Journal of Natural Science Illustration

GUILD OF NATURAL SCIENCE ILLUSTRATORS

VOLUME 49 • NUMBER 2 • 2017

A Note From...

Gail Guth, GNSI Journal Co-Editor-In-Chief

GNSI members are absolutely the best! Of course we all know that already; but if you had any doubts, just settle in with a nice cup of coffee, glass of wine, or a cool iced tea and enjoy a visual stroll through this (or any!) issue of the Journal for confirmation. In this issue, we journey from exquisite digital and traditional illustrations to advanced digital modeling, to a recap of a long and successful illustration career, to the joys and challenges of a GNSI Education Series Workshop: inspiration and information abound.

Probably by the time you read this, the GNSI Annual Conference in Asheville, NC will be underway, or perhaps over. For those who are able to attend, the conferences are an amazing immersion experience into the company of the best science illustrators in the business: take your reading experience from the Journal, multiply that over and over, and you have a GNSI conference! In recent years, the talented conference teams have worked hard to harness the power of the internet and social media to open the conference to members who cannot attend in person. For the rest of the year, we hope these pages will continue that amazing GNSI experience and bring it right into your home or office.

Clara, Britt and I will see you in Asheville, where we are certain to twist your collective arms (ever so gently) for future articles; please don't hide in closets or dark hallways, or run off into the woods when we approach! If you aren't joining us in Asheville, consider your arms twisted right now. Send us your sketches and your article ideas and we will see if we can share your work with our greater GNSI Family!

Regards,

Gail Guth
guth-gnsi@comcast.net

GNSI Journal articles are peer-reviewed for scientific illustration techniques and skills.

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Cover: Musculoskeletal Anatomy of the Sport Horse (*Equus caballus*); digital, 9 x 12 inches; commissioned by Tufts Cummings School of Veterinary Medicine; © 2016 Natalya Zahn

GUILD OF NATURAL SCIENCE ILLUSTRATORS

The Guild of Natural Science Illustrators is a non-profit 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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GNSI JOURNAL STAFF:

Facial Makeover of a New Theropod Dinosaur

— *Dino Pulerà*

Final rendering of *Daspletosaurus horneri.*

Background and significance of discovery

Almost every week there seems to be a new dinosaur discovery, and the week of March 30th, 2017 was no exception. What makes this discovery different is that it not only proposed a rare mode of evolution but also suggested a whole new appearance for tyrannosaurs themselves. Carr et al. (2017) described a new theropod (bipedal meat-eating dinosaur) that was older than its famous cousin *Tyrannosaurus rex*. They named it *Daspletosaurus horneri*, (Horner's frightful lizard).

Found in the Two Medicine Formation in Montana, dating back to ~75.1 to 74.4 million years ago. *D. horneri*, was approximately 9 meters in length (~ 75% the length of *T. rex*). It existed about 8-9 million years before *T. rex* and only 100,000 years after its sister species *Daspletosaurus torosus* (~76.7 to 75.2 million years ago).

Since *D. torosus* is closely related to *D. horneri* and occurs in the same geographic location, immediately preceding *D. horneri* in time, Carr et al. have interpreted this data as a rare mode of evolution called anagenesis. Unlike cladogenesis, which is more common — where an ancestor branches or gives rise to more than one descendent — an ancestor of anagenesis gives rise to a direct descendent in a linear non-branching manner. For more information on the anagenesis of *D. horneri*, please visit Carr's blog: *tyrannosauroideacentral.blogspot.ca/2017/04/introducing-daspletosaurus-horneri-two.html*

D. horneri not only had a unusual mode of evolution, it may also have had a novel appearance. At first glance it looks like a typical tyrannosaur with a large hatchet-shaped head, armed with blunt, stabbing teeth, but upon closer examination the researchers discovered that the exceptionally well preserved fossils revealed amazing anatomical detail. Since *D. horneri* has a very coarse texture over its maxilla (upper jaw) and dentary (lower jaw), pierced with many foramina (holes within bone that accommodate blood vessels and nerves), the researchers proposed that this anatomy was very similar to what is seen in modern crocodylians (Fig. 1, next page). Therefore, they inferred that *D. horneri* probably had a similar appearance: a lipless "face" that was tightly wrapped with a skin of large flat scales invested with integumentary sensory organs (ISOs) (Fig. 2). This could imply that *D. horneri* had a very tactile sensitive snout, almost like a sixth sense , which may have been used in courtship, prey capture, object manipulation or the careful handling of hatchlings.

The Illustration

The illustration of *D. horneri*'s life restoration had an evolution of its own. Thomas Carr, a life-long friend, contacted me a couple of years ago and asked if I would be interested in reconstructing the appearance

EDITOR'S NOTE:

This article is a great example of the constant interplay between science and scientific illustration, where updates to research require updates to images. Whether we are drawing dinosaurs or daisies, scientific illustrators need to keep pace with the latest studies and discoveries to maintain cutting edge accuracy — and be prepared to shift gears, sometimes in mid-illustration, as new findings change our understanding of the subject.

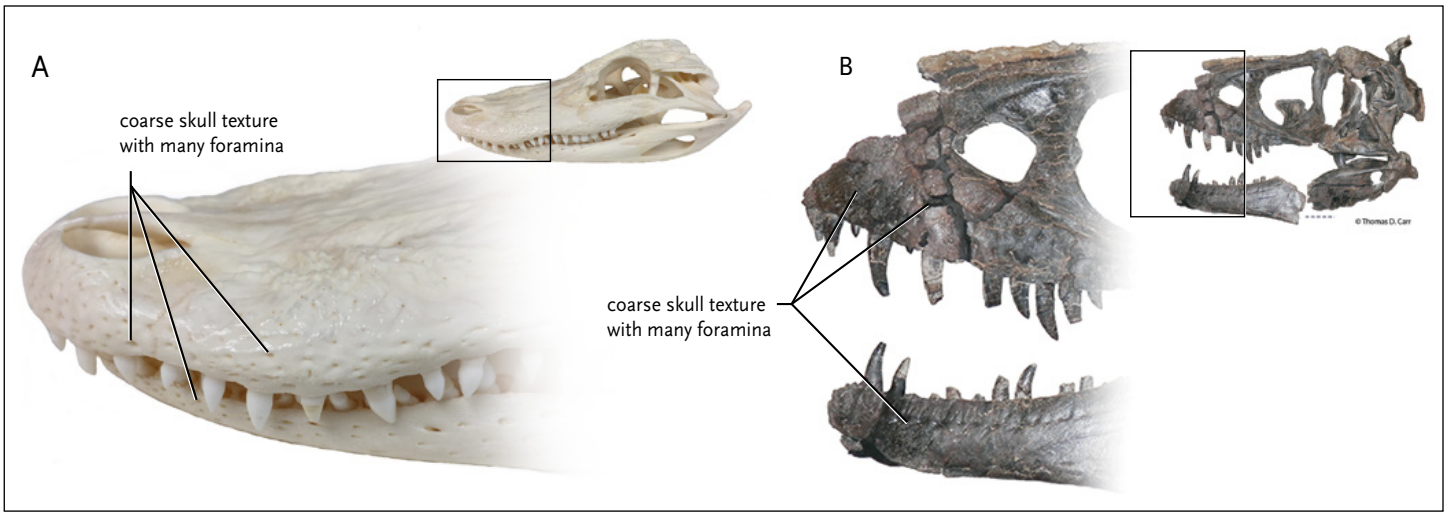
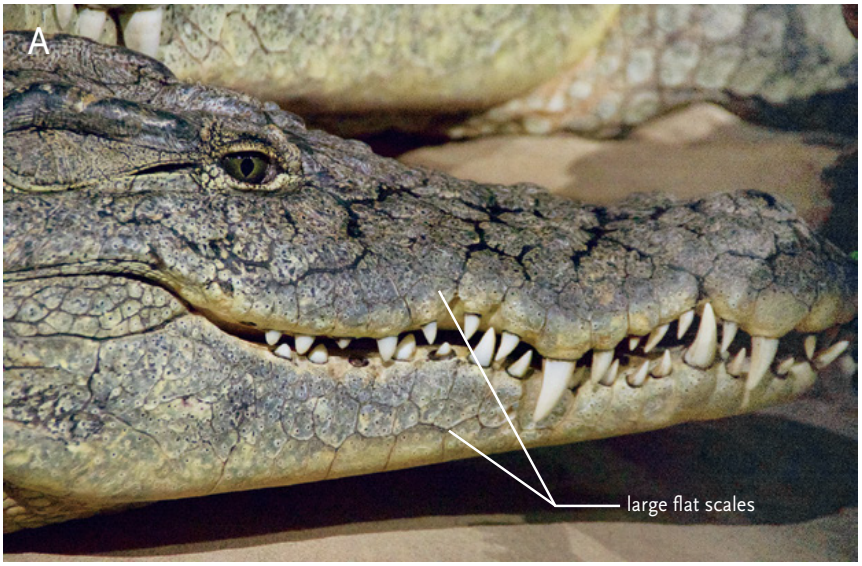


Figure 1: Rough and course skull texture along maxilla and dentary with multiple foramina. (A) shown in an alligator skull, photo © Dino Pulerà and (B) *D. horneri* skull, photo © Thomas Carr.



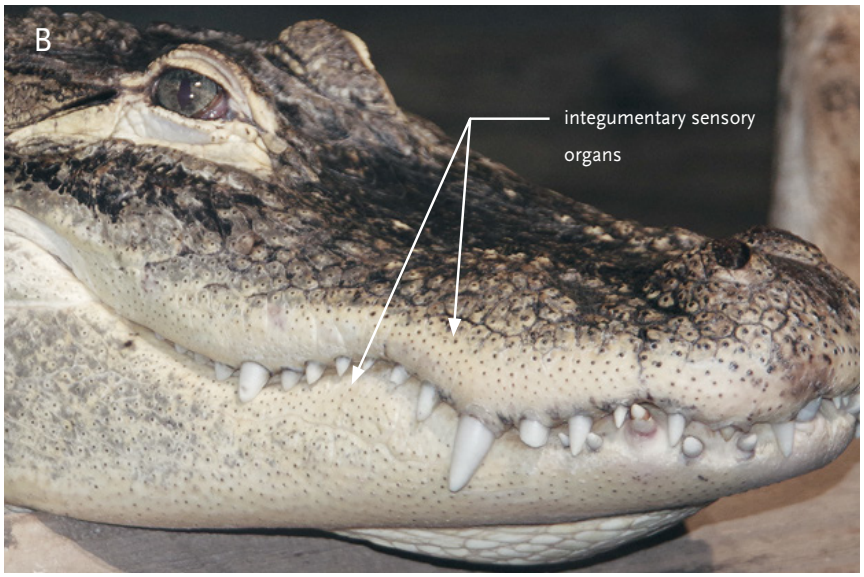


Figure 2: Large flat scales along upper and lower jaws with integumenary sensory organs (ISO): (A) in a saltwater crocodile, *Crocodylus porosus*, photo © Dino Pulerà; (B) and American alligator, *Alligator mississippiensis*, photo © Dino Pulerà

of this new dinosaur. Thomas originally envisioned *D. horneri* with a keratin beak that covered the face in a mask-like manner similar to a modern day bird (Figs. 3 and 4).

As he continued to study the fossils more closely and made comparisons with modern animals, the interpretation changed to a snout and face covered in large flat scales (Figs. 5 and 6). After continued investigation, the researchers proposed that certain areas of the skull was were covered in armor-like patches of skin (*e.g.* chin, tip of snout, top of snout, cheek horn and lacrimal horn) and that an area behind the eye was covered with a smooth keratinous sheath (Fig. 6). Since *D. horneri* has facial bones that are rugose (wrinkled) and coarse, interspersed with a multitude of neurovascular foramina similar to crocodylians, Carr et al. inferred that branches of the trigeminal nerve exited these foramina and innervated the soft tissue margins along the upper and lower tooth rows and the sides of the jaws. Because the large flat scales covered the densest regions of the neurovascular foramina, as is seen in crocodylians, they were probably associated with ISOs. With this new information, I literally went back to the drawing board and updated my illustration again (Fig. 6).

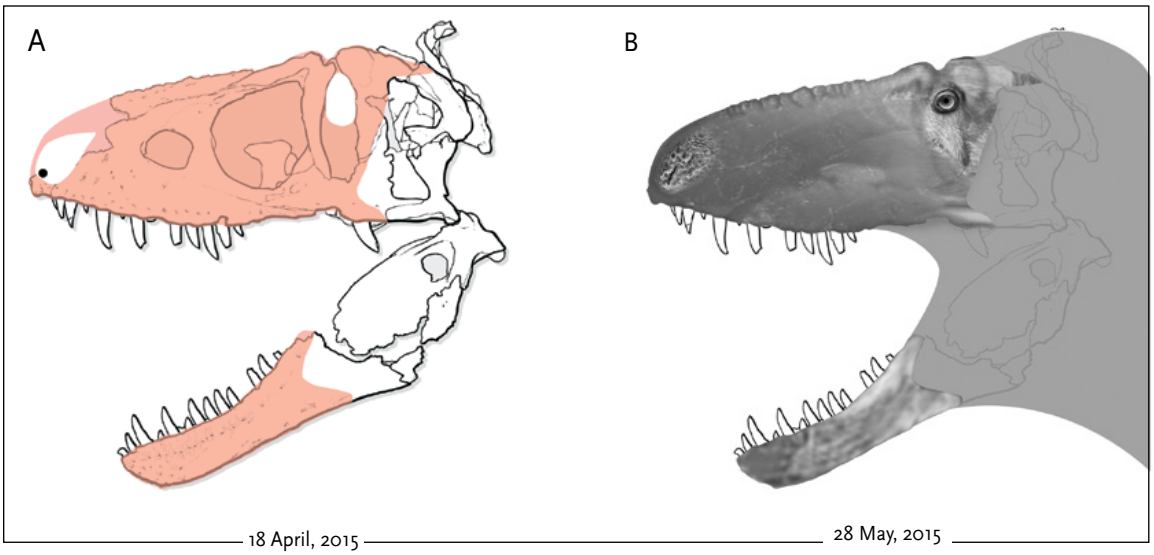


Figure 3: (A) Initial interpretation of facial integument of *D. horneri*, © 2015 Thomas Carr; (B) quick rendering of beak-like appearance of integument using Photoshop's rubber stamp to sample bird beaks and reptile scales, © 2015 Dino Pulerà

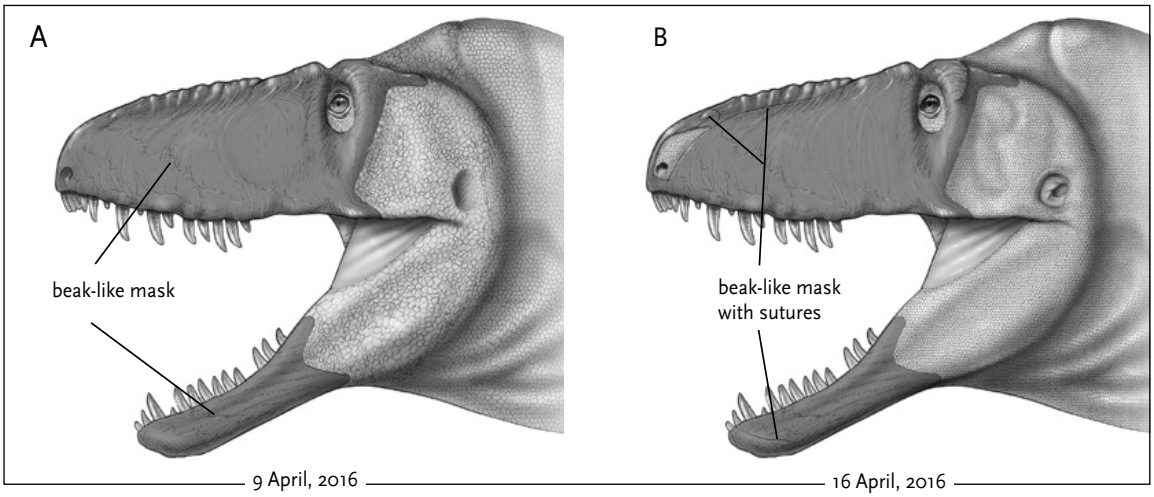


Figure 4: Mask-like integument interpreted as keratinous sheath (A) like an avian beak and (B) addition of sutures

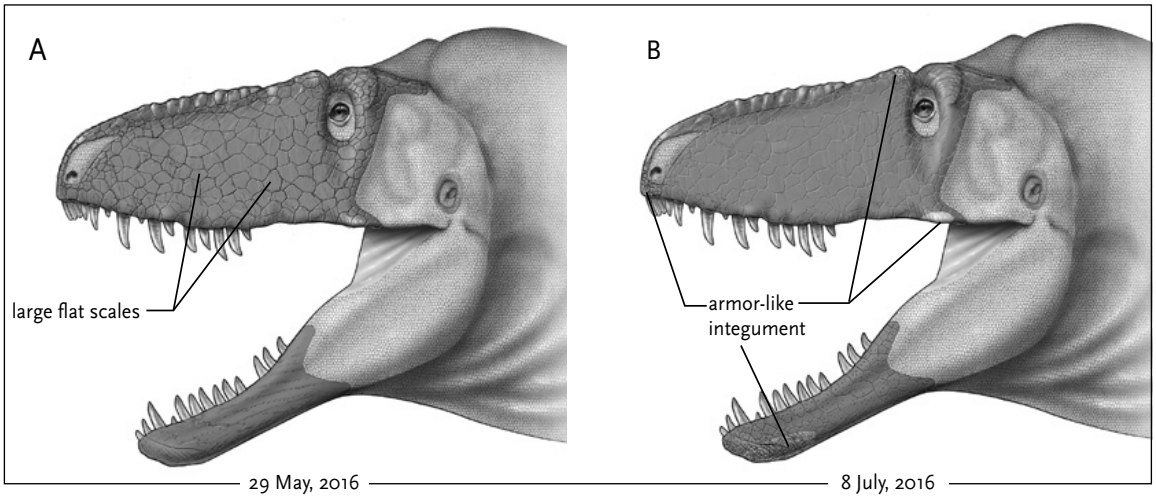


Figure 5: Mask-like integument interpreted as large scales (A) and armor-like rough patches of skin (B)

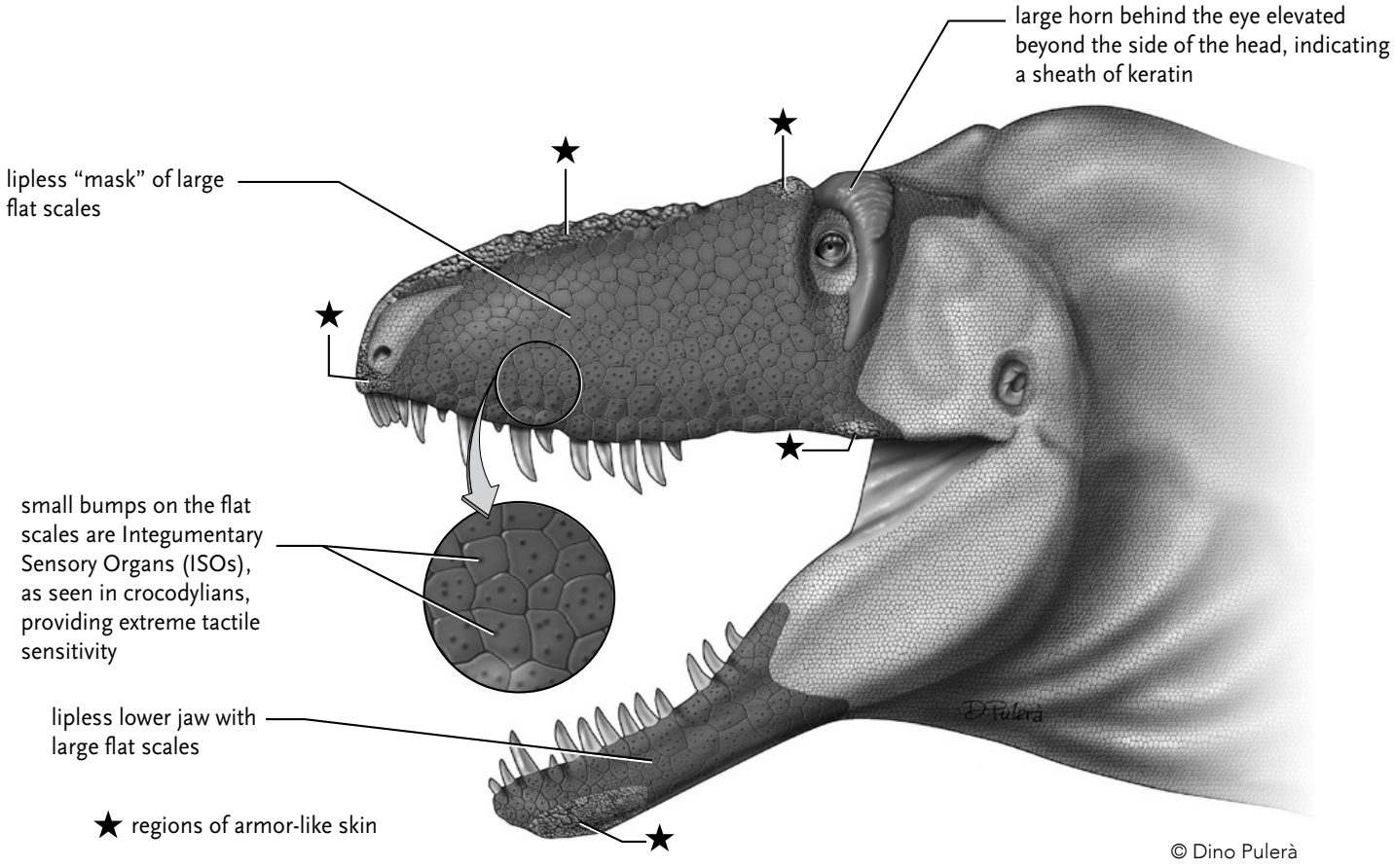


Figure 6 *(above)*: Life reconstruction of the integument of *Daspletosaurus horneri*, based on the distribution of texture on the facial bones.

Figure 7 *(right)*: Cuvier's dwarf caiman, photo © Dino Pulerà

Original research paper can be download at:
https://www.nature.com/articles/srep44942

Carr, T. D., D. J. Varricchio, J. C. Sedlmayr, E. M. Roberts, and J. R. Moore. 2017. A new tyrannosaur with evidence for anagenesis and crocodile-like facial sensory system. Scientific Reports. Doi: 10.1038/srep44942.

Finally, Thomas wanted a color version of *D. horneri's* portrait to be used for the press release. Since the research proposed a crocodylian appearance for this dinosaur, Thomas decided to use the coloration and pattern of Cuvier's dwarf caiman (*Paleosuchus palpebrosus*) (Fig. 7). Using the beautiful appearance of this little crocodylian as a guide and inspiration, I created a hypothetical portrait of this new member of the tyrannosaur family (image, p. 3).

This research has attracted much media attention. There seems to be no shortage of feathered dinosaurs in the news of late, so it's no surprise that a croc-faced tyrannosaur has been met with some healthy skepticism and critical reviews on social media regarding this unconventional interpretation of a theropod dinosaur. Carr et al. have established the null hypothesis that is now available for testing by colleagues. Time will tell if later research will greatly change this new appearance for tyrannosaurs. This research is quite novel and fills a gap in our knowledge of facial integument in tyrannosaurs, and I was thrilled and honored to have been the first person to bring this magnificent beast to life.

Member Spotlight: Natalya Zahn

"Study nature, love nature, stay close to nature. It will never fail you."

~Frank Lloyd Wright

Like so many artists, and so many more scientific illustrators, I have spent my lifetime wondrously inspired by the natural world. The path to my current career in illustration has been somewhat roundabout, and due to a lack of formal training in the sciences I will likely always suffer from a little impostor syndrome when labeled a scientific illustrator. Nonetheless, nature has been a consistent guide throughout my life and work, and I have found a remarkably broad audience for my particular style. I am grateful daily for my role as an image maker and storyteller of natural histories.

Since my childhood, as the daughter of two successful artist/designer entrepreneurs, it was abundantly clear that art-making and adventuring were preferred activities of mine. Growing up exploring the forests and farmland of northern Vermont provided me with an endless source of wilderness discoveries, and my predisposition for processing experiences through drawing resulted in stacks of animal and plant renderings — many of which can still be found in family flat files. Amateur "field guides" of local mushroom varieties and watercolor studies of avian kitchen window casualties are among the proud features of my adolescent portfolio.

Magnolia & Beetles, watercolor ©2015 Natalya Zahn

Portrait by Heather McGrath

Under the sharp and enthusiastic guidance of my mother and father (both of whom hold degrees in the fine arts), and supported by an unusually robust community of artistic family friends, my skills quickly matured. Despite a bleak experience at the rural high school I attended, my creatively enriched home environment helped land me acceptance to the Rhode Island School of Design, where I majored in Illustration.

There was a period of time during my college application process when the allure of diving deep into the study of biology or zoology became a significant pull. However, after a RISD campus visit, an overwhelming gut-feeling dissolved all indecision and confirmed the path of my future practice; time and again I would be made subtly aware that although I am a gifted artist of nature and science, a serious scientist I am most definitely not.

Throughout my higher education in the arts, the fact that RISD lacked biology courses in no way

"Soil to Sky" interpretive illustration from the Longwood Botanical Gardens Meadow exhibit, ink and gouache ©2014 Natalya Zahn

kept me from using animals and natural histories as inspiration. Once I became a senior and was given full control of my own assignments, there was no stopping me; dominating my 4th year studio space was the construction of an African grassland diorama (complete with cape buffalo and lions), the modeling of a deep sea sculpture depicting an epic battle between a sperm whale and giant squid, and an independent investigation of equine skeletal anatomy.

Study-abroad summers in Australia, France, and Yellowstone National Park afforded me additional opportunities to develop a taste for travel sketchbooks. I relished the spontaneity of working from life, observing and absorbing as much as drawing. Perhaps most thrilling to me, whether I was creating sculptures or sketchbook entires, was the capacity of my work to educate a viewer; a piece of art that is both beautiful and engaging, and also able to impart a nugget of knowledge (or open up an entire world of discovery) is a hands down win-win in my book.

During my last year at RISD I found myself in a 3-dimensional illustration class with a wonderful professor who had some rather advantageous connections in the working world. Thanks to his encouragement and generous recommendation I was given my very first dream assignment post-graduation: a series of line-drawings of animals for National Geographic's kids division.

Despite that work being the perfect kick-off for the career in illustration I desired, when it ended I found myself hazy and without a plan for how to move forward. As timing would have it, a position for an in-house graphic designer opened up just then at a boutique children's clothing company near my hometown. Having no other fruitful leads at the time, I slipped into the role, happy to have found a source of reliable income that was at least in the creative ballpark. My days were filled primarily with advertising campaigns and digital layouts, but the post was a satisfying introduction to office life. I learned how to plan and manage complex projects — as well as people — and I became the right hand to my brilliant creative director, who lit a fire in me for textile design (a skill that would resurface in my natural illustration work over a decade later).

When I left that job, five years later, and relocated to Cambridge, MA with my then partner, I again found myself somewhat unmoored with respect to my career. I had no interest continuing in the field of graphic design, but it had been what felt like ages since I practiced illustration and I was painfully rusty in draftsmanship and mindset. I struggled to narrow down what niche I might be best suited for. Making matters more complicated, there were uncontrollable forces brewing that would soon leave me in a sort of emotional paralysis, humbled by personal loss and life upset.

Dark periods and challenges are often more revealing of character than good times, and I realized then, from my own newly steep vantage point, that before I did anything else, I needed to ground myself with heart and instinct, in a way that would guide me from the inside out, and put me back on a path I dreamt about as a kid. Reflexively, I began to seek out nature and start drawing again.

Leaning into savings, I escaped as often as possible to the Harvard Museum of Comparative Zoology, the Franklin Park Zoo, or on any field trip that would connect me with animals. I forged relationships with museum curators and PhD candidates in the sciences and I filled sketchbooks, which I developed into a dedicated naturalist's blog driven purely by self-directed, science-minded work. The exercise felt wildly self indulgent, and yet, it was precisely what I needed. Slowly but surely, through the people I met and my visible presence online, paid work began to find me. I had finally unlocked a form of marketing that fit me just right.

A page from the illustrator's Alaska sketchbook, gouache and colored pencil ©2016 Natalya Zahn

My first big break came when an exhibit design studio based outside of Philadelphia stumbled onto a handful of my museum specimen sketches via my naturalist's blog. I was asked to submit a proposal for an 86-acre meadow exhibit at the renowned Longwood Botanical Gardens. Over 50 pieces of illustration were needed for interpretive signage, most of which would be fabricated out of durable materials and installed, in perpetuity, outdoors. This significant prospect felt like a stroke of luck at the time, but it had in fact been hard-earned. I was ready for this, and I got the job.

The Longwood project took a year to complete, during which time I continued contributing to my naturalist's blog and even began a new one, dedicated to dogs and inspired by my beloved Rhodesian Ridgeback, Oscar. Magazine clients found me quickly through my blogs and presence on social media, as did brands looking to enhance their product packaging designs and marketing imagery. My illustrative renderings of animals, plants and food ingredients were successfully making the leap from the scientific to the consumer market. Good old-fashioned people networking from my days spent making friends at Harvard paid off as well when institutional clients like the San Diego Zoo and MIT Media Lab came to me through a chain of recommendations.

In 2015 I was invited to develop a solo exhibit for installation at Tower Hill Botanic Garden in Boylston, MA. Itching to resurrect my textile design skills, and invigorated with a wealth of new interest in botanical subjects, I designed the show around a series of five original, watercolor-based floral patterns, each revolving around a different plant and pollinator relationship. The show was a success, and initiated a new string of projects in both the botanical illustration and textile design fields.

After a number of years of steady commercial and assorted client work, I took a break last summer to attend an artist residency in Alaska's Arctic National Wildlife Refuge. The trip enabled me to disconnect from deadlines and outside art direction and focus once again on that grounded desire to seek connection and inspiration from nature. Unfailing nature did not let me down.

Swallowtail & Tulip Tree textile pattern, watercolor and digital ©2015 Natalya Zahn

Kiki and baby Kambiri, Lowland Gorillas, acrylic and colored pencil ©2013 Natalya Zahn

Focus XIV on Nature

Congratulations to the GNSI member Jury Award winners!

Tufted Puffin ***Flight Animation*** *(Fratercula cirrhata)*
Watercolor on paper
Barbara Ierulli © 2015

Top: **Teatown Reservation: Pre-Settlement Era View** [Passenger Pigeons *(Ectopistes migratorius)]*
Bottom: **Teatown Reservation: Settlement Era View** [Wild Turkey (*Meleagris gallopavo*)]
Watercolor on paper
Linda Thomas © 2014

Evening Encounter [Ringtail, Blue-winged Grasshopper, Pinon Pine (*Bassariscus astutus, Trimerotropis cyaneipennis, Pinus edulis*)]

Watercolor on paper
Linda Feltner ©2012

Carrion Flower *(Stapelia gigantea)*
Acrylic, color pencil, gouache, pastel dust on black presentation board
Scott Rawlins © 2013

Dragons in Darkness [Olm *(Proteus anguinus)*]
Paper
Tiffany Miller Russell © 2013

Tentacles [Bigfin Reef Squid, Broadclub Cuttlefish, Giant Pacific Octopus, Chambered Nautilus (*Sepioteuthis lessoniana, Sepia latimanus, Enteroctopus dofleini, Nautilus pompilius*)]

Watercolor on paper
Daisy Chung © 2015

to view the whole catalog:
http://exhibitions.nysm.nysed.gov/fon/exhibitions/index.html

FOCUS ON NATURE: About the Exhibit

— Patricia Kernan

Focus on Nature (FON) is an international, biennial juried exhibition, started in 1990 at the New York State Museum (NYSM). For 27 years, the purpose has been to highlight the value of natural and cultural history illustration and the excellence of the artists working in the field.

For FON XIV, 79 pieces of artwork were chosen from 450 entries, representing 65 artists from 11 countries; 25 of these artists are current GNSI members. The jury of five includes artists and scientists, three of whom are permanent members and two are guests. The guest artist is chosen by having participated the most often in previous exhibits. FON XIV's guest artist was Bobbi Angell.

Fifteen Jury Awards were given this year, without hierarchy, for outstanding technique, uniqueness, and accuracy. The Jury Awards given to pieces of artwork created by GNSI members are shown on pages 10 & 11 of this issue.

This year's exhibit was hosted by The Roger Tory Peterson Institute in Jamestown, NY; prior exhibits were all at the New York State Museum. Over the years 417 artists have participated, representing 27 countries. Out of this exhibit has grown a magnificent collection of 185 pieces (including 20 donations from FON XIV) of purchased and donated artwork that tracks natural history illustration from 1990, the beginning of the computer age, to the present. Every piece ever selected for a FON exhibit is considered worthy of this collection. This collection builds on an already long history of natural and cultural history illustrations in the NYSM.

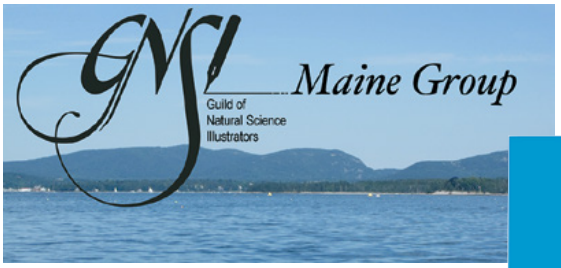
FON XV is seeking a venue with the interest, space, security, proper lighting, and administrative resources to host an exhibit of this size and scope. If you have suggestions, particularly contacts within an institution, please email the curator, Patricia.Kernan@nysed.gov

Chapter Happenings

Welcome the two newest GNSI Groups, Maine and Texas!

Chapters and Groups provide a valuable local connection to GNSI members, and the opportunity to participate more directly in science art activities, exhibits and camaraderie throughout the year. Members are encouraged to join a Chapter or Group in their region, or if there is none, consider forming your own. Start with a Group, a slightly less formal arrangement, to see if there is a solid commitment to maintaining the organization, then progress to Chapter status at your own pace.

Contact Daisy Chung, GNSI Membership Secretary, for more information on creating or joining Chapters or Groups: daisyyanjuchung@gmail.com



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3D – 2D PIPELINE: DIGITAL MODELING TECHNIQUES

— *Leonardo Alannis with Britt Griswold*

Abstract

This article aims to provide you with useful 3D tools for executing your 2D visualizations. This workflow will provide a friendly and streamlined approach in bridging the gap between 3D and 2D media. If you're a traditional artist, this experience will show you how 3D can be used to enhance your illustrations. If you already have digital experience, I'd like to present you with more advanced techniques to incorporate in your arsenal.

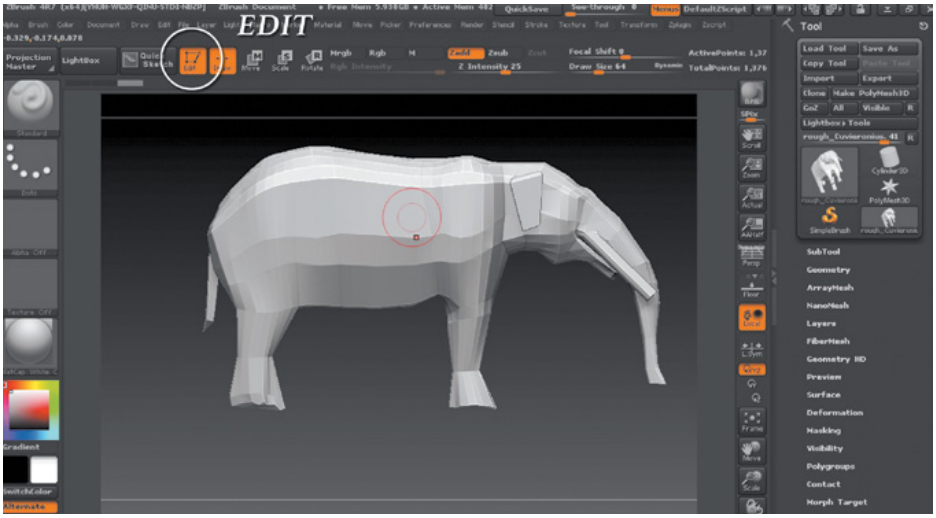
The use of 3D modeling has been common in consumer animation and film for a while. In the realm of scientific illustration, 3D techniques have been employed mostly in medical and astronomical fields. This article offers a way in which 3D can be a powerful tool for paleontological reconstruction artists.

I will show you my workflow for creating 2D illustrations using 3D elements. I hope this method will be useful even if you are a traditional artist. If you already have 3D experience, this article may give you some new methods for using it. The software I'll be using is ZBrush® for the 3D sculpting and Adobe Photoshop® for the final illustration.

One thing to clarify before we get started: the terms 3D modeling and 3D sculpting, though related, refer to different aspects of digital modeling. 3D modeling refers to creation of a 3D object, commonly a set of connected edges and points that create a polygon mesh, from scratch. Sculpting refers to adding detail and definition to this mesh. This tutorial will use an existing simple 3D mesh of an extinct elephant (*Cuvieronius)* and will not cover basic modeling techniques. If you are new to 3D modeling, I highly suggest familiarizing yourself with basic 3D modeling techniques before attempting this project.

To get started, let's import the rough model into ZBrush. Once loaded, locate the edit button (Fig. 1) and click on it to start editing the mesh.

Now subdivide the initial mesh two times using the geometry palette, then turn on symmetry by going to Transform>Activate Symmetry button (Fig. 2). This will save you a lot of time so you can sculpt one side and simultaneously create the opposite side.



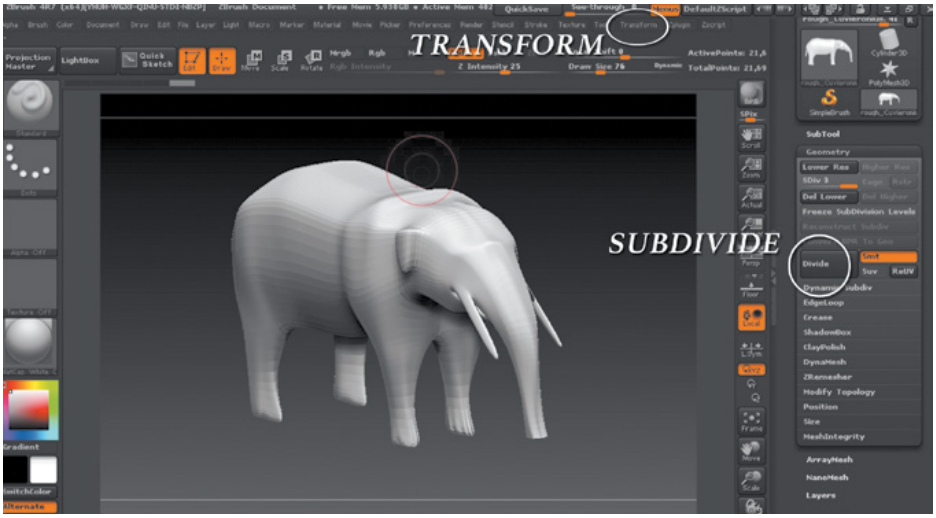


Figure 1: *(top)* Import a basic elephant model into ZBrush.

Figure 2: *(bottom)* The Divide button doubles the horizontal and vertical resolution — thus quadrupling the number of polygons which make up the object. Note the much smoother appearance of the mesh once it is subdivided.

What is ZBrush®?

ZBrush is a digital sculpting and painting program that has revolutionized the 3D industry. The ZBrush interface will seem complex to the uninitiated. But like all digital tools, repeated practice projects and online reading will make it as straight forward as any other sophisticated digital tool. ZBrush has a powerful set of modeling and sculpting tools. You can create realistic renders directly in ZBrush, but export options can prepare your model for 3D printing or use with other digital applications. ZBrush allows you to sculpt and paint with millions of polygons without having to worry about purchasing expensive graphics cards. The full program is rather expensive ($795/seat), but there is a "Core" version with the main features for $150, and academic pricing, 30-day free trial downloads, and a simple free sculpting program (*Sculptris*) to experiment with.

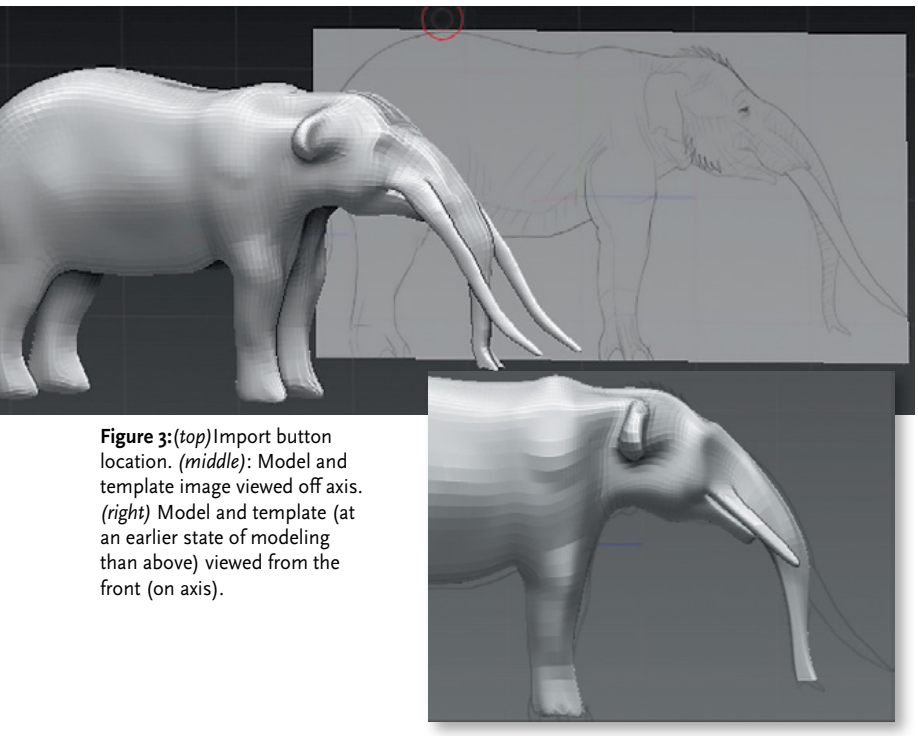
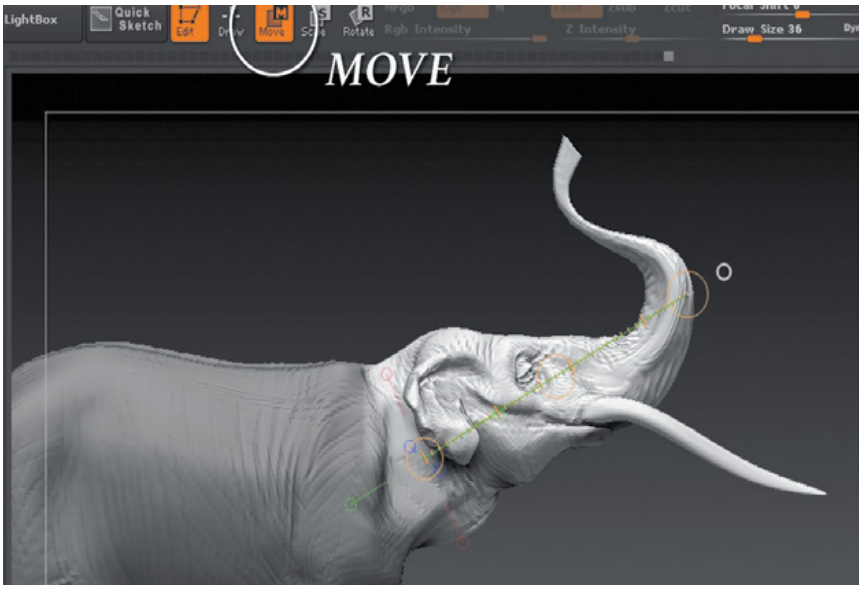


Figure 3: *(top)* Import button location. *(middle)*: Model and template image viewed off axis. *(right)* Model and template (at an earlier state of modeling than above) viewed from the front (on axis).

Figure 4: Use a selection brush to highlight portions of the model to be repositioned. Use the Move Tools overlay of orientation handles to reorient. The orientation handles are shown as colored lines and shapes.



SCULPT THE GENERAL FEATURES

The tools I'll be using at this stage are the Move tool and Standard Brush (SB). Quick tips: use the shift key with the SB to smooth out an area, and ctrl to carve, use bracket keys [] to resize your sculpting brush.

Import reference image if necessary: go to Draw>Snapshot To Grid palette. If you need a side view reference, look for the Left-Right button, click, then click *Import* (Fig. 3). Find your reference image and load it.

Begin modeling the rough details of your pachyderm with the brush tools. Once the basic shapes are fleshed out, subdivide your mesh once more to add finer detail if desired. But try to keep the model as low-res as possible. The more polygons your model has, the slower and harder it will be to use it in other programs that don't work like ZBrush. The modeled mesh you have created is called a "subtool" in ZBrush parlance. You can have more than one object in your file. Your whole file is called a "ZTool". Remember to regularly save your file, in case the program crashes, and ***remember to save as a ZBRUSH PROJECT (.zpr)*** and not as a Document (.zdoc).

POSITION AND EXPORT THE MESH

Once sculpting and modeling are complete, pose your model with the Move button (Fig. 4). It's best to keep an unposed copy of your file saved somewhere else. in case you want to return to the original model. Proper posing will take some time — don't hurry.

Now that you have a detailed, posed model, let's reduce the mesh complexity so that it is less megabyte heavy; it will perform faster in Photoshop this way. Go to the top menu: ZPlugin>Decimation Master and choose the percent of reduction you'd like (Fig. 5a). Try it with different percentages, but remember that you don't want to reduce the quality too much or your model will look pixelated. I'm using 20% decimation for this example. Once you have chosen a percentage, click *Preprocess Current*, wait for it to process, then go back to the Decimation Master and click *Decimate Current*.

Export your reduced mesh subtool (model) in .OBJ file format. The .OBJ format is a common standard that includes common characteristics of 3D models understood by most 3D modeling packages and 3D viewers. I recommend that before exporting, you find the export palette (Fig. 5b) Tool > Export Palette and make sure that these options are set to optimize the data structures for .OBJ:

quad: Polygons will be exported as quads (four-sided).
mrg: UV coordinates will be merged on export.
grp: Polygroups will be exported.

USING THE PHOTOSHOP 3D TOOLS

Now let's start the compositing. Open Photoshop. If you have a background image, open that file; otherwise, create a new file. On the top menu go to 3D > New 3D Layer from File... and load your .OBJ file. You'll see a pop-up window. Use the defaults and press OK. And on the next pop up, click *Continue*.

Let your elephant image load (Fig. 6). When it does, the shape will look solid black: don't worry, this is because we haven't added any lighting to it yet. Later versions of Photoshop may add a default light. First, let's transform the model a bit before we add lighting. Towards the top right you'll see a Transformation Controls menu. This controls the position of your 3D object or the view of the camera (Fig. 7). A second set of overlay controls to position your object can be accessed by selecting your object from the 3D palette (Fig. 8). You can use these controls to rotate, scale and move your object.

To add a light, under your 3D palette (Window > 3D) look for the little light bulb. There is a tiny arrow

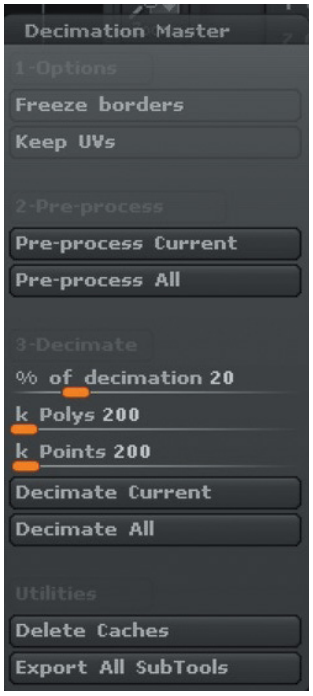


Figure 5a: ZBrush Decimation Master Palette

Figure 5b: ZBrush Export Settings Palette.

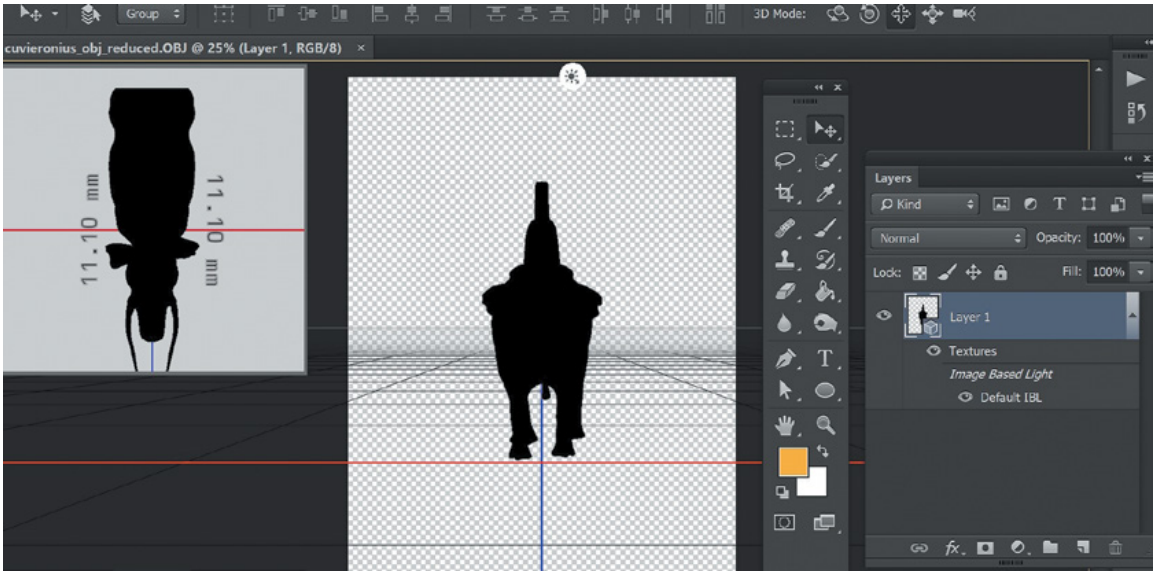
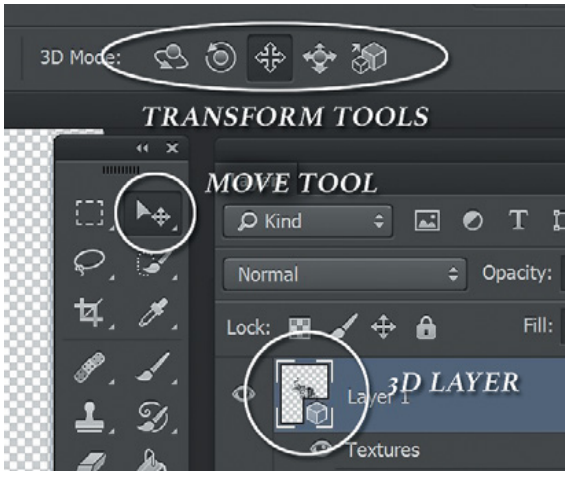
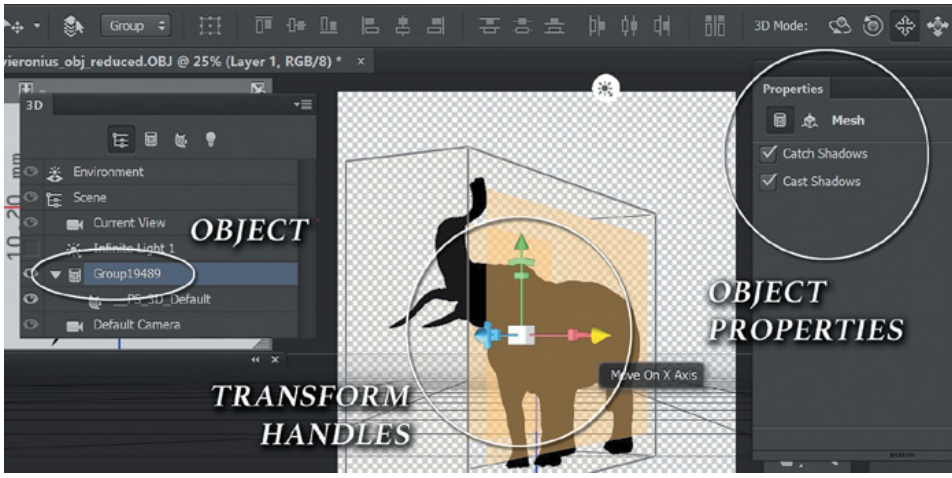


Figure 6: Default import of a 3D object in to Photoshop.

Figure 7: *(bottom, left)* Selecting the Move tool and a 3D layer present the camera move tools.

Figure 8: *(bottom, right)* Selecting the Move tool and the 3D object from the 3D palette reveals the 3D transform tools for the object.





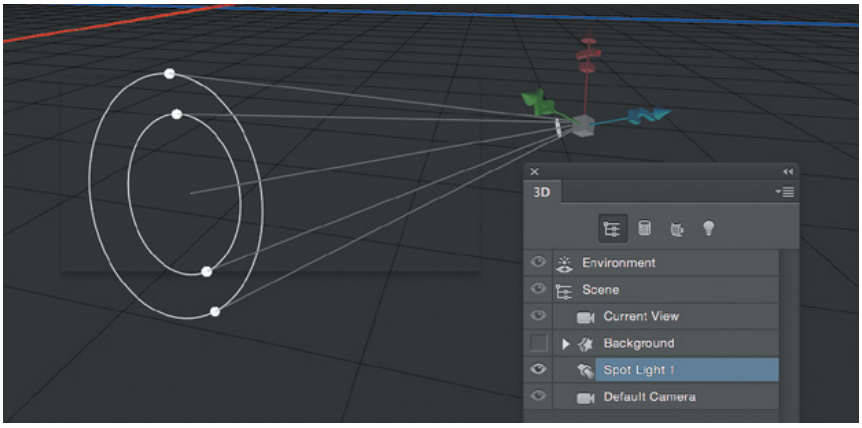


Figure 9: Light selection and manipulation in 3D Photoshop.

next to it; click it, then choose New Spot Light. To move the position and angle of the light, click on the spotlight on the 3D menu then use the transformation controls to get the best lighting (Fig. 9). You can add more lights if you think they are necessary. The Properties palette will let you edit the qualities of each light selected.

Once you have the lighting and pose of your choice, close the 3D window. Click on another Layer in your image or a non-3D tool to exit 3D editing mode. If you need to go back to 3D editing mode, simply select the move tool and select your 3D image layer in the Layer palette. The 3D transformation controls will pop up again.

Once you are out of the 3D environment, consider the 3D layer now as you would any regular layer in Photoshop. When you're not in 3D editing mode, the 3D object acts just like any 2D image. I used skin photos from Asiatic elephant pictures to texture my model.

You can then use photo reference or illustrations to composite the background. I added a few gradient overlays to create an atmospheric effect and here is the final result. (Fig. 10).

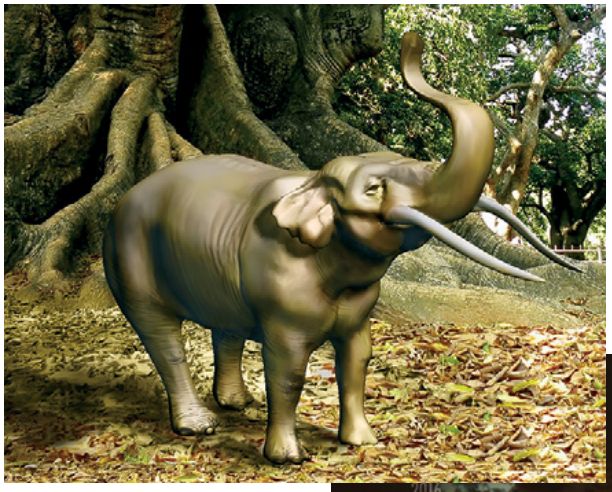


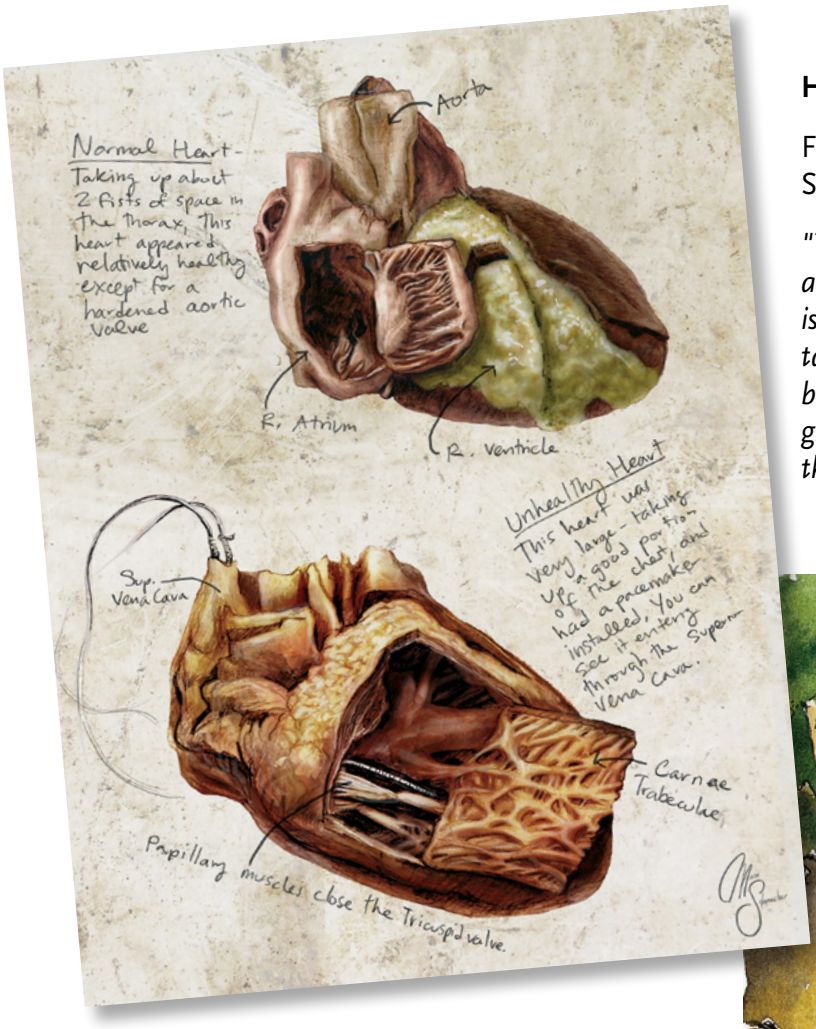
Figure 10: *(top)* Placed 3D model with basic coloring.

(right) Final painting using elephant skin textures collaged into position as part of the 2D painting process.
Art © Leonardo Alannis.

Note: As you ponder the many tools and buttons in the ZBrush interface, use the online documentation on getting started and the reference explanations of the various tools and work interface:

docs.pixologic.com

Pages From My Sketchbook:
INTERIOR & EXTERIOR LANDSCAPES



Heart Dissection, © Mesa Schumacher

From the anatomy labs of the Johns Hopkins School of Medicine

"There is a huge variation in the size of hearts! While a normal heart may be around the size of two fists, it is not uncommon for an unhealthy struggling heart to take up much of a person's chest in the effort to supply blood to the body. Here I drew a healthy heart, and a greatly enlarged heart with a pacemaker inserted into the superior vena cava."

Waterfall, © Jennifer Landin

"El Yunque National Forest in Puerto Rico is the only tropical rainforest ecosystem in the U.S. Forest Service. This waterfall awaits hikers at the end of a beautiful, twisty trail with amazing vegetation, coqui frogs, and giant tree snails."

2016
EDUCATION SERIES
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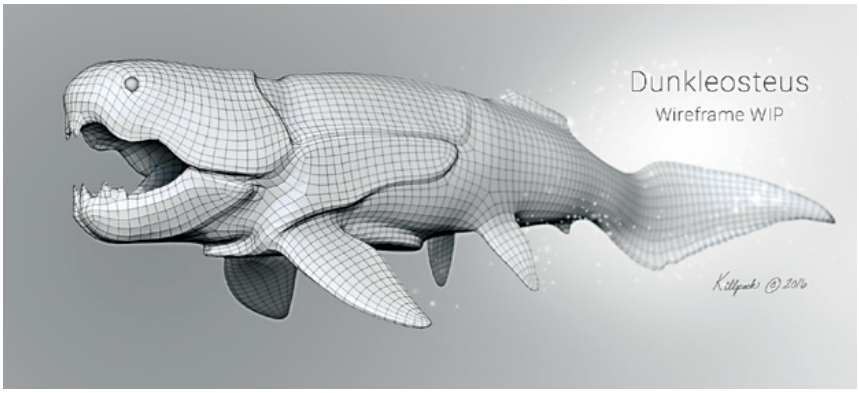
Fort Wayne, Indiana
OCTOBER 27-30, 2016

LEVELING UP IN ZBRUSH®:

A Review of the 2016 GNSI Education Series Workshop

—by Sara Taliaferro with Amanda Zimmerman

Ever tried to teach an old dog a new trick? How about teaching two-dimensional traditional artists how to create a three-dimensional sculpture digitally? But everyone who attended the 2016 GNSI Education Series Workshop, *Leveling Up In ZBrush®*, was up for the challenge. The class was taught by David Killpack, Principal & Creative Director at Illumination Studios who uses ZBrush for science and medical illustration. We gathered at Indiana-Purdue Fort Wayne (IPFW) University in the Walb Union Building on October 29 and 30, 2016, for an immersion experience. The workshop was an intense, challenging, and inspiring two days of solid work, and under Killpack's tutelage, it did not disappoint.



Polygon render of a fossil fish, *Dunkleosteus torrelli*, reconstruction.
© David Killpack

INSTRUCTOR SPOTLIGHT: David Killpack

David Killpack is the Principal and Creative Director at Illumination Studios, a full-service agency specializing in enlightening visualization for scientific communication. At a very early age, his artistic talents were coupled with a strong desire to communicate the narrative of the natural world. Growing up on a farm in southwest Iowa, placed him at the interface of "humanity & nature" and endowed him with a strong work ethic. While attending Iowa State University, he was simultaneously employed as a scientific illustrator at Engineering Animation Inc. (1998-1999). He received a BA (BPMI) from ISU in 2000 and began work as a medical illustrator at UT Southwestern Medical Center in Dallas that same year. He served as medical illustration supervisor for a several years in the same institution before he left in 2008 to run Illumination Studios full time. He has been honored with a number of awards and recognition from the AMI, Guild of Natural Science Illustrators, New York State Museum, National Science Foundation, Scientific American, and TEDMED. He also serves on the Board of Directors for the Vesalius Trust.

ZBrush, the brain child of parent company Pixologic™, is a computer program that allows the user to build 3D and 2D models. Unlike many other programs, ZBrush gives the user the ability to manipulate the form with a mouse or stylus much like a sculptor would work in clay. The high-resolution models created in ZBrush are used by artists primarily in the gaming, movie and animation industry. "ZBrush is even compatible with 3D printers, so you can print your models and bring them to life," explains a Top Ten Reviews staff writer (12-9-16).

Because ZBrush's user interface is complex and somewhat counter-intuitive, we began our work by building a basic form; we combined simple round shapes (Z-balls) which can be stretched, widened or added onto as you go, much like a sculpture would use a wireframe to start. Once we had the base form we could begin experimenting with ZBrush's customizable brushes to add digital clay and begin blocking out our rough form. These customized brushes can add texture and color too. Even lighting can be added at the final stage.

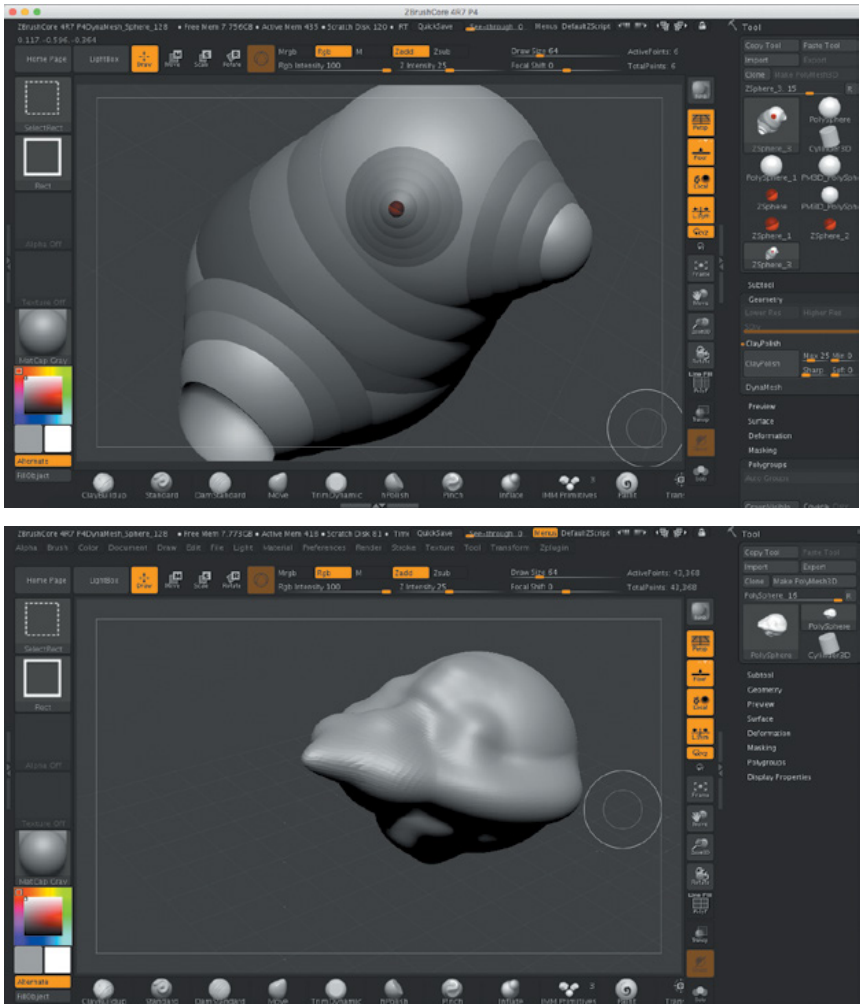
Most 3D modeling programs rely on polygons. These triangular shaped facets have a limited set of modeling capabilities — especially when attempting to reproduce organic shapes of the natural world. In contrast, ZBrush relies on "dynamesh". And, as G2 Crowd reviewer Esin G. enthuses, the "best side of the ZBrush is simply dynamesh. Leaving all the restraining rules behind at first and being able to shape the form freely, gives the feeling of real sculpting experience; it makes the ZBrush clearly number one."

As for the workshop itself, David Killpack exudes an enthusiasm coupled with an extreme work ethic that is easily contagious. While online tutorials may be less overall investment, the payoff in attending a workshop with the instructor present and a group of science illustration peers in the class can be huge. "We'll utilize the environment of sophisticated learners ([t]hanks to Sara Taliaferro for that term)," Killpack wrote before the workshop, and indeed that held true. 2016 Susan W. Frank Scholarship recipient Amanda Zimmerman notes, "For me, attending a workshop with a teacher helps with retention greatly. If I forget something, I then know the lingo to do an

online search for a tutorial. I like the feeling of modeling in clay that the program provides, but I have yet to be able to polish my pieces off to the ultra-rendered things I see other artists knock out. 'Patience', says Yoda."

And of course, there are those additional sweet spots to the experience, just as one finds when attending the annual conferences. Guild members are excellent at the community-building aspects of professional events, made all the more rich by soaking in the regional wonders. We inspire each other, problem-solve our current work projects, and strengthen professional alliances between sessions and over dinner. In Fort Wayne, this extended to barbeque feasts, a visit to Johnny Appleseed's grave, touring "Halloweentown" Street, a sampling of seasonal beer fails, and even a spotting of the legendary Mullett Man of Fort Wayne.

Currently the Guild is exploring distance learning and other creative options for professional development offerings. But as our 2016 GNSI Education Series Workshop reaffirmed, learning "in community" and as an immersion experience is still an excellent way to get in-depth, specialized, and well-supported training.



Using ZBrush's dynamesh allows users to "sculpt" organic shapes.
Both photos © Amanda Zimmerman

(above) Hard at work at the Fort Wayne GNSI Education Series Workshop. Photo © Erin Frederickson

(bottom, right) An indisputable highlight of the 2016 Education Series Workshop was a visit to Johnny Appleseed's grave!

L. to r.: Bruce Worden, Erin Frederickson, Sara Taliaferro, instructor David Killpack, Amanda Zimmerman, and Virge Kask.
Photo © Gail Guth

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