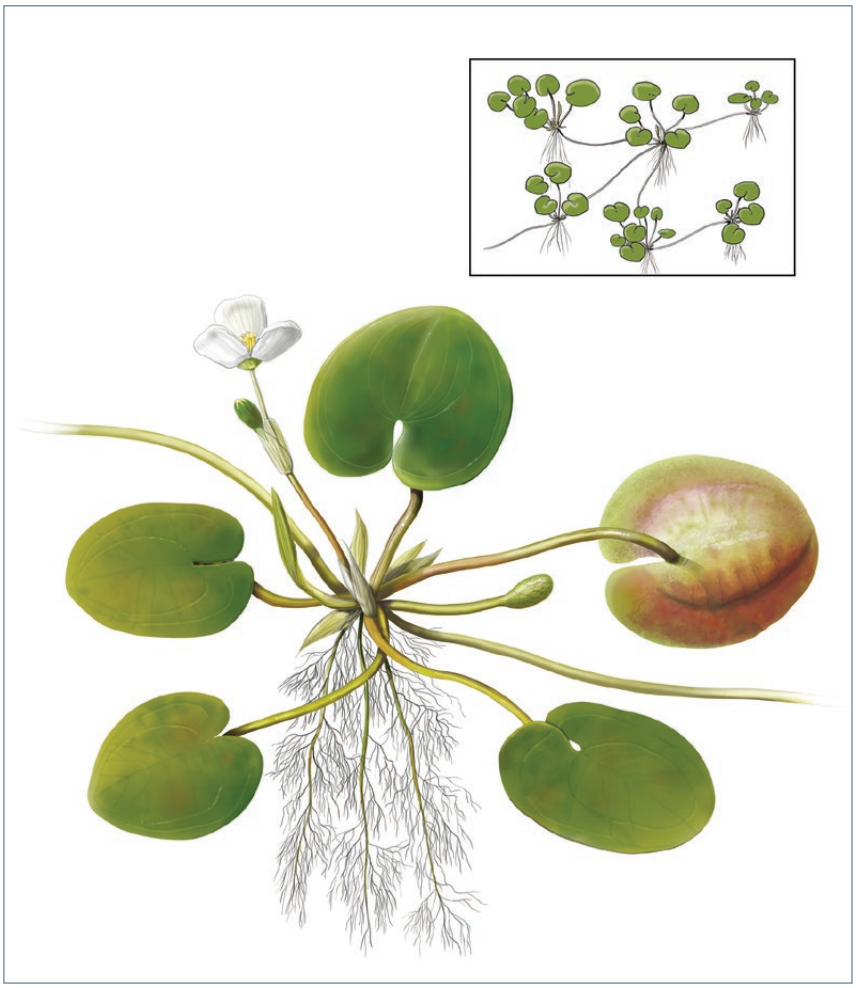
I used the process detailed previously for all the plants except for the Brazilian *Elodea*, which presented a different challenge in that the multiple leaf forms would require too many masks and layers. As a result I chose to create a stencil outline for each leaf as I went, rendering everything on one layer (*Figure 19*).

The end result of this effort was a series of digital illustrations that represented a traditional media style while providing ease of workflow and the ability to output to a wide variety of media. Any edits that were requested were easily accommodated and fit with the final style due to the consistency of color and brush stroke.

Figure 17: (*below*) Black background used to prepare file for conversion to JPEG and PNG.

Figure 18: (*below right*) Final illustration of European frogbit.

Figure 19: (*above*) Brazilian *Elodea*.



ABOUT THE AUTHOR: Over the course of his varied career, Bruce Kerr has worked as an industrial designer, an owner of an award-winning graphic design and multimedia studio, and a volunteer diver at a nationally-recognized aquarium. He also has experience as a manager of an in-house multimedia group that he started for an internationally-recognized biopharmaceutical company. His work has been used in publications, interpretive centers, museums, and research firms throughout the country. Bruce is versatile in a number of media including graphite, oil, watercolor, acrylic, and digital rendering. His current work focuses on representing underwater landscapes in oil and watercolor, as well as paper sculpture. For more examples of his work, visit *www.brucekerrart.com*.

Pop-Up Gift Cards

— *Sally Cox, GNSI Great Plains Chapter*

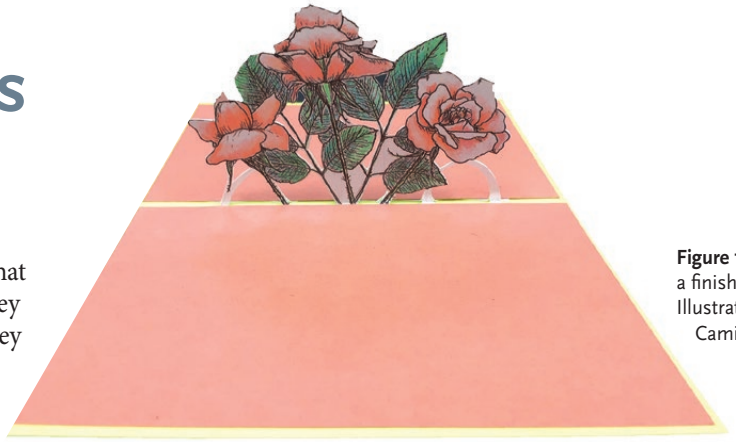


Figure 1: An example of a finished pop-up card. Illustration of roses © 2019 Camille Werther

Pop-up cards are unique forms of paper arts that utilize elements of 3D paper architecture. They make excellent gifts for special occasions, and they could be impressive as promotional materials or proposals.

Two books by Masahiro Chatani inspired my interest in creating these unique art cards.[1] Masahiro Chatani was a Japanese architect (certified, first class) and professor considered to be the creator of origami architecture. From its development until his death in 2008, he was widely acknowledged to be the world's foremost origami architect.[2] After practicing his concepts, I wanted to use my own creations in a pop-up structure.

I photocopy, or scan and print my illustrations to create a double-sided design. I use cardstock, decorative papers, scissors, and/or craft knives, a folding bone or butter knife, and glue sticks. I also use a heavy book for a weight to press the card after it's been glued.

Two terms to know are mountain fold and valley fold. Think of the letter W: it has two valley folds, and a mountain fold in the middle. The pop-up structure that I will share also has one mountain fold in the middle, and the two valley folds form the flaps that anchor the design.

For the Guild of Natural Science Illustrators, I thought some instructions could help our members create pop-up cards using their own work, for gift-giving. My thanks go to my associate, Camille Werther, who contributed the illustration of roses shown in this process.

PROCESS

First, observe what format your design will require. Is it in a landscape or portrait orientation? Second, place a mirrored copy of the design above the first copy, so the two images are head-to-head. Third, leave an inch or so below the bottom of the design to allow room for tabs that will be the support.

An 8.5" × 11" sheet of cardstock can be visually divided into quarters. Print or copy your image on the lower left quarter of the page. Place it so the top of the design almost touches the center of the page. If you have mirrored your image, the two images should meet at the fold head-to-head (*Figure 2, panels c and d*). The fold should allow the images to line up exactly on the front and back. You can cut

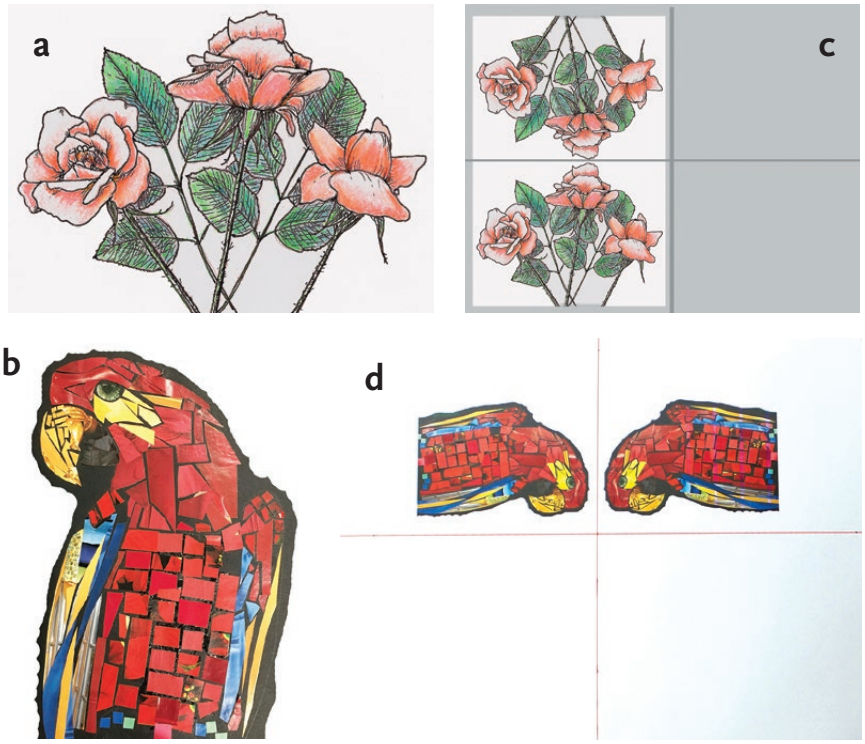


Figure 2: (*a*) Landscape orientation. (*b*) Portrait orientation. (*c*) Image placed on one half of the page and mirrored across the centerline. (*d*) Mirrored image with room at the bottom for tabs.

Footnotes

[1] "Pop-Up Gift Cards", and "Paper Magic: Pop-Up Paper Craft", ONDORI/ Japan Publications, Copyright 1988, ISBN 0-87040-768-6

[2] Wikipedia, https://en.wikipedia.org/wiki/Origamic_architecture

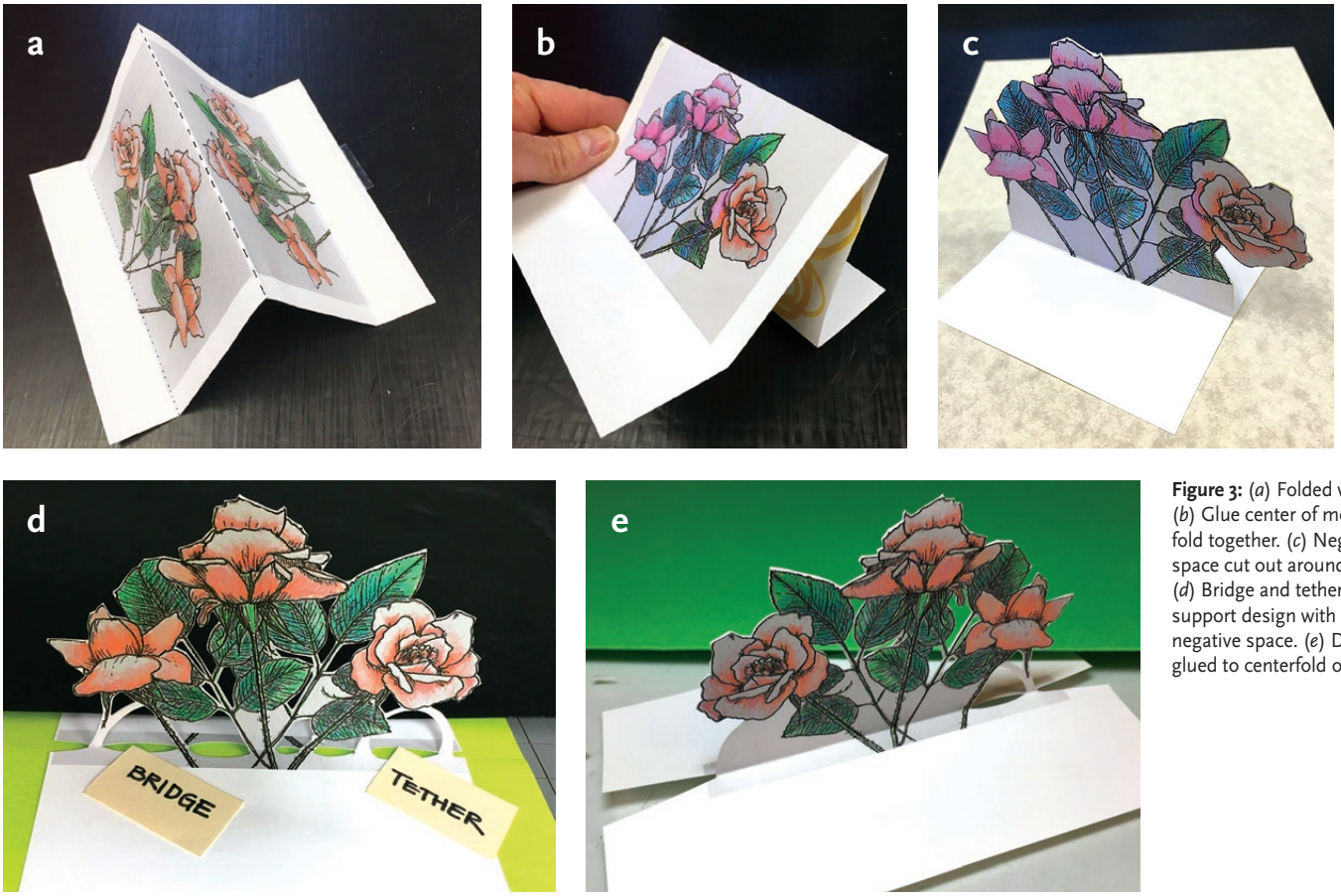


Figure 3: (*a*) Folded with tabs. (*b*) Glue center of mountain fold together. (*c*) Negative space cut out around flowers. (*d*) Bridge and tether used to support design with lots of negative space. (*e*) Design glued to centerfold of card.

off the right half of the cardstock and save it for the outside cover of the card or for another use.

Use a folding bone or butter knife, score a line horizontally where the fold should be, so it can easily be folded in half. Call this the mountain fold. Also score horizontal lines across the bottom of your design on both sides of the card. Call these the valley folds. The valley folds create tabs at the base (*Figure 3, panel a*).

Glue the inside of the mountain shape to create a double-sided design, but do not glue the tabs (*Figure 3, panel b*). Put a heavy weight on top for a few minutes. After the glue has dried a bit, you can trim around the design, saving a good stable base for the tabs (*Figure 3, panel c*).

If you wish to try an advanced technique, use an Xacto® knife or scalpel to cut out some negative space within the design. This works best when the design has been folded in half and glued. Keep plenty of contact at the base so the tabs will remain stable. If the design seems to need additional contact with the base, add bridges or tethers from the design, as shown (*Figure 3, panel d*).

Take the other half that you cut off of the cardstock, (or use a contrasting color of cardstock) and fold it in half to make a valley fold. Then glue the tabs of your design on either side of this centerfold (*Figure 3, panel e*).

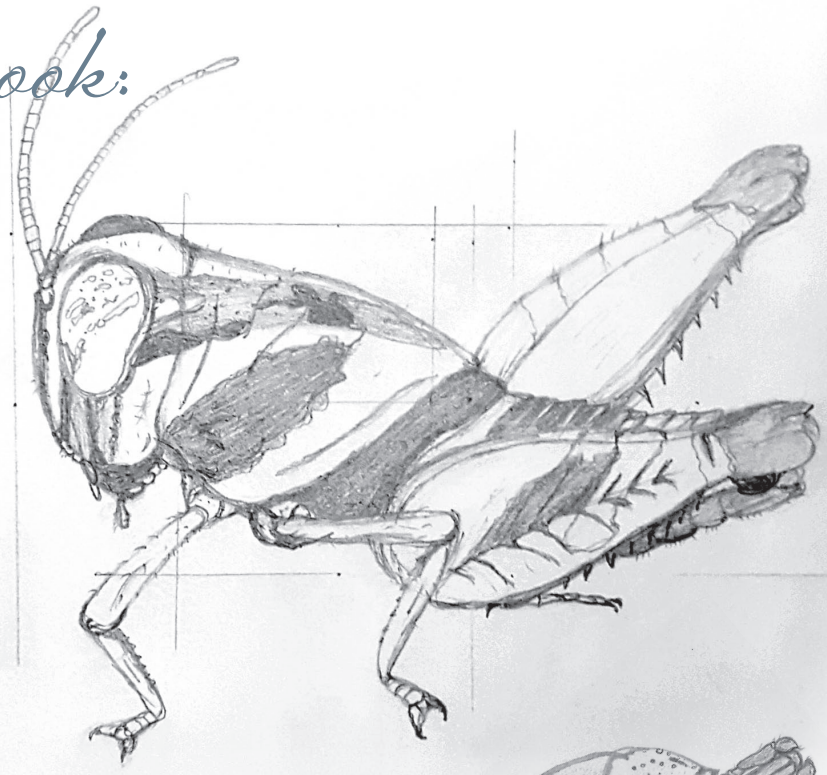
Using decorative papers, cut shapes to cover the tabs (*Figure 4*). Glue, place over tabs, fold card, and place weight on the card for a few minutes. You may also decorate the outside of the card.

Figure 4: Completed card example.

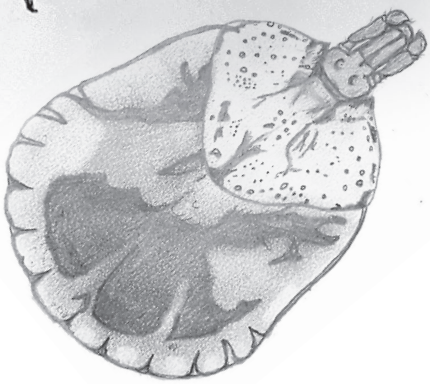
From the Sketchbook:
Entomology Illustration

David Nielsen is an Entomologist with the Nebraska Department of Agriculture (funded by the USDA) and the US Army. He enjoys illustrating insects and mites he collects from his work to showcase for others the variety that exists in nature.

Most of his work is for personal use, though he's used some illustrations for professional presentations and for taxonomic keys for state taxon. He's also used them as teaching aides when training soldiers on vector identification.

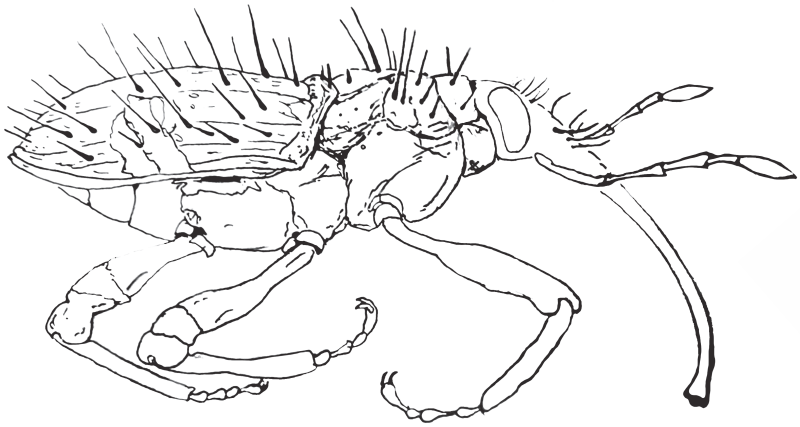


Spur-throated Aztec grasshopper (*Aidemona azteca*). David drew this sketch a few years back and later rendered it in watercolor.

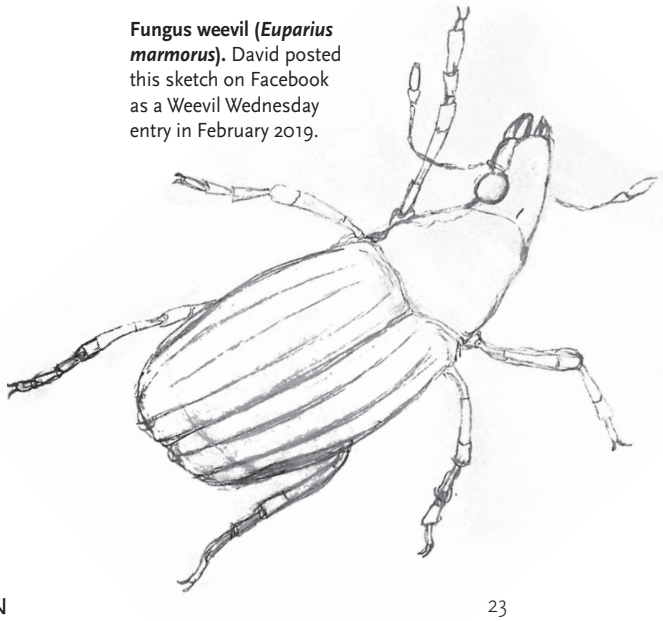


Cuban tick (*Amblyomna abipictum*). Drawn from a specimen sent from Cuba (shown unfinished).

Porcupine weevil (*Plocamus echidna*). (*top*) Finished illustration in acrylic and archival ink on mixed media paper. (*bottom*) Initial sketch.



Fungus weevil (*Euparius marmorus*). David posted this sketch on Facebook as a Weevil Wednesday entry in February 2019.



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