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To send light into the darkness of men's hearts – such is the duty of the artist. Schumann

Drawing Session 3: Patterns in Nature
Learning to REALLY SEE!

- Worksheets are from
- Slideshow of examples of patterns seen in nature
- *Exercise: Drawing the patterns in fruit.*

Taken from **Lessons in Classical Drawing** by Juliette Aristides
Chapter One…***The World Through an Artists Eye***

"When we look deeply into the patterns of an apple blossom, a seashell, or a swinging pendulum we discover a perfection, an incredible order, that awakens in us a sense of awe that we knew as children. Something reveals itself that is infinitely greater than we are and yet part of us; the limitless emerges from limits.
--Gyorgy Doczi

Spend time looking before you start to draw. Looking in a physically different way can also be helpful in breaking you of your preconceived visual notions. Squint to simplify…I reserve the beginning part of a drawing almost exclusively for pattern seeking. Writers often draft thesis statements before beginning a project, a few sentences that summarize their entire work:

Beginning artists often work piecemeal…having no plan or map to provide an overall structure. In the Northwest every year we hear of hikers walking into the woods in their flip-flops and a bottle of soda only to be saved by a search-and-rescue team three days later. …A few structural lines in the beginning often mean the difference between a successful drawing and a disappointing one.

Almost anything in nature can be categorized into one or more of the **Five Patterns in Nature**. Spiral, Meander, Packing, Branching, and Explosion.

1. **Spiral**: a seashell, a spider web
2. **Meander**: a snake's trail through the sand, ripples in the water
3. **Packing**: honeycombs of a beehive, grains of sand
4. **Branching**: trees, veins on a leaf
5. **Explosion**: a sunflower, a snowflake.

Fibonacci number

From Wikipedia, the free encyclopedia

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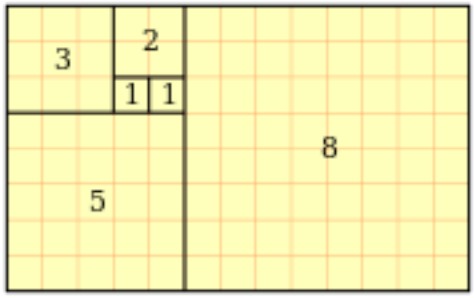
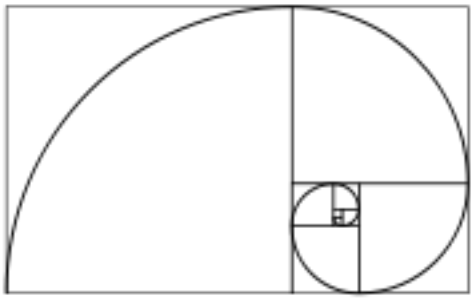


A tiling with squares whose sides are successive Fibonacci numbers in length



A Fibonacci spiral created by drawing circular arcs connecting the opposite corners of squares in the Fibonacci tiling; this one uses squares of sizes 1, 1, 2, 3, 5, 8, 13, 21, and 34. See golden spiral.

In mathematics, the **Fibonacci numbers** or **Fibonacci series** or **Fibonacci sequence** are the numbers in the following integer sequence:

$$1,\ 1,\ 2,\ 3,\ 5,\ 8,\ 13,\ 21,\ 34,\ 55,\ 89,\ 144,\ \ldots.$$

By definition, the first two numbers in the Fibonacci sequence are 0 and 1 (alternatively, 1 and 1), and each subsequent number is the sum of the previous two.

The Fibonacci sequence is named after Leonardo of Pisa, who was known as Fibonacci. Fibonacci's 1202 book *Liber Abaci* introduced the sequence to Western European mathematics,[3] although the sequence had been described earlier in Indian mathematics.[4][5][6] (By modern convention, the sequence begins either with $F_0 = 0$ or with $F_1 = 1$. The *Liber Abaci* began the sequence with $F_1 = 1$, without an initial 0.)

Fibonacci numbers are closely related to Lucas numbers in that they are a complementary pair of Lucas sequences. They are intimately connected with the golden ratio, for example the closest rational approximations to the ratio are 2/1, 3/2, 5/3, 8/5, ... Applications include computer algorithms such as the Fibonacci search technique and the Fibonacci heap data structure, and graphs called Fibonacci cubes used for interconnecting parallel and distributed systems. They also appear in biological settings,[7] such as branching in trees, phyllotaxis (the arrangement of leaves on a stem), the fruit sprouts of a pineapple,[8] the flowering of artichoke, an uncurling fern and the arrangement of a pine cone.[9]

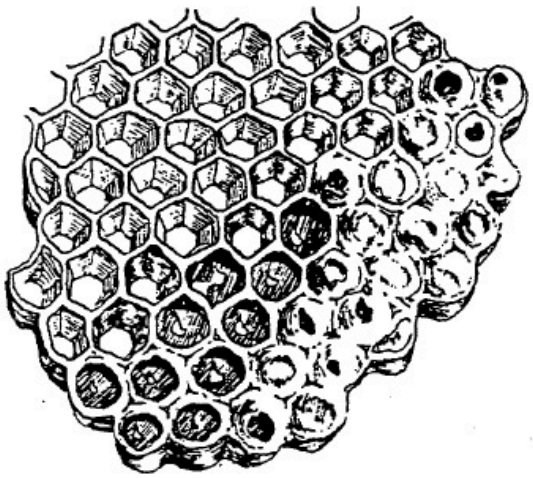
You Tube Video https://www.youtube.com/watch?v=7Uo4Oond1e8 The Fingerprint of God : Fibonacci numbers & Golden ratio

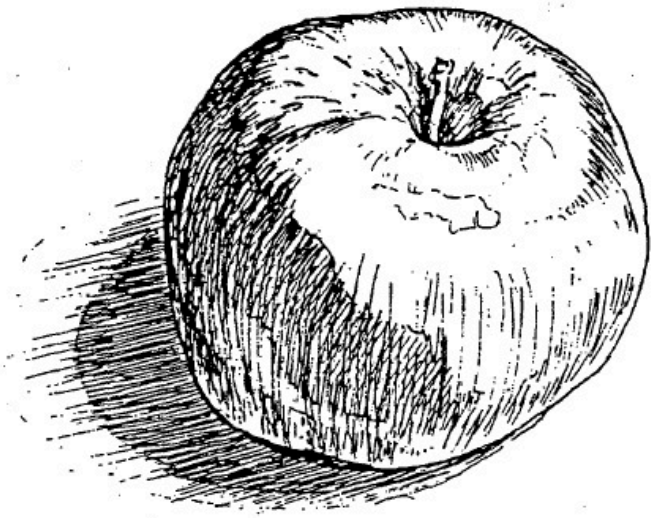
Patterns in Nature

arian Farrior

The permaculture principle of observing and replicating patterns in nature can become a fascinating study—and a life-long one. Here is a short outline of the primary patterns that occur in nature. These patterns are about forms in space; timing and rhythms influence them as well, but as my observations are part of a life-long study, I have not yet had enough opportunity to research the time dimension!

This synopsis follows the outline from Peter Boyle's wonderful book, *Patterns in Nature* (see references), with a few additions.



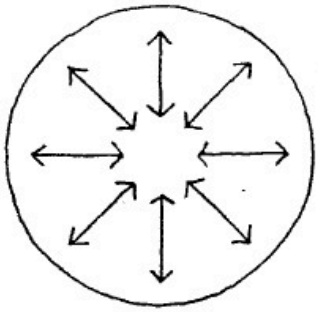


Sphere: expansion and contraction

Pattern of Perfection

Shapes: Sphere, Hemisphere, Dome

Purpose or Function: The sphere is a balance between expansive and contractive, outward and inner forces. Spheres provide the least amount of surface area for the most volume; this shape minimizes heat loss.



Examples in Nature: Planets, stars, drops of water, radiolarians, volvox algae, diatoms, eyes, eggs, seeds, cherries, crabapples, squash, pumpkins, breadfruit.

Associated Mathematical Terms: Volume = 4/3 r^3; Surface area = 4 r^2

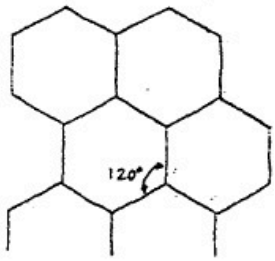
Examples in Garden and Permaculture Design: circle gardens, solar umbrellas, geodesic domes.

Illustrations by Lisa Wittrup

Patterns of Packing & Cracking

Shapes: Polygon, Nets

Purpose or Function: Three-way joints with shared partitions minimize surface area required to enclose the same amount of volume. This shape saves space, material, energy, and creates the shortest path (besides a line); it also provides a rigid structure.



Hexagon: 120°

Examples in Nature: soap bubbles, ice crystals, honeycombs, corn kernels, turtle shells, snake skin scales, basalt columns, cilia struts, bird bones, network of veins in plants.

Associated Mathematical Terms: hexagon: 120° angles

Examples in Garden and Permaculture Design: hexagonal spacing of plants in Biodynamic systems; triangular spacing of seeds or plants; storage

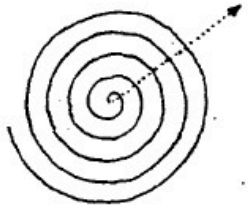
Patterns of Growth

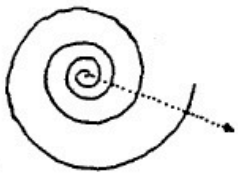
Shapes: Spiral, Helix

Purpose or Function: Spirals add size without changing the shape. They uniformly fill a space and maximize the amount of material within it. The ability to contract like a spring adds length without adding width. "Spirals are found where harmonic flow, compact form, efficient array, increased exchange, transport, or anchoring is needed" (Mollison, p. 83).

Examples in Nature: spider web, mollusk shells, sea shells, horns, composite florets, cacti, fern fronds, vine

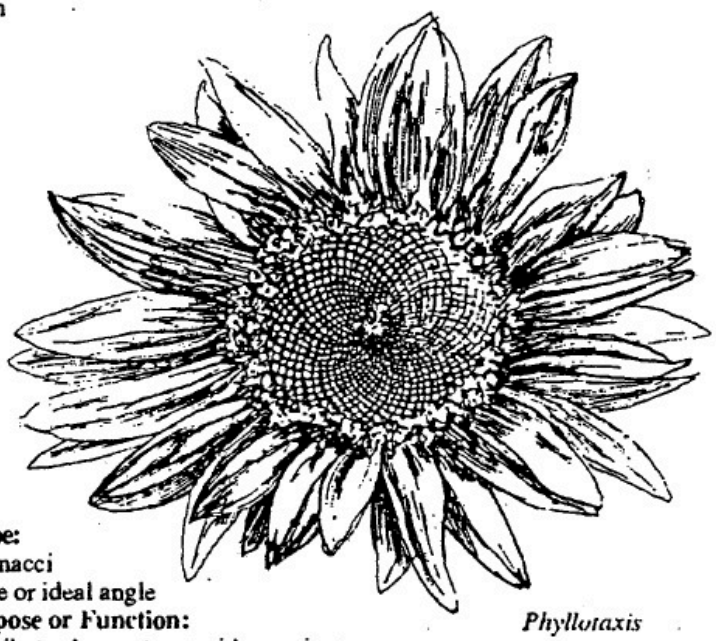
Logarithmic spiral

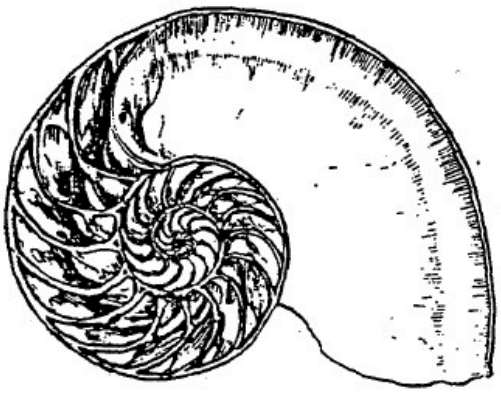




Archimedean spiral

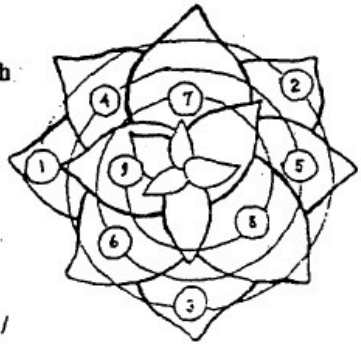
tendrils, pine cones, pineapple, eddies, hurricanes, convection currents, sunspots, planetary orbits, galaxies, DNA.
Associated Mathematical Terms: The Archimedes spiral maintains a constant distance between coils and increases arithmetically (see picture). The logarithmic spiral (also called equiangular or proportional spiral) increases geometrically, usually by the number $\phi = 1.61803...$, where $\phi = \phi^2 - 1$. Phi (ϕ), or the proportion 1.61803:1, is called the Golden Mean or Golden Ratio. Phi (ϕ) is approximated by the ratio of each number in the Fibonacci series of integers to the previous number, where each number in the series is defined as the sum of the preceding two numbers, i.e., 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, etc. The ratio of F_{16}/F_{15} in this series is 1.618032786.
Examples in Garden and Permaculture Design: Spiral garden; Spiral plowing





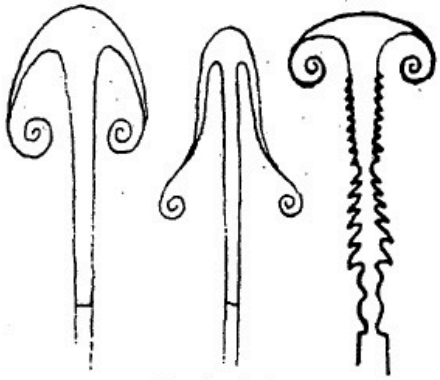
Shape: Fibonacci angle or ideal angle
Purpose or Function: Distributes leaves to provide maximum exposure to sunlight with minimum overlapping of leaves.
Examples in Nature: Phyllotaxis, which is the distribution or arrangement of leaves or buds on a stem, or seeds in a flowerhead.
Associated Mathematical Terms: Fibonacci angle = 137.5°; Divergency constant, approximately .3819 = 137.5/360, defined as (t/n), where t = the number of turns around a stem or axis, and n = the number of leaves; e.g. 1/2, 1/3, 2/5, 3/8, 5/13, 8/21. Notice the Fibonacci numbers recurring in the ratio Fn/Fn+2.
Examples in Garden and Permaculture Design: spiral garden

Phyllotaxis



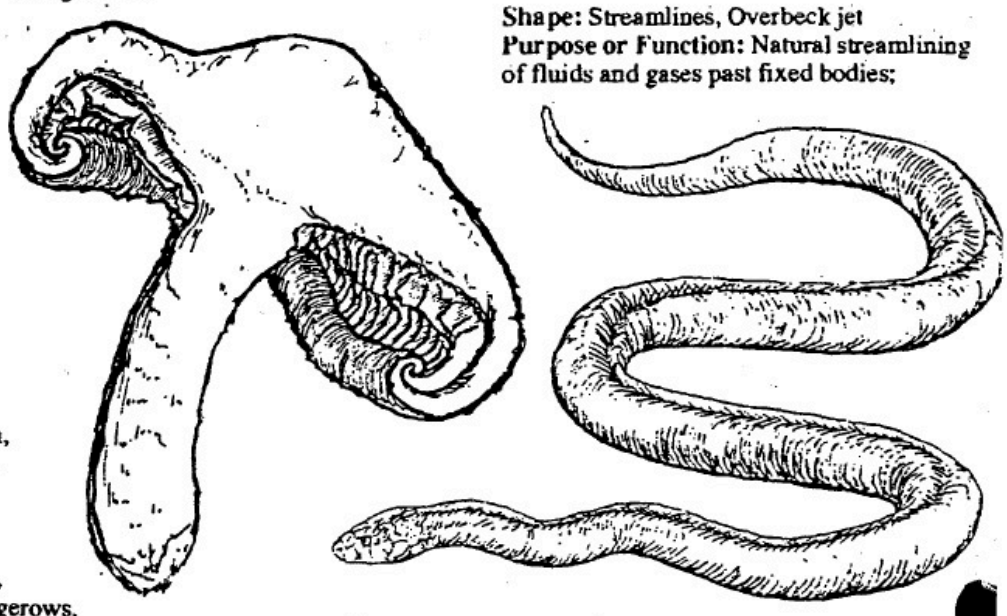
Patterns of Flow

Shape: Meander, Waves, Ripples
Purpose or Function: movement, circulation, transportation, uniform expenditure of energy
Examples in Nature: streams, rivers, glaciers, sand dunes, moray eel, snake
Associated Terms: laminar flow, vortices, turbulence, elliptical intervals, lobes. **Examples in Garden and Permaculture Design:** edge effect, crenelated edge of pond, lobular pathways and gardens.



Overbeck Jet

Shape: Streamlines, Overbeck jet
Purpose or Function: Natural streamlining of fluids and gases past fixed bodies; generates vortices or spirals.
Examples in Nature: mushrooms, jellyfish, rivers flowing into the sea, cream in coffee, van Karman trails in water, Ekman spirals in wind Associated Term: Torus
Examples in Garden and Pc Design: keyhole garden; mandala garden; flowforms, permanent forest edges, windrows, and hedgerows.



Patterns of Branching

Shapes: Forks, bilateral [illegible]ymetry, explosion and double [illegible]losion.

[illegible]pose or Function: [illegible]ollection and distribution of nutrients or physical properties, such as energy. Diffusion and infusion of materials and heat. The most efficient way to reach all points in a large area while moving the shortest possible distance (less weight and stress). Multiple branches help to preserve information, and permit regrowth in case of damage. A common pattern for small flowerheads—yielding a dense array of florets to attract insects; or barbs for protection, or for seed dispersal.

Forks

Bilateral Symmetry

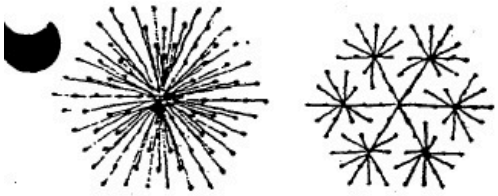
Examples in Nature:

Forks: Trees, roots, leaves, antlers, feathers, blood vessels, river systems

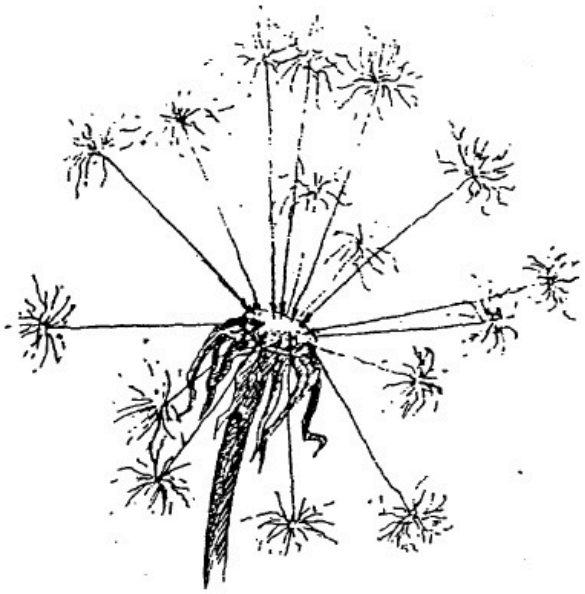
Bilateral symmetry: evergreens, ferns, leaf veins

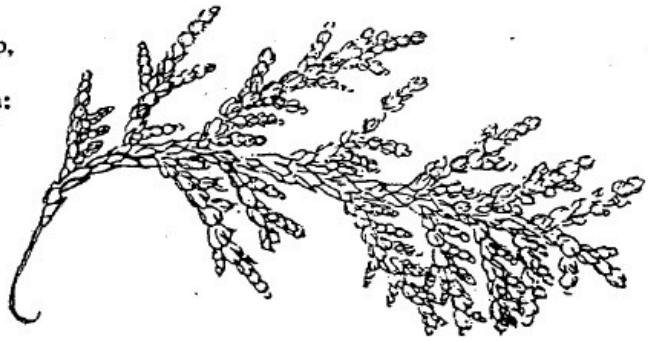
Explosion and double explosion: seed pods, clover blossoms, Queen Anne's lace, wild parsnip, goatsbeard, other umbel flowers.

Examples in Garden and Permaculture Design: garden pathways; heat exchange.



Explosion and Double Explosion





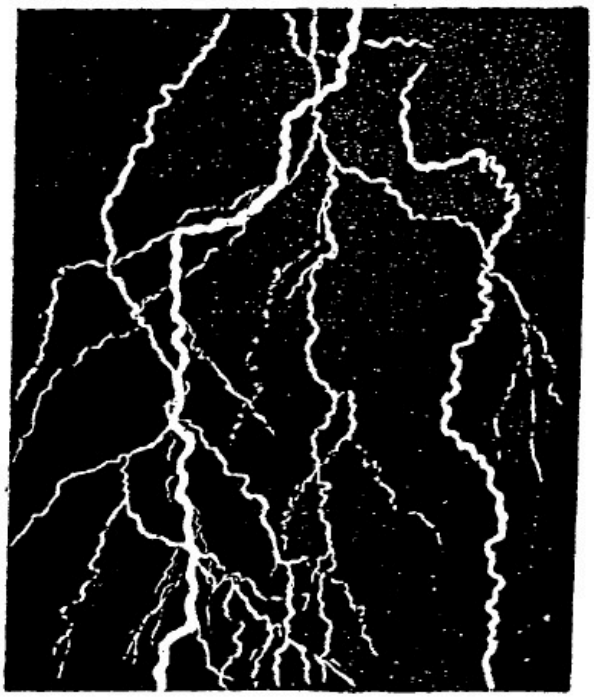
Shape: Fractals, Scatter patterns

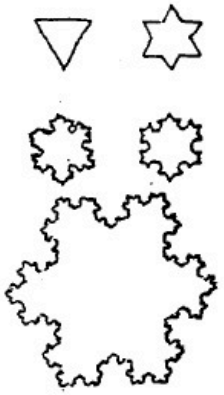
Purpose or Function: Self similarity—repeated duplication of shape on smaller scales (iteration); detail looks like larger picture. Irregular complex structures.

Examples in Nature: rocky coastlines, ferns, lichens, tree branches, roots, clouds, frost crystals, snowflakes, fault lines, lightning, neuronal nets, information nets

Associated Mathematical Terms: fractal geometry, nonlinear equations, chaos dynamics

Examples in Garden and Permaculture Design: pathways, networks, clusters





Fractal: iteration

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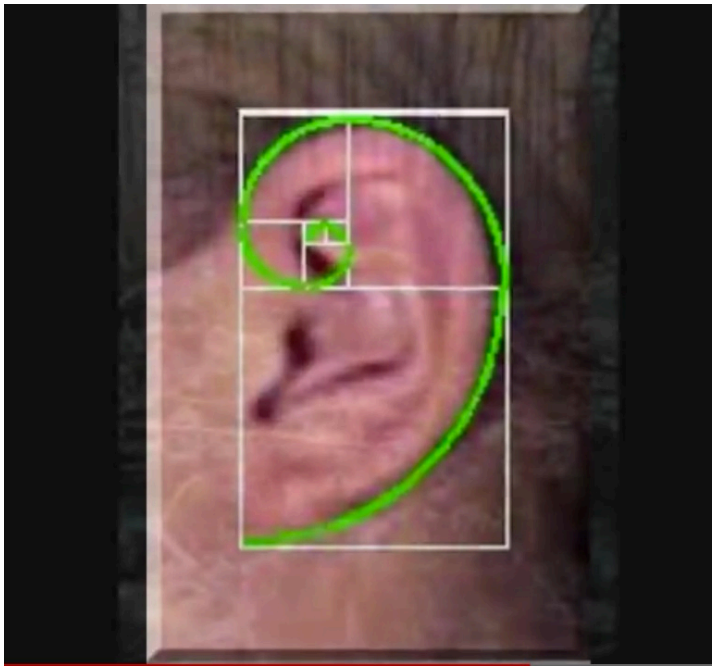

Mrs. Browns art Class Students are taught the idea that anything in nature can be categorized into one or more of the **Five Patterns in Nature**. Spiral, Meander, Packing, Branching, and Explosion. (Examples: **Spiral**: a seashell, a spider web; **Meander**: a snake's trail through the sand, ripples in the water; **Packing**: honeycombs of a beehive, grains of sand; **Branching**: trees, veins on a leaf; **Explosion**: a sunflower, a snowflake.)

Students reviewed the five patterns in nature and were introduced to the artwork of the American artist Andy Warhol. They created a grid using rulers and pencils and filled in their grid with abstract interpretations of the five patterns in nature. This is reminiscent of many of Warhol's screenprints, such as the famous print titled "Marilyn Monroe". Students noticed Warhol's vibrant use of color in his images, and they used bright markers to color in their own pictures.

Juliette Aristides YouTube Video LCSC Center for Arts & History on January 18, 2013

Drawing….Seeing…
Newsweek article on getting rid of cursive in school. Why such a disappointment?
Early American 19th century drawing books often starting their drawing lessons with handwriting and linked it from handwriting to drawing to geometry all in one book. If you get rid of handwriting you may be getting rid of the only drawing instruction some will ever have.

Drawing is the foundation of painting and sculpture and architecture.

Most of all drawing helps you SEE. What does that mean?
We all see as soon as we are born. As parents we help our kids put language to what we are looking at and become adept at being able to label things so our sense of sight is very much linked to utility.
In art we strip it back down and just use our eyes purely for aesthetics with the idea of just being able to get great pleasure. Drawing helps us slow down, lock in to something and become basically a child forever because we will never get bored with looking.

A heightened sense of the observation of nature is one of the chief delights that have come to me through trying to paint. (Winston Churchill)

Continuous effort - not strength or intelligence - is the key to unlocking our potential. (Winston Churchill)

A man can wear out a particular part of his mind by continually using and tiring it, just in the same way he can wear out the elbows of his coat. (Winston Churchill)