



ILLUSTRATING THE MICROSCOPIC WORLD

Presented by:



GO2Qurious

With a LIVE
podcast
show from:

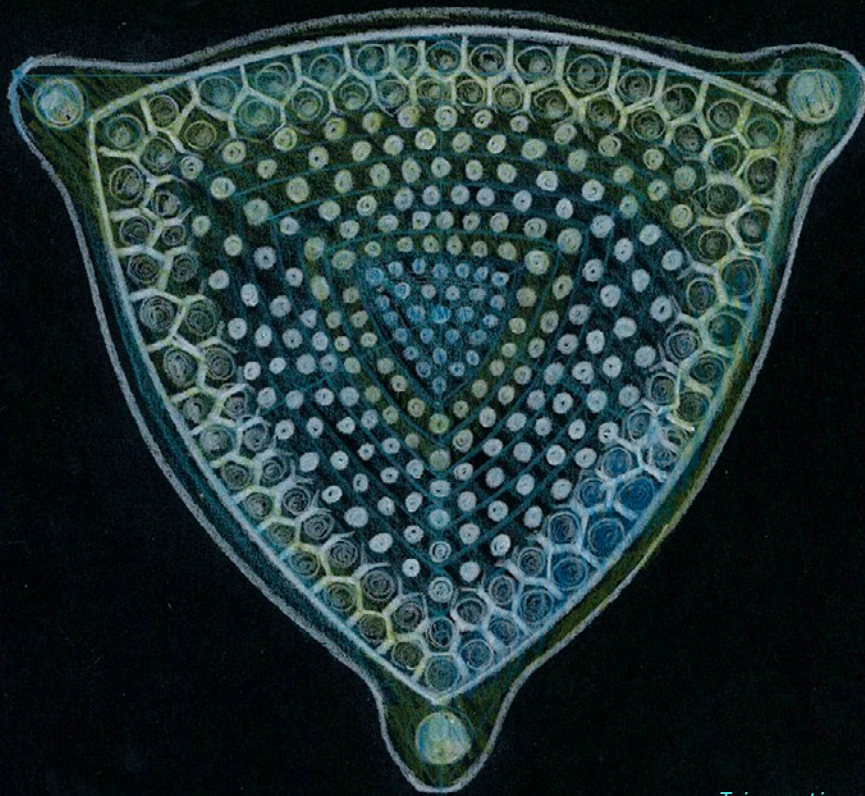


ACTUALLY, IT'S
**PHYTO-
PLANKTON!**



Scientific Illustration
workshop with
undersea artist
Kirsten Carlson
(Fathom IT Studios)

And oceanography
presentation by our
podcast hosts:
Dr Jamie, Dr Lachlan &
Dr Ivona



Triceratium robertsonianum

WORKSHOP BOOKLET

FOR USE WITH WORKSHOP RECORDING

Hosted by Go2Qurious
Created by Kirsten Carlson

www.go2qurious.com
www.kirstencarlson.net

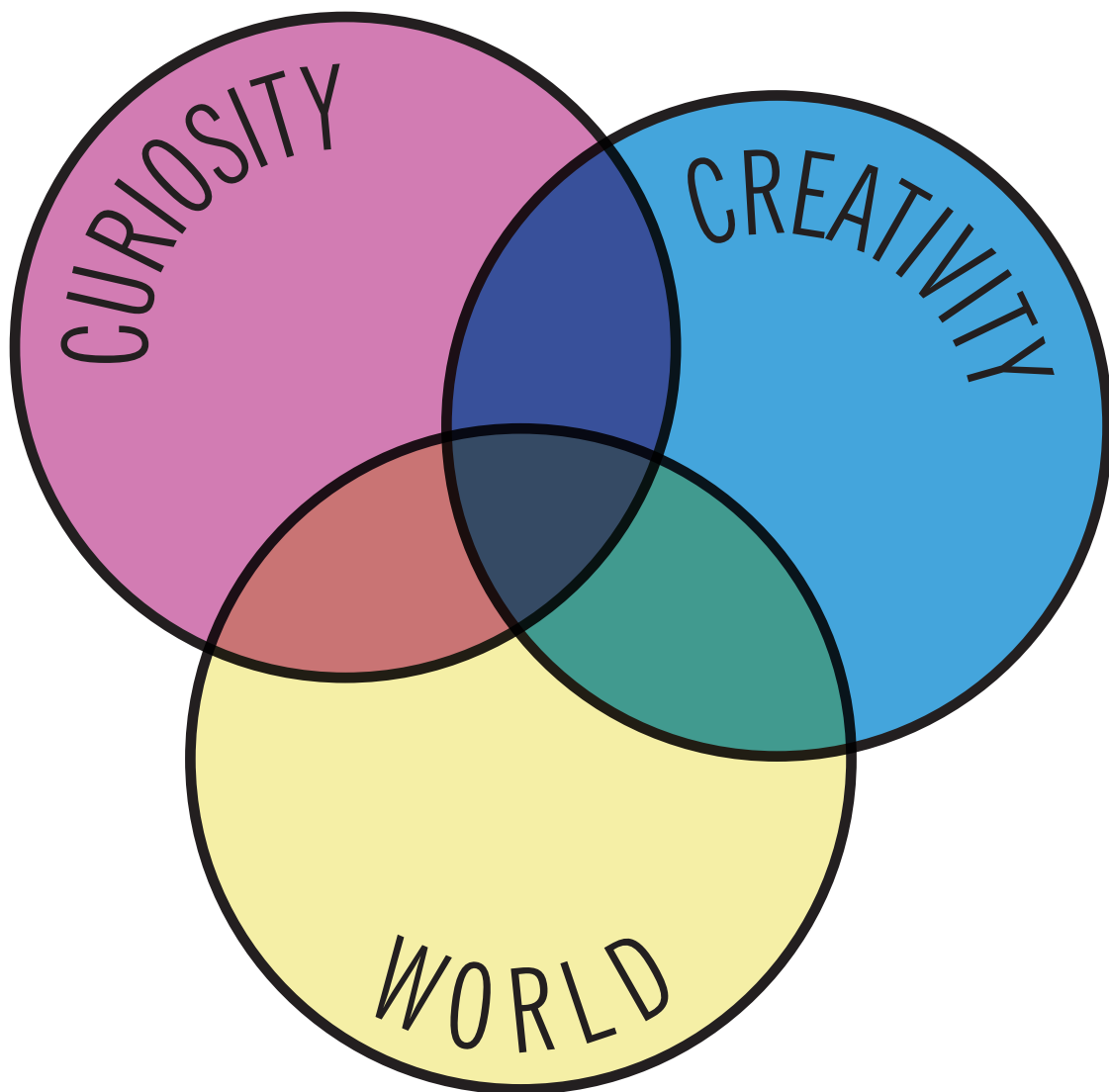
WHY IS SCI-ART IMPORTANT?

Combining science and art (sci-art) provides a colorful kaleidoscope to observe and interpret the beauty and wonder of nature in the world around us.

Curiosity is defined as a strong desire to know or learn something. Scientists explore the world through the lens of curiosity.

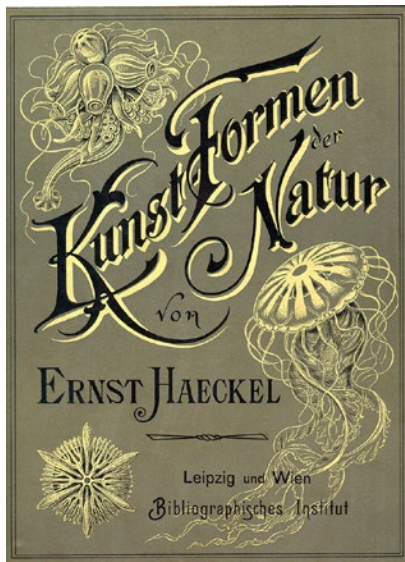
Artists manifest their creativity into reality. Creativity is defined as the use of the imagination or original ideas to create something.

We are all scientists and artists when we explore the world as creative and curious beings.



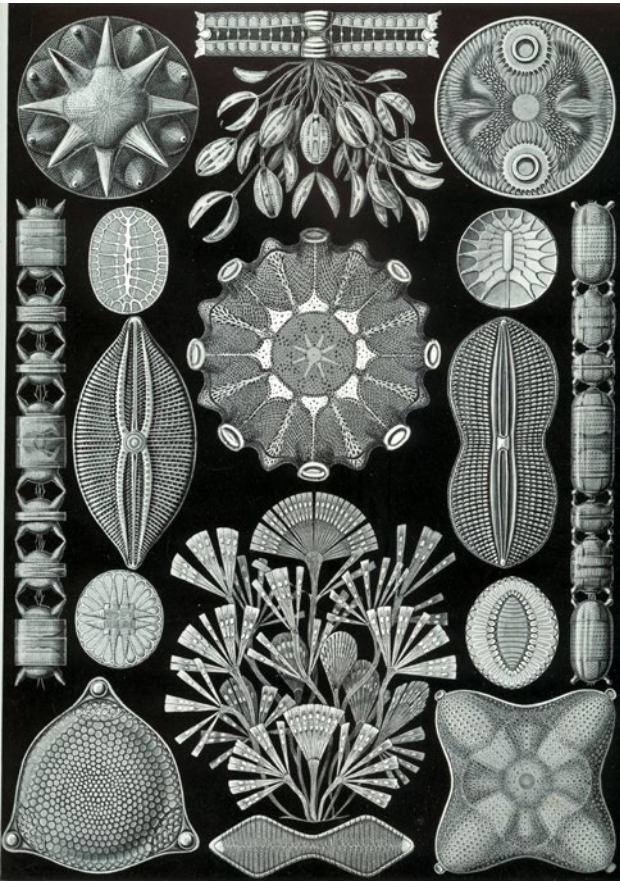
ERNST HAECKEL'S SCI-ART

Ernst Haeckel (1834-1919) was a scientist and artist. His book, *Kunstformen der Natur* [Art Forms in Nature] published in 1904 contained many species he discovered himself. He utilized creative arrangements of organisms on each page that have been copied many times since. I chose his diatom illustration as the inspiration for this class because I'm fascinated by the intricate detail and fluid beauty of his illustration.



You can view all the illustrations from the original publication online at wikimedia: https://commons.wikimedia.org/wiki/Kunstformen_der_Natur



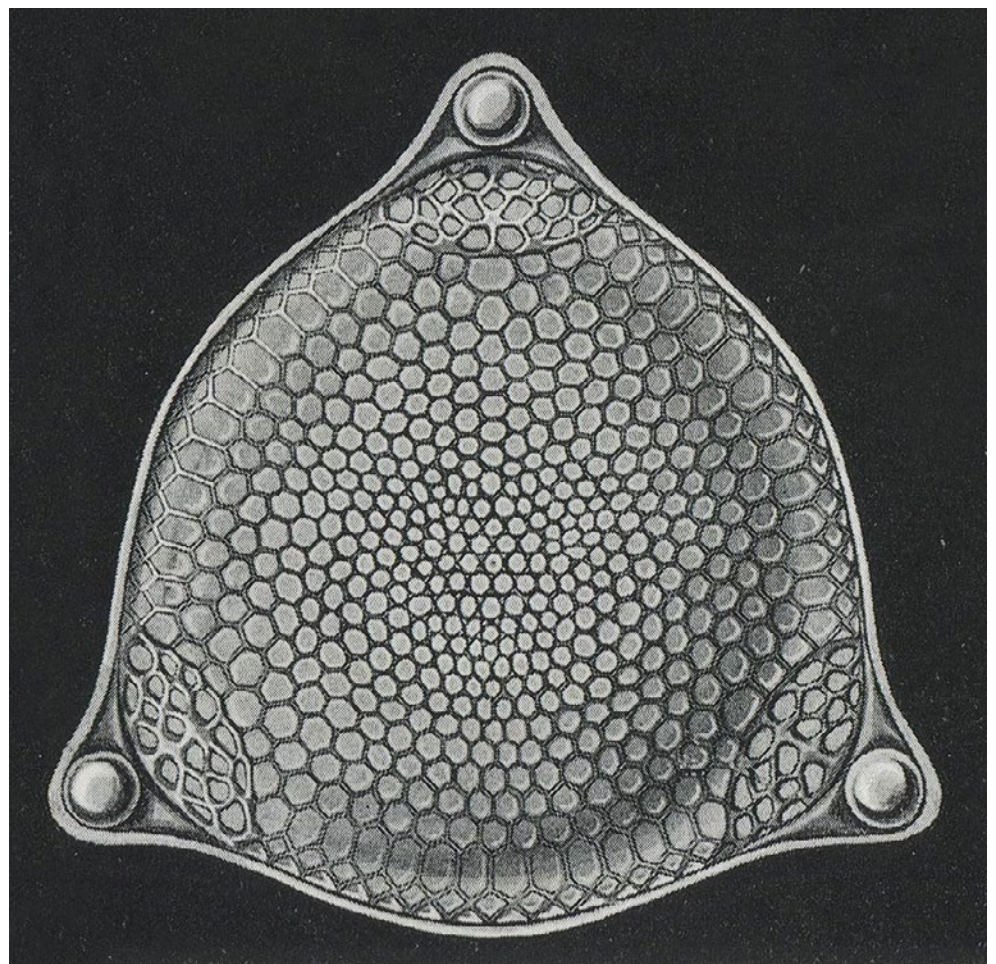


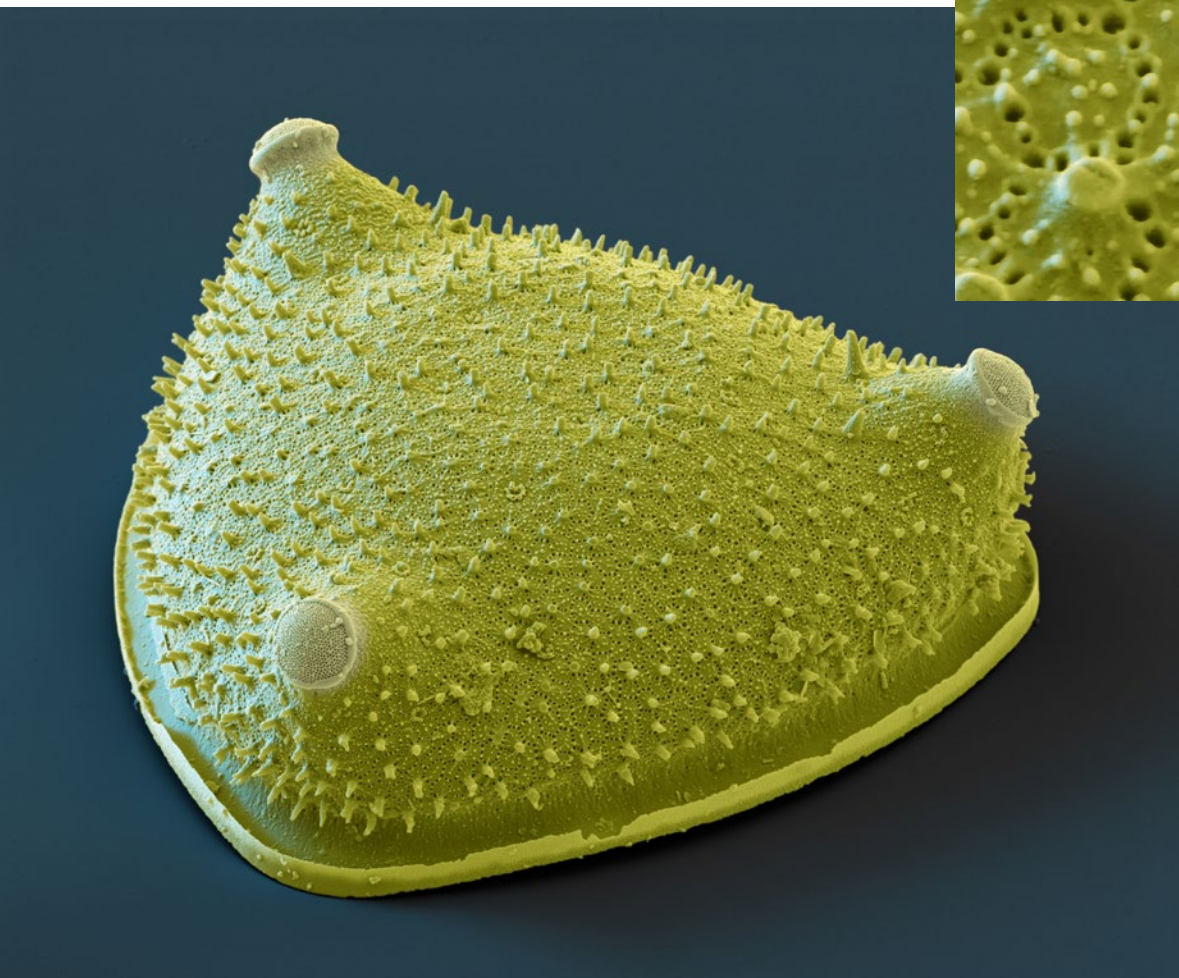
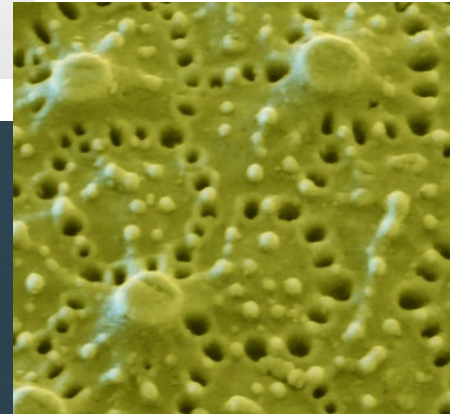
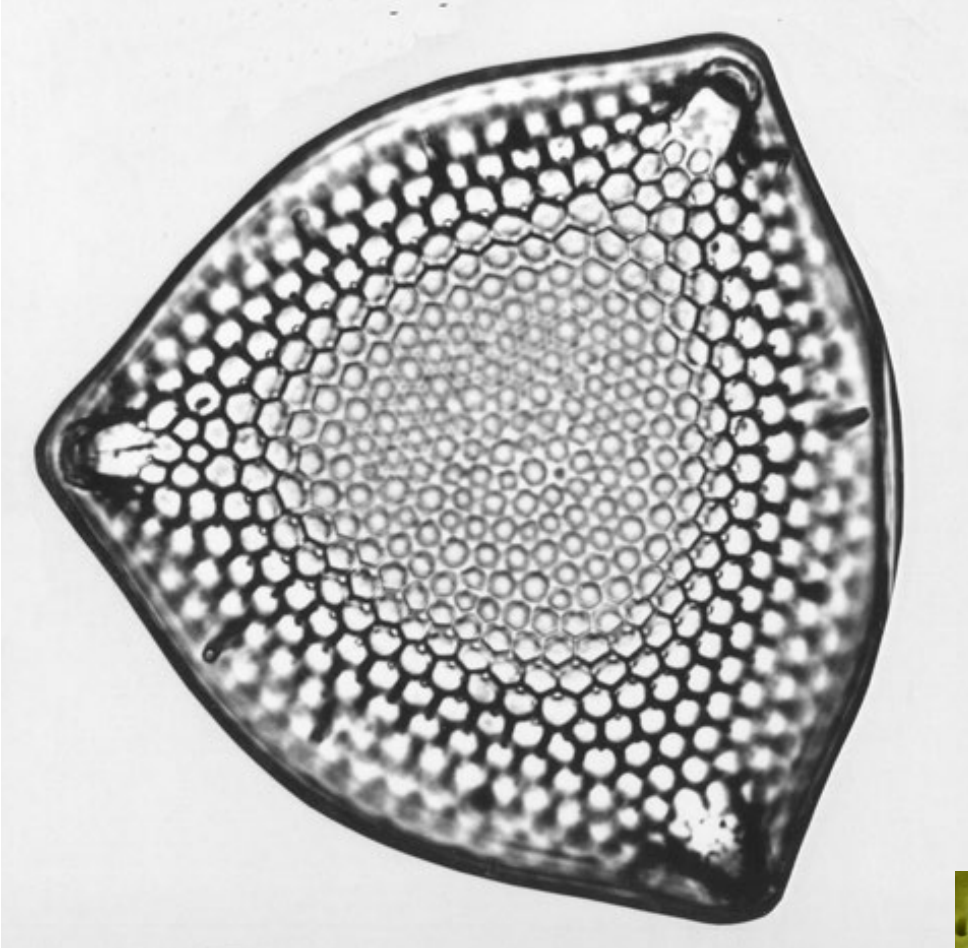
Kunstformen der Natur [Art Forms in Nature], 1904
Plate 84. Diatoms

THE TASKS OF SCIENTISTS
AND ARTISTS ARE REALLY
IDENTICAL, TO DEPICT
THE WORLD AROUND
US WITH THE PRECISION
OF THE SCIENTIST
AND THE PASSION OF
THE MYSTIC. — ERNST HAECKEL

IN THIS WORKSHOP

we are creating an
illustration of *Triceratium
robertsonianum*
inspired by Ernst Haeckel's
illustration (right) as well as
by the photograph (next page,
top) and scanning electron
micrograph (SEM) (next page,
bottom). Note: The hexagonal
pattern visible in SEM closeup.





ART SUPPLY LIST

BLACK PAPER • WHITE PENCIL* • COLORED PENCILS • SHARPENER • RULER



*The best white pencil I've found for black paper is the Derwent Drawing Pencil in Chinese White, please experiment with whatever you have available.

GET TO KNOW YOUR ART SUPPLIES + WARM UP EXERCISES

EXERCISE 1

CONTOUR LINES

[starts 16 minutes into workshop]

Draw different kinds of contour lines keeping the spacing nice and even.

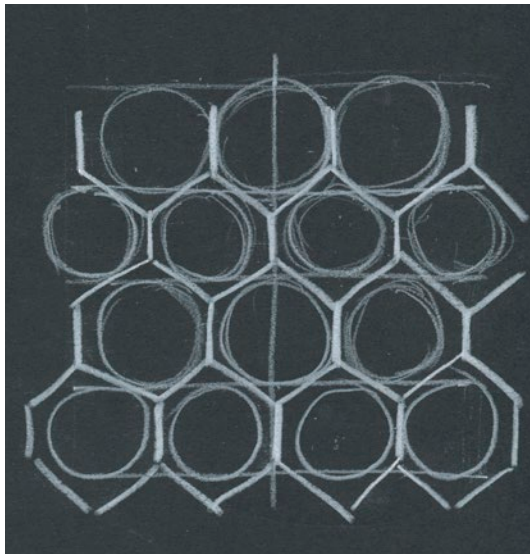


EXERCISE 2

CIRCLES & HEXAGONS

[18:00]

Create evenly spaced rows of lines, add staggered circles, then create hexagonal pattern using a series of vertical and oblique lines.

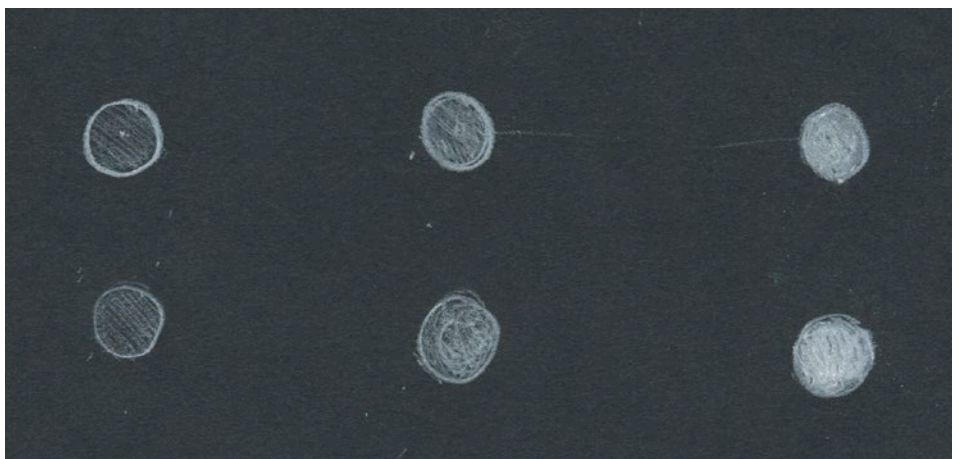


EXERCISE 3

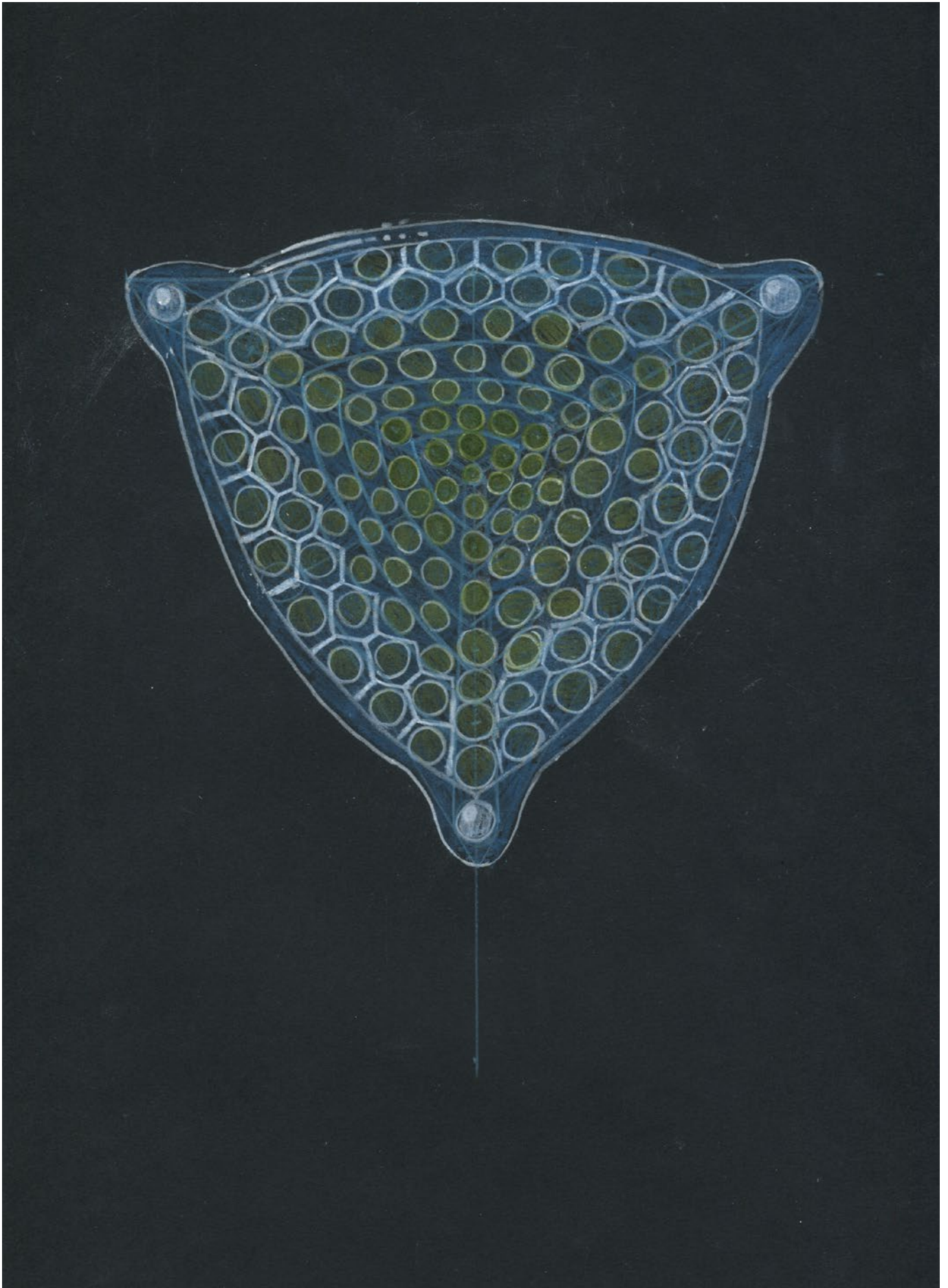
DENSITY & TRANSPARENCY

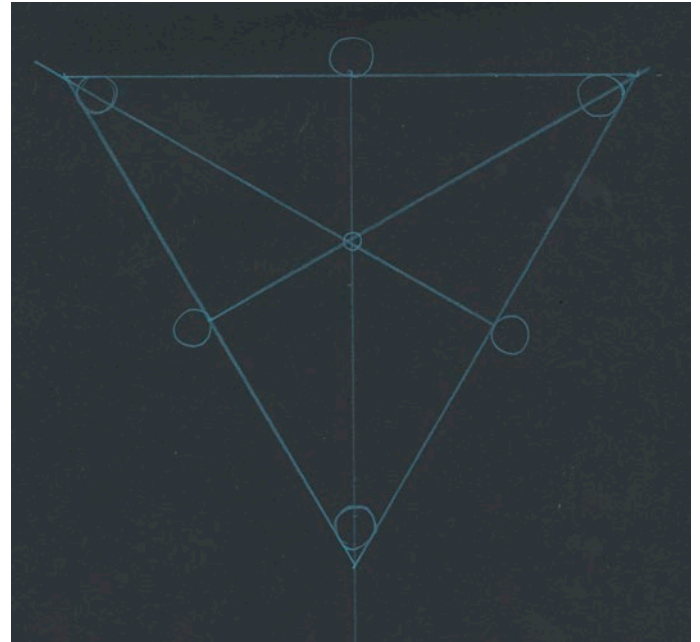
[25:00]

Draw a series of three circles, using different pencil pressures fill them in as described in the workshop. Repeat.



CREATE YOUR OWN HAECKEL INSPIRED DIATOM DRAWING





STEP 1 (blue pencil)

DRAW AN EQUILATERAL TRIANGLE AS A GUIDE

[30 minutes into workshop]

Length for each side of triangle: 15 cm

Midpoint: 7.5 cm

1. Draw a 15 cm horizontal line in the upper part of your paper to create one side of the triangle. Mark the midpoint on the line.
2. Measure distance from edge of paper to that midpoint.
3. Keeping the ruler parallel to the horizontal line, move the ruler down to the lower part of your paper (more than 15 cm) and mark the midpoint with a dot.
4. Draw a vertical line between the two midpoints so that it creates a large "T".
5. Create a straight line, 15 cm long from each end of the horizontal line to a point on the vertical line. Ideally, if you've measured correctly, this will create a point. Mark the midpoint for side 2 and 3.
8. Draw a line from the midpoint on each side to the corner opposite it.

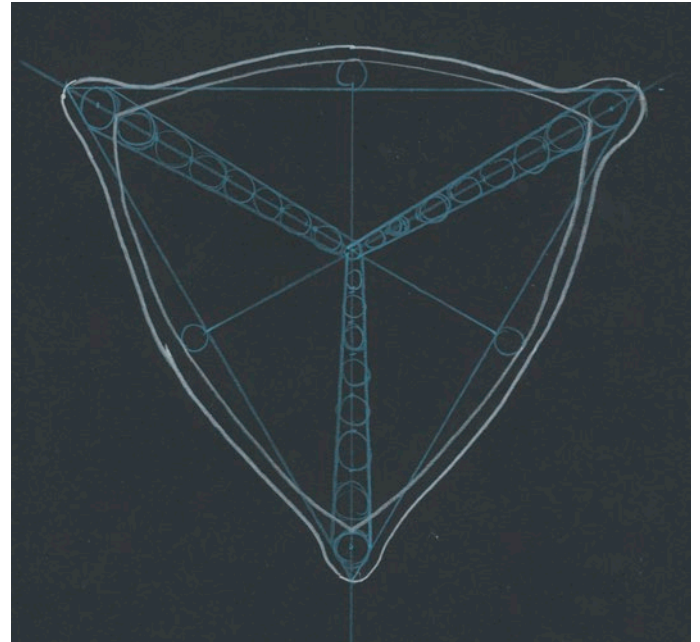
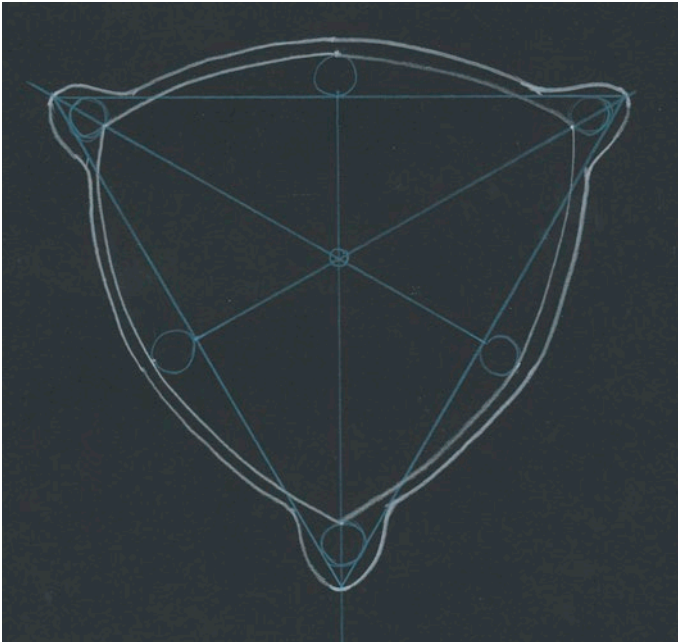
STEP 2 (blue pencil)

DRAW CIRCLES AT THE 7 INTERSECTING POINTS

[33:15 minutes into workshop]

*Remember to sharpen your pencil when it gets too dull. A shortcut is to keep rotating the pencil to find the sharp edge, and/or keep the pencil upright and vertical.

1. Draw 3 circles (~1cm diameter) in each corner of the triangle.
2. Draw the same size circle on the outside of the triangle at each of the 3 midpoints.
3. Draw a circle that's approximately half the diameter (~.5 cm) of the other 6 circles in the center at each midpoint.



STEP 3 (white pencil)

DRAW THE TRICERATIUM DIATOM OUTLINE

[34:55 minutes into workshop]

*Start by using a light pressure until you're happy with the arc, then go over it with a heavy line, avoid making a straight line.

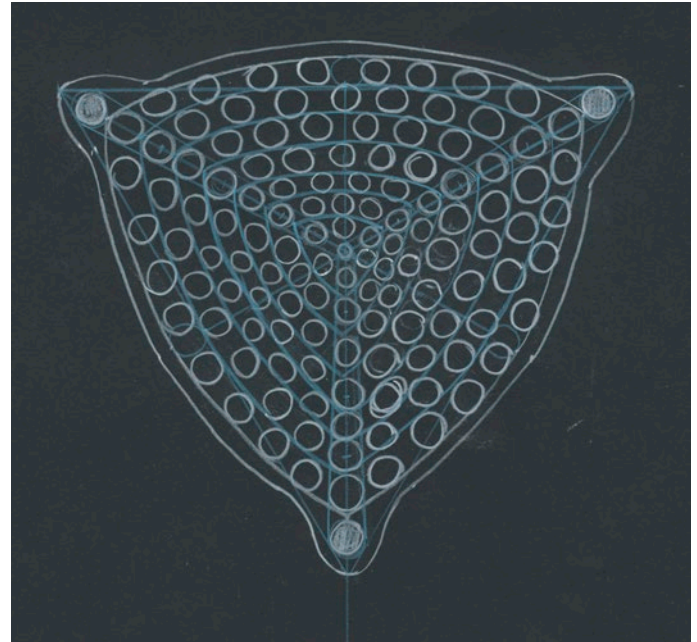
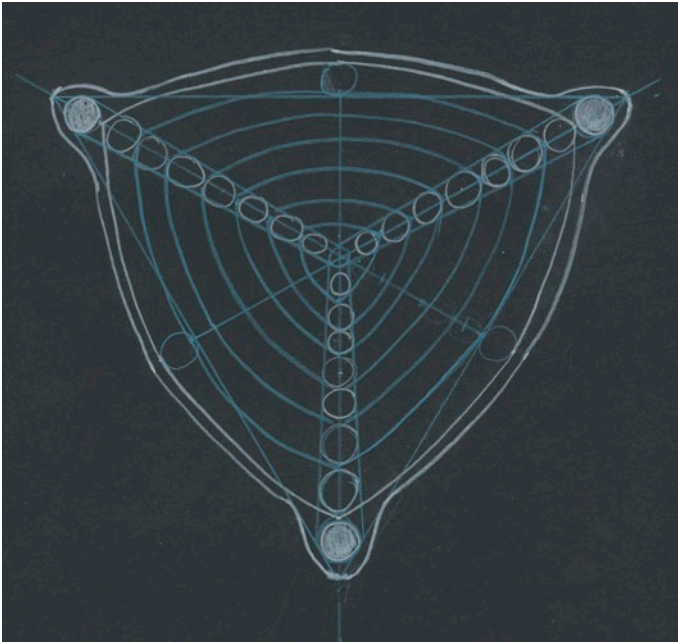
1. Draw the interior line first.
2. Use the circles as guides to draw an arc between each corner of the triangle that starts and ends touching the bottom of each circle that bisects the line, it should skim the top of the circle at the midpoint.
3. To simplify the arc, start at the midpoint and draw each side of the arc separately instead of going from corner to corner.
4. Start drawing the exterior outline by drawing a short arc (ie. an eyebrow) above each circle located in the corners, use the tip of the triangle's corner as a guide, stop the arc halfway.
6. Draw a contour line around the outside of the interior line you drew in step one and match the spacing you created in the arc above each circle.

STEP 4 (blue pencil)

DRAW GUIDES FOR THE HEXAGONAL STRUCTURE

[40 minutes into workshop]

1. Using your straight edge, draw a line from the outside edge of each corner circle to the outside edge of the center circle. The lines provide a guide to create a stack of circles decreasing in size.
2. Using the walls of each tapering column as a guide, stack the circles, just touching between the center and outside circle, approx. 7 circles will fit between the two other circles (total of 9).
3. Make sure to use the same number of stacked circles for all 3 columns.



STEP 5 (blue pencil)

INTERIOR CONTOUR GUIDES

[44:15 minutes into workshop]

1. Begin with the outer most circles as guides and create a contour line that is as wide as the height of each circle, being careful to maintain the arc.
2. It's easiest to do each section, from corner to corner, working from the outer edge to the interior. For more of a challenge rotate the paper and make a contour line all the way around, pausing at each corner.

STEP 6 (white pencil)

STAGGERED CIRCLES

[47 minutes into workshop]

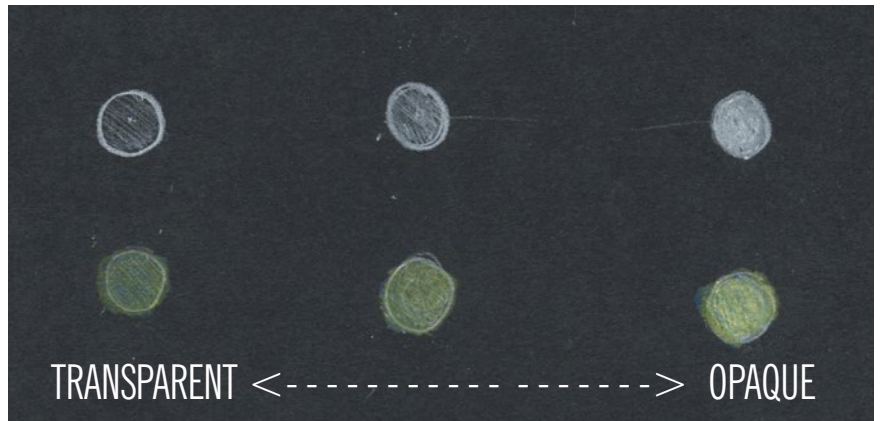
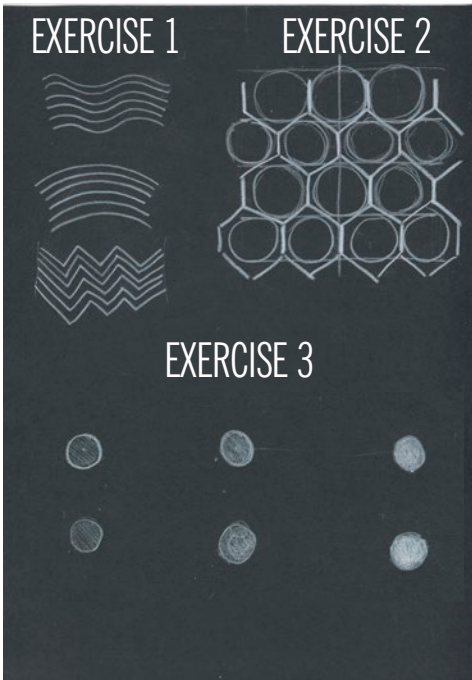
1. Start with the innermost trianglular guide and add an open circle (not colored in) between each of the other three. The second row will have an 'error' in that you will stack two circles on top of one another.
2. Leave air (black space/white space) between each circle.
3. Stacking and staggering the circles creates the framework for the hexagonal structure.
4. Easier to do each section versus all the way around (unless you'd like more of a challenge).

NOW IT'S TIME TO ADD COLOR!

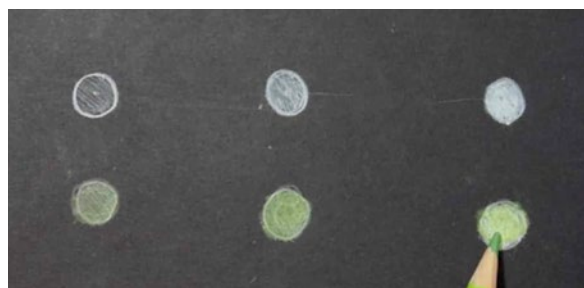
ADDING COLOR TO EXERCISE 3 (green and blue pencil recommended)

[53:28 minutes into workshop]

Grab your first piece of paper, the one with the three exercises.

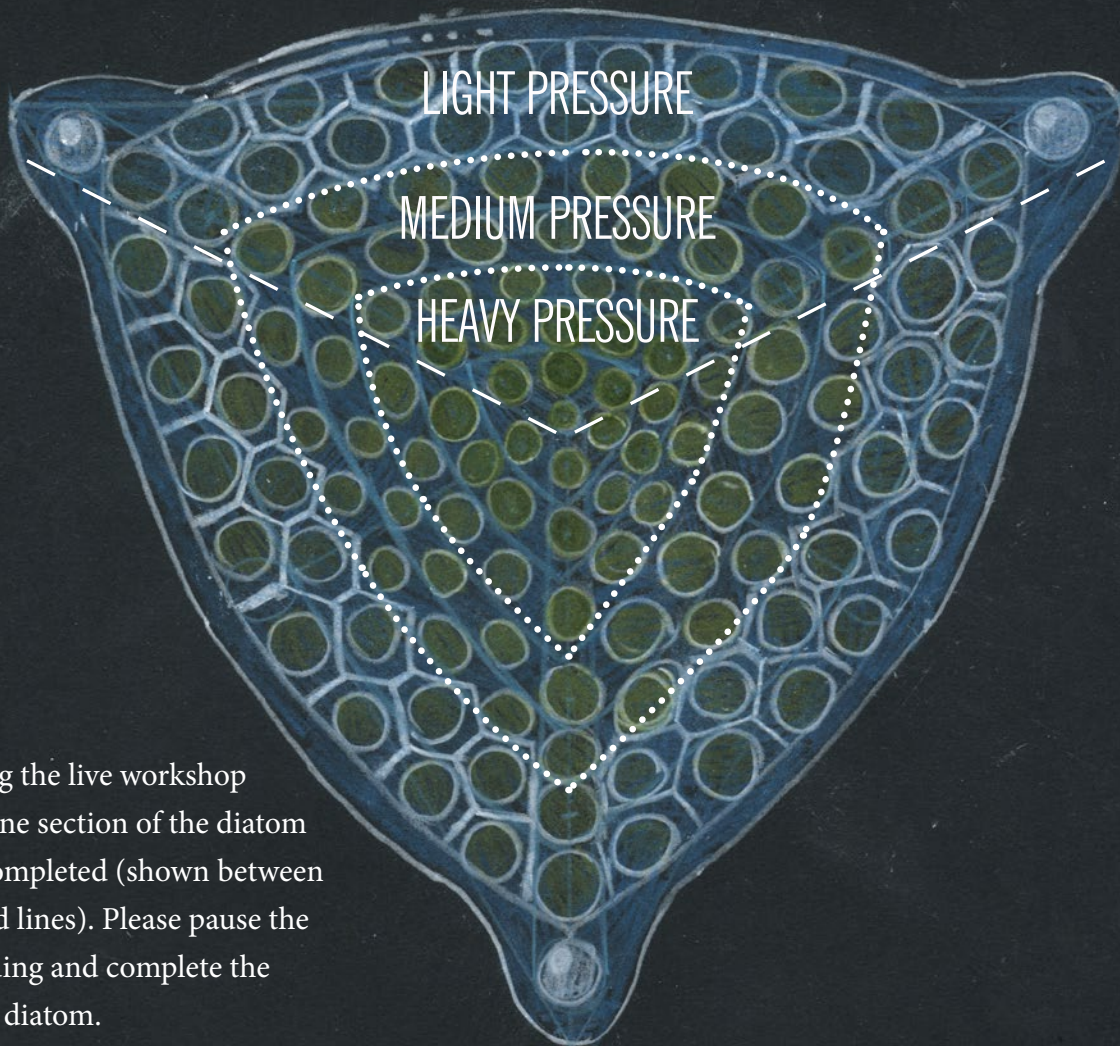


Using medium pressure, fill in all three bottom circles with green, then fill in with blue using the exact same pressure.



COLORING Triceratium robertsianum (green and blue pencil recommended)

[58 minutes into workshop]



During the live workshop only one section of the diatom was completed (shown between dashed lines). Please pause the recording and complete the whole diatom.

STEP 1 (green pencil)

1. Using heavy pencil pressure, fill in the central and two innermost rows of circles.
2. Using medium pressure, fill in the next two rows .
3. Using light pressure, fill in the two outermost rows.

STEP 2 (white pencil)

Create a hexagon structure around the two outermost rows of circles.

STEP 3 (blue pencil)

Using light pressure, color the entire interior of the diatom.

STEP 4 (white pencil)

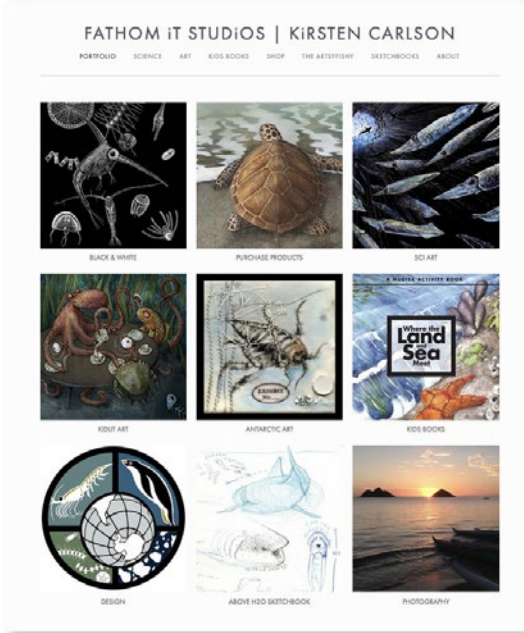
Create a sense of 3D and glassy (silica) shine by adding some highlights.

OPTIONAL PRE-STEP* (white pencil)

Before doing STEP 1 in green, you may opt to fill in the circles with a white pencil using the same directions in STEP 1. The diatom on the cover was done in this way.

FATHOM IT STUDIOS RESOURCES

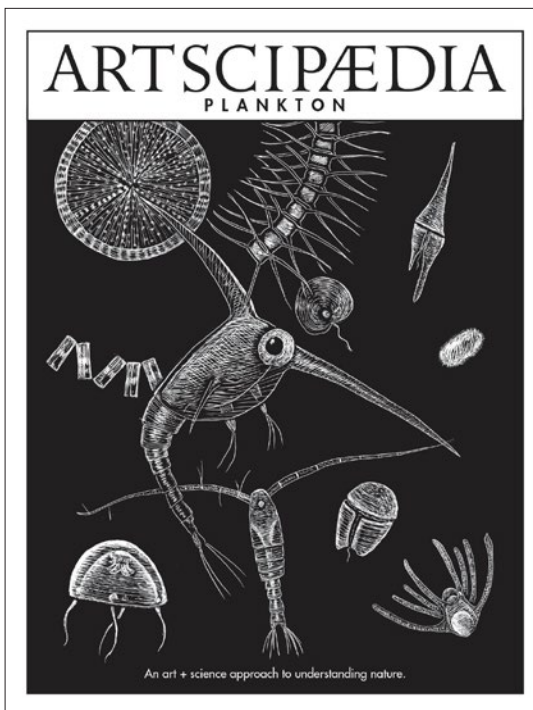
I hope you enjoyed the workshop! I invite you to visit my online studio where you can sign up for updates if you'd like more sci-art! At the bottom right is an article I wrote about the importance of a sketchbook to the sci-artist.



FREE POSTER DOWNLOAD:
<https://schmidtocean.org/education/ocean-education-resources/>

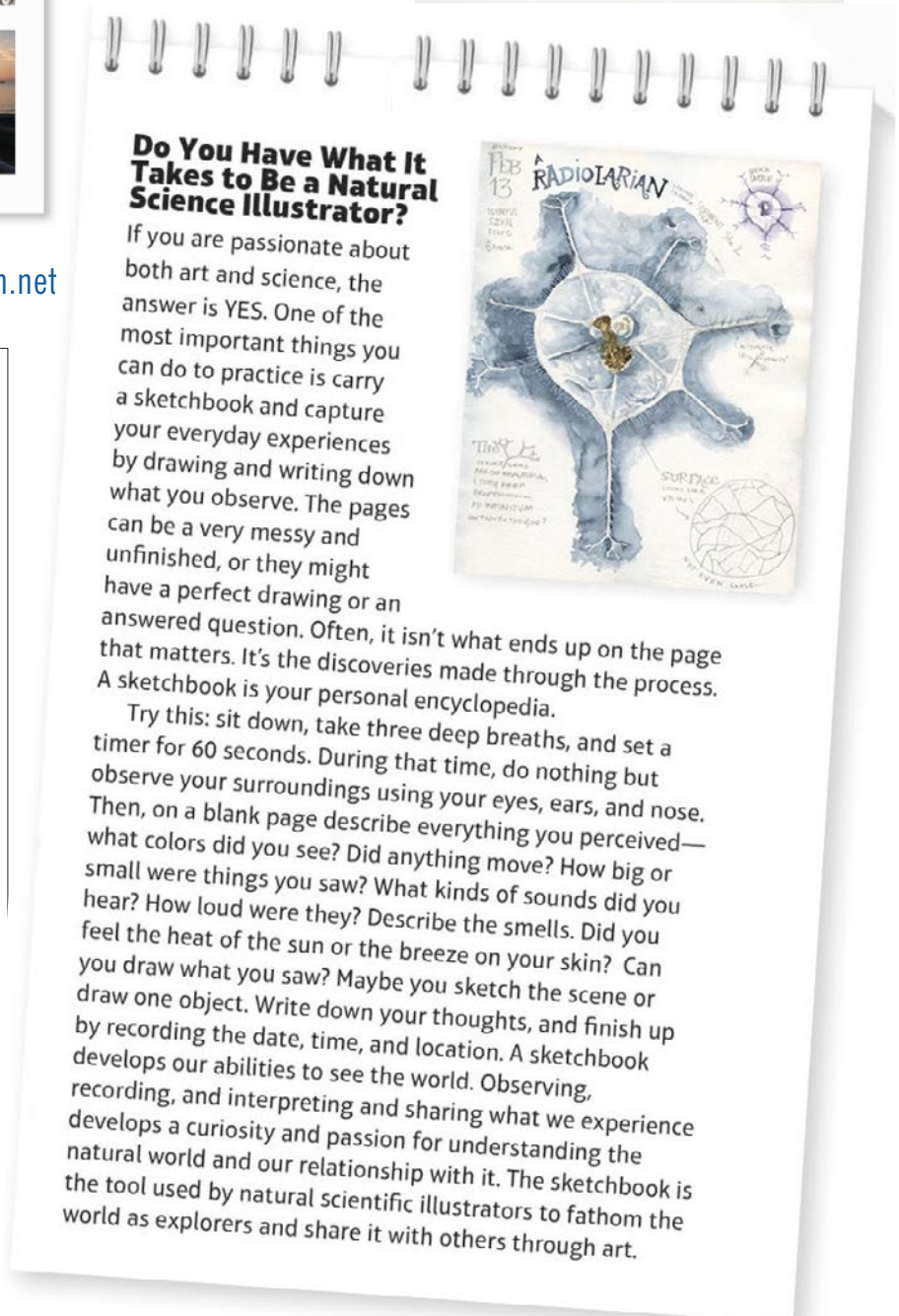


VISIT ME ONLINE: www.kirstencarlson.net



FREE ARTSCIPAEDIA COLORING ZINE DOWNLOAD:

- US Size, Hawaii Artist-in-Residence
- A4 Size, Go2Qurious



Do You Have What It Takes to Be a Natural Science Illustrator?

If you are passionate about both art and science, the answer is YES. One of the most important things you can do to practice is carry a sketchbook and capture your everyday experiences by drawing and writing down what you observe. The pages can be a very messy and unfinished, or they might have a perfect drawing or an answered question. Often, it isn't what ends up on the page that matters. It's the discoveries made through the process. A sketchbook is your personal encyclopedia.

Try this: sit down, take three deep breaths, and set a timer for 60 seconds. During that time, do nothing but observe your surroundings using your eyes, ears, and nose. Then, on a blank page describe everything you perceived—what colors did you see? Did anything move? How big or small were things you saw? What kinds of sounds did you hear? How loud were they? Describe the smells. Did you feel the heat of the sun or the breeze on your skin? Can you draw what you saw? Maybe you sketch the scene or draw one object. Write down your thoughts, and finish up by recording the date, time, and location. A sketchbook develops our abilities to see the world. Observing, recording, and interpreting and sharing what we experience develops a curiosity and passion for understanding the natural world and our relationship with it. The sketchbook is the tool used by natural scientific illustrators to fathom the world as explorers and share it with others through art.

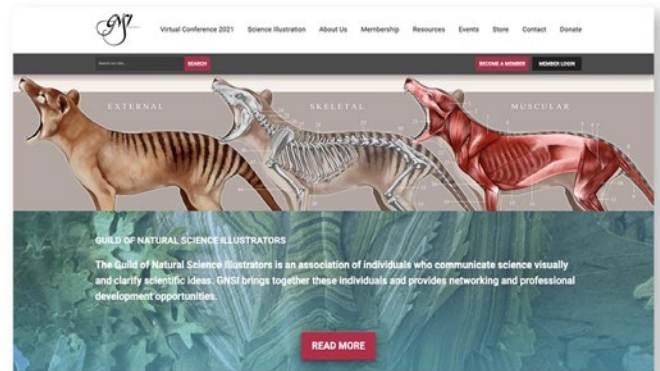
MORE SCI-ART & PLANKTON RESOURCES

GUILD OF NATURAL SCIENCE ILLUSTRATORS

www.gnsi.org

A great resource if you'd like to know more about a career in sci-art or explore the world of scientific illustration.

The best place to start is the FAQ page!



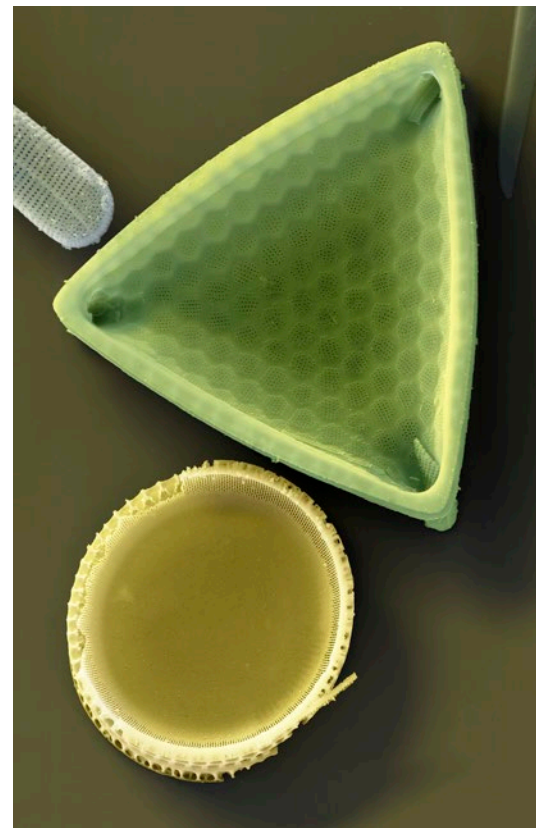
ARTICLE MENTIONED IN WORKSHOP

[Nature's Nanotechnologists:](#)

[Unveiling the Secrets of Diatoms by Jane Bradbury](#)

Published: October 12, 2004

“Diatoms, unicellular algae with ornate silica shells, have fascinated amateur and professional biologists ever since the invention of the microscope. But these days, diatoms and their exquisite shells are also attracting the attention of nanotechnologists who hope that diatoms will teach them how to make minute structures currently beyond the capabilities of materials scientists. And now these nanotechnologists, together with ecologists interested in the global carbon cycle—in which diatoms play a central role—have a genomic blueprint to help them in their studies: the annotated genome sequence of *Thalassiosira pseudonana*.”



BONUS: I ❤️ PLANKTON

[The Diatomist by Matthew Killip](#)

I didn't have a chance to mention this during the workshop, but I absolutely fell in love with the art of arranging diatoms using a microscope.

[The Diatomist](#) is a wonderful short film about Klaus D. Kemp's creative sci-art quest to keep this Victorian age microscopic art form alive in the 21st Century. 🐾

