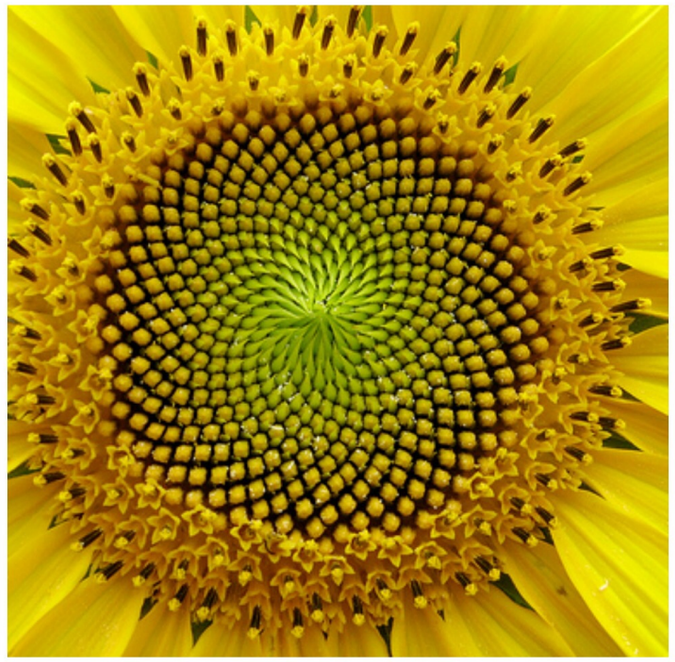
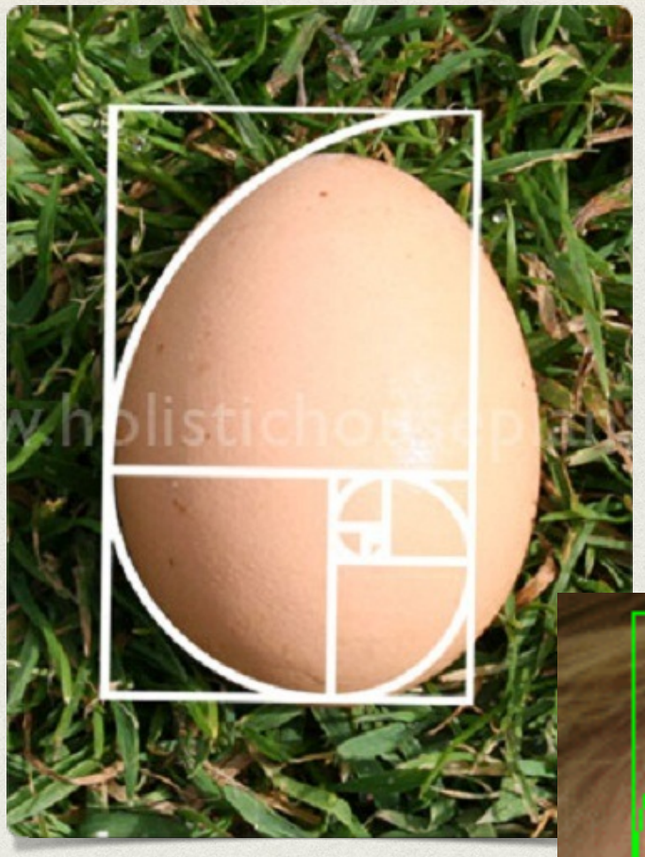



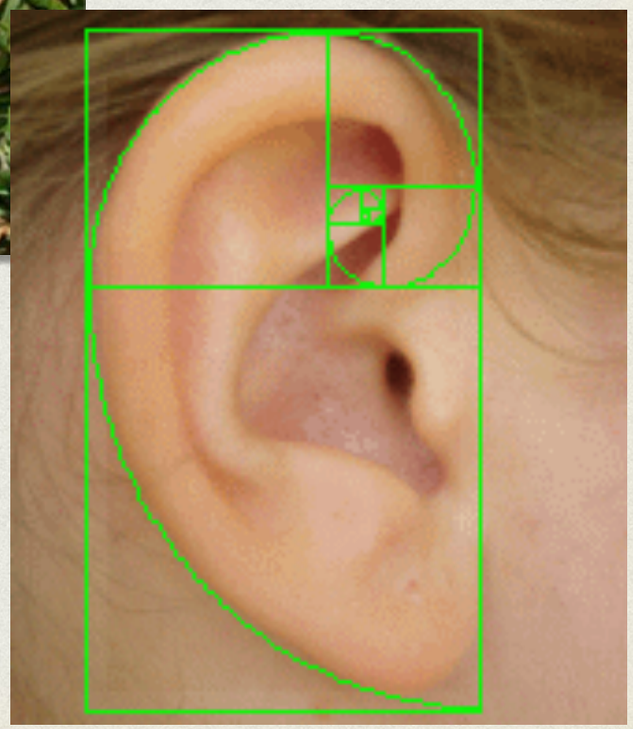

FIBONACCI AND PLANTS

Order and Structure in Aesthetics and Botany

PATTERNS OF NATURE

- Mathematical patterns appear throughout nature particularly in the way in which organisms grow.
- Mathematics can be a tool to describe and predict the physical growth patterns.
- Patterns provide structural advantage for the organism as well as efficient use of resources and space.
- As artists, we can use these patterns and ratios in order to better understand our subject and thereby represent botanical subjects more believably.





WHO WAS FIBONACCI?

- Born around 1175 in North Africa
- Father was a merchant and traded with the East.
- 1202 first book Liber Abaci, introduced the Hindu-Arabic numeric system.
- Famous and respected mathematician in his time.
- Created and explored the solutions to what are now classic mathematic problems. All based in practical issues in the fields of trade, materials estimating, construction, and economic predication.
- Resided and died in Pisa, Italy.

WHAT IS THE FIBONACCI SERIES?

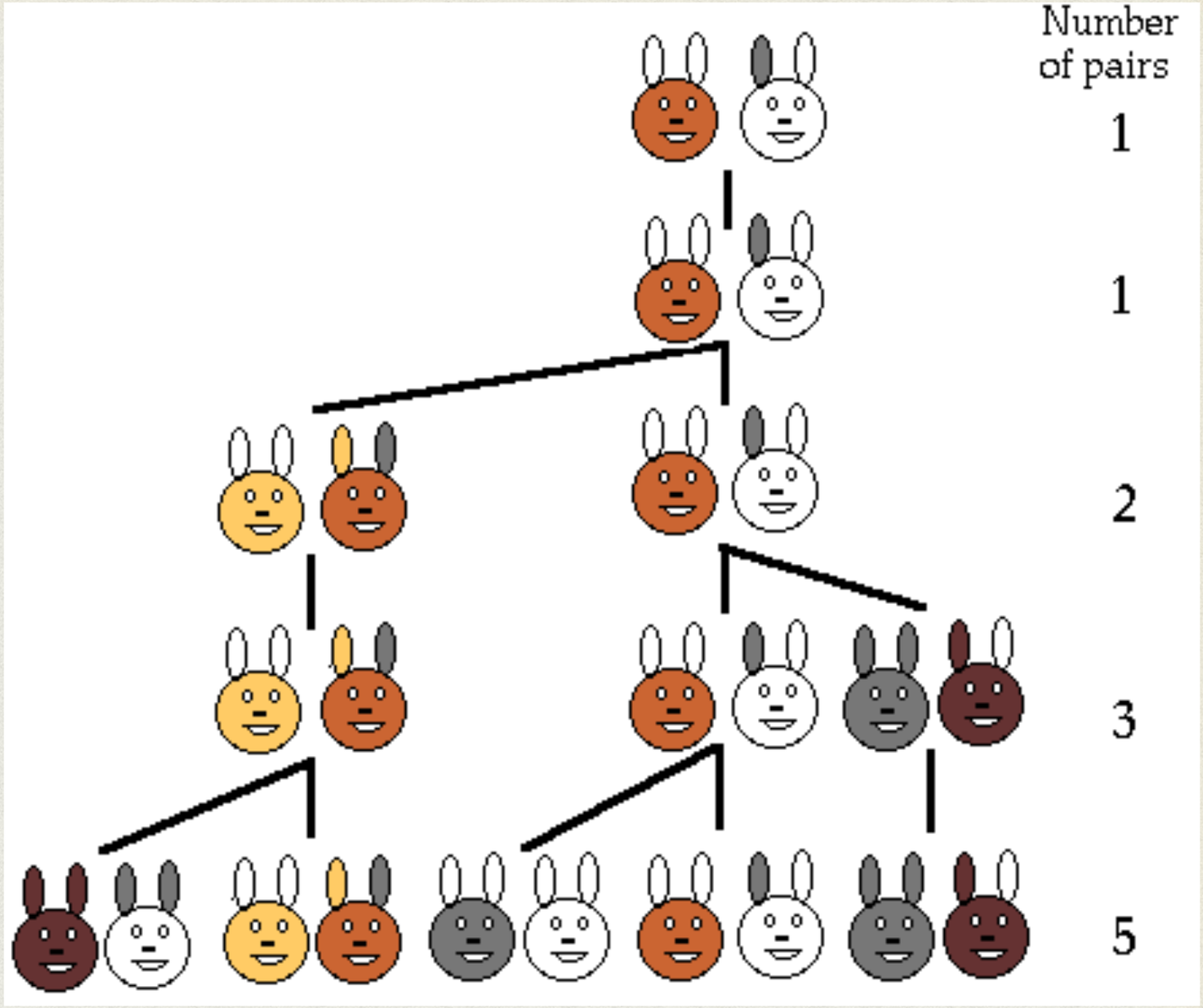
- A numerical sequence of numbers:
  1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144.

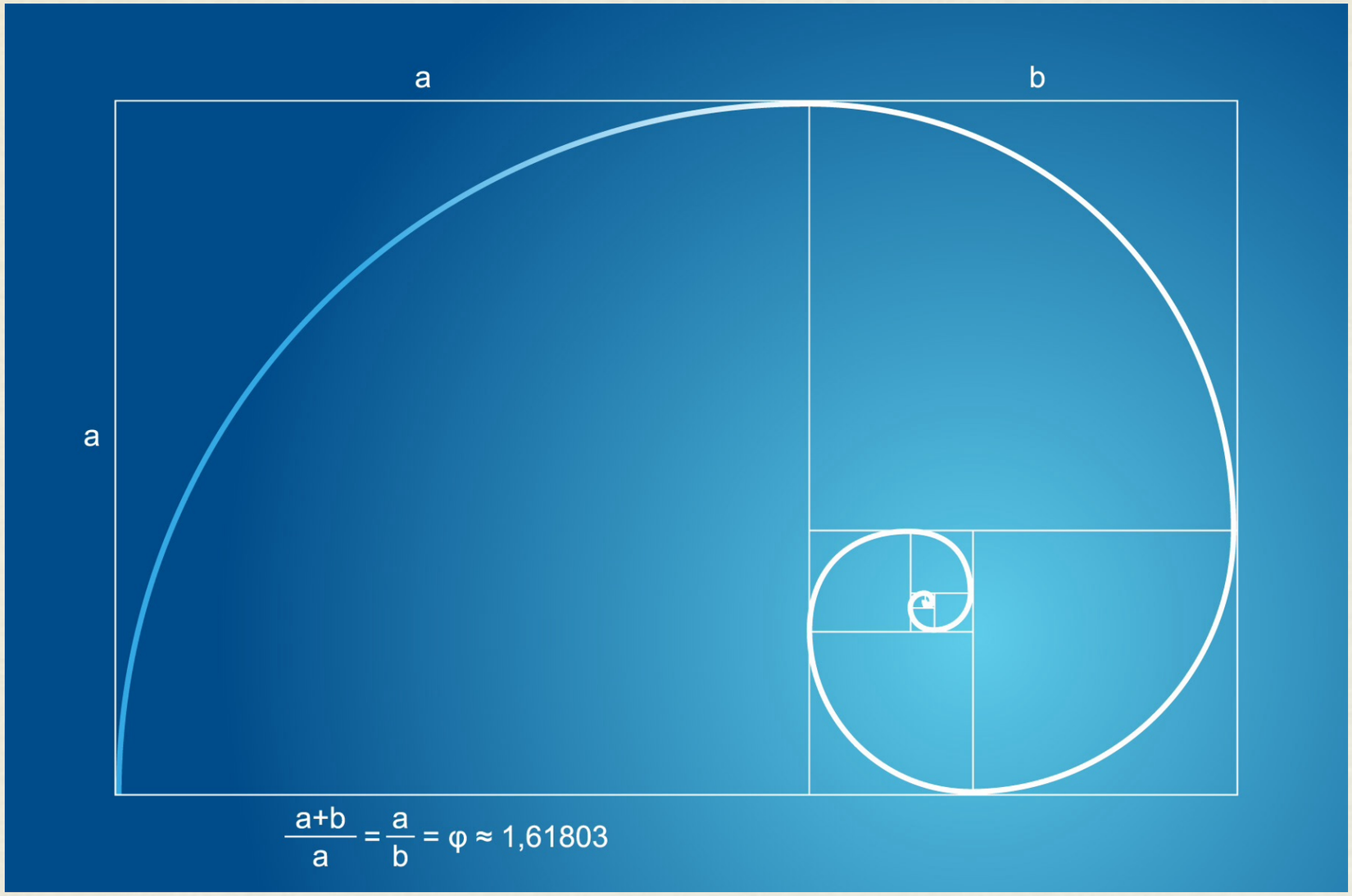
- In this sequence, after the first number, every number is the sum of the previous two.

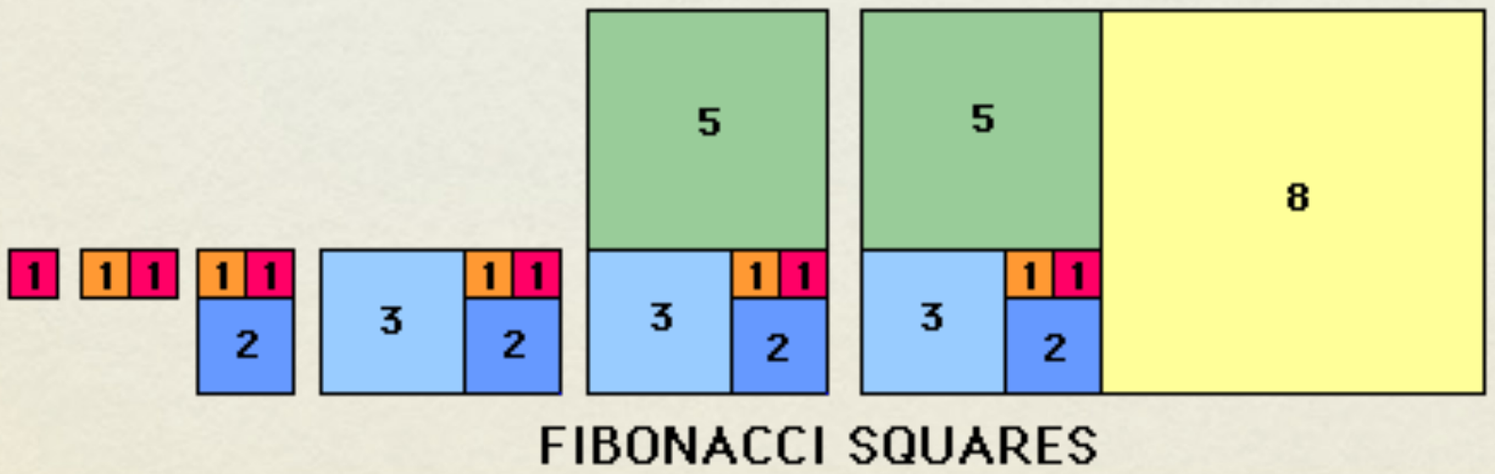
- The fractions formed by successive Fibonacci numbers—e.g., 3/2 and 5/3 and 8/5—get closer and closer to a particular value, which mathematicians know as the golden number, 1.613, represented by the Greek letter Phi (say "fee").

THE PROBLEM WITH BUNNIES

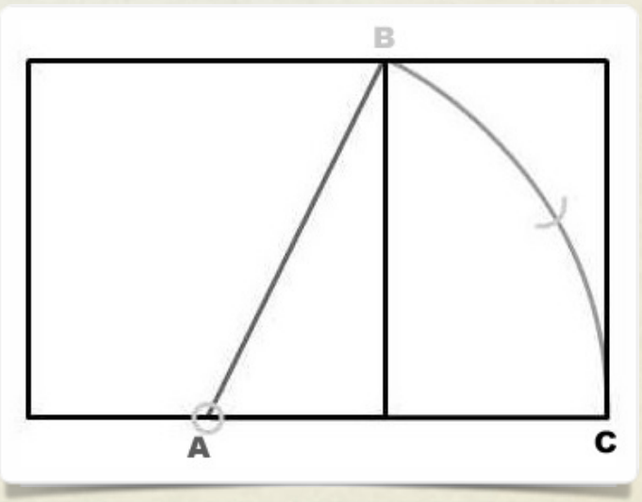
- The original problem that Fibonacci investigated (in the year 1202) was about how fast rabbits could breed in ideal circumstances.
- Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on. The puzzle that Fibonacci posed was…
- How many pairs will there be in one year?
- A lot, in fact this problem gives you the first 300 numbers in the Fibonacci sequence.
- Believe it or not this is the beginning of the computer age and binary sequencing.







FIBONACCI SQUARES



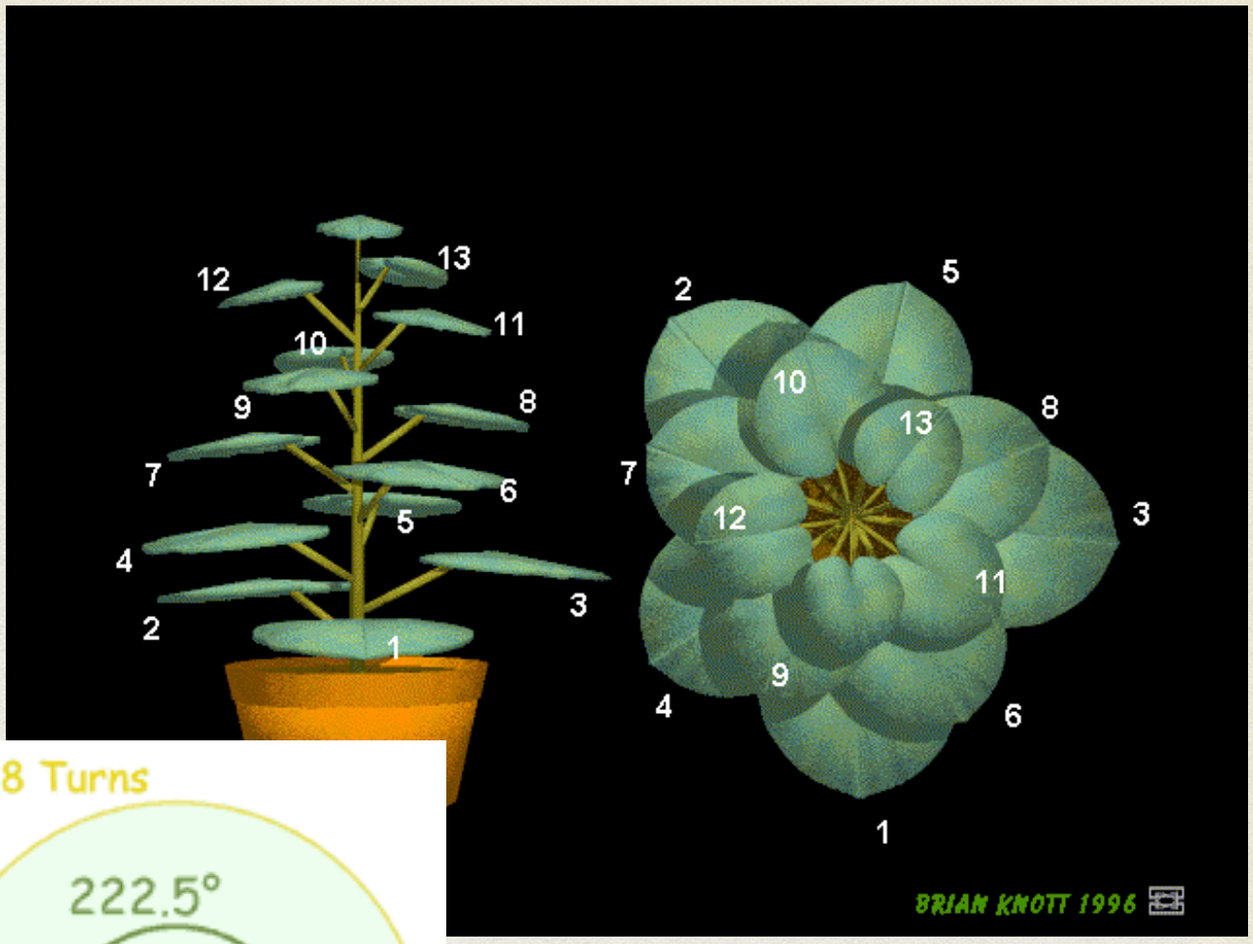
CONSIDER THE SUNFLOWER

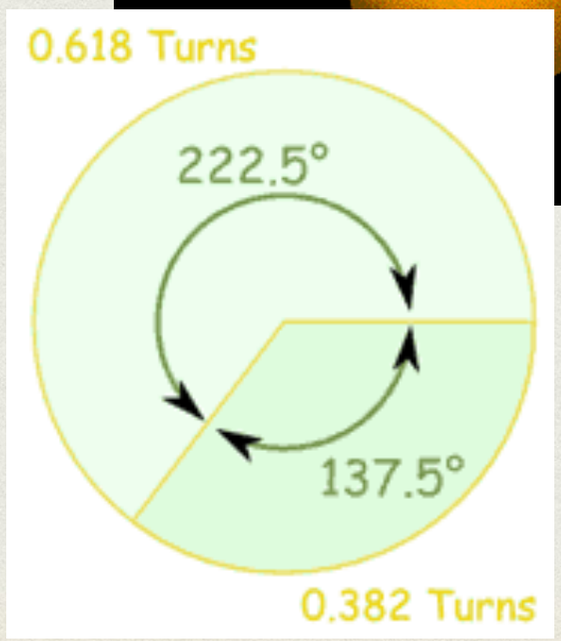
The spiral happens naturally because each new cell is formed after a turn

This pattern and mathematical relationship was noted by the Indian writer and mathematician, Pingala in 200BCE

PHYLLOTAXIS

- The term phyllotaxis means "leaf arrangement" in Greek.
- It was coined in 1754 by Charles Bonnet, a Swiss naturalist.
- Botanists define the phyllotactic ratio as the fraction of a circle through which a new leaf turns from the previous (older) leaf. In the case of a 137.5-degree divergence angle, the ratio is 1/ phi, which is approximately 0.618,



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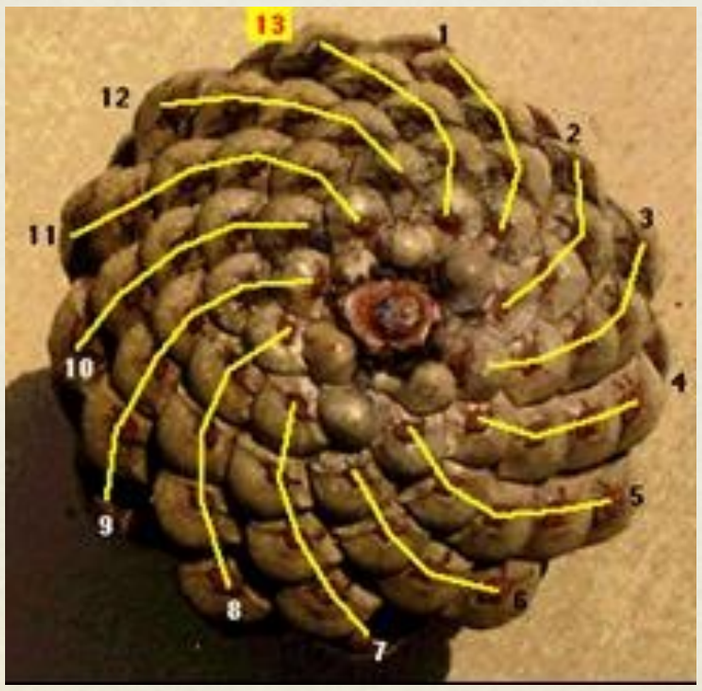
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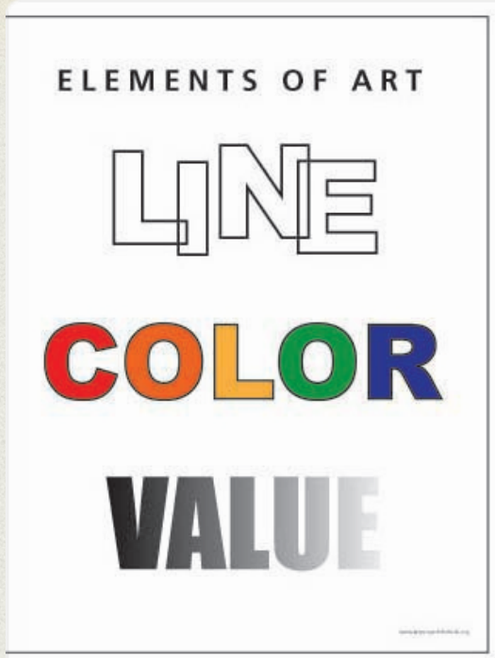
VOCABULARY AND TOOLS IN AESTHETICS

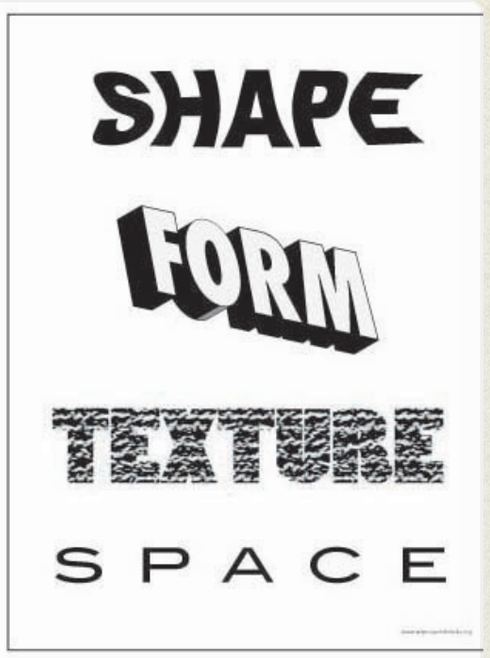
Heade's Magnolia

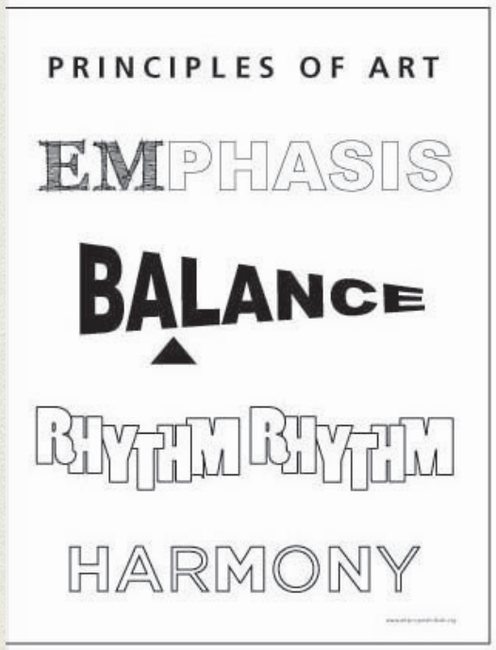
How do we talk about art and how it is made?

ELEMENTS AND PRINCIPLES OF ART

- Elements of Art are the fundamental units of a work of art.
- Principles of Art or Design are the primary ways in which those units are used.
- Think of an analogy with writing: words=elements and grammar=principles.



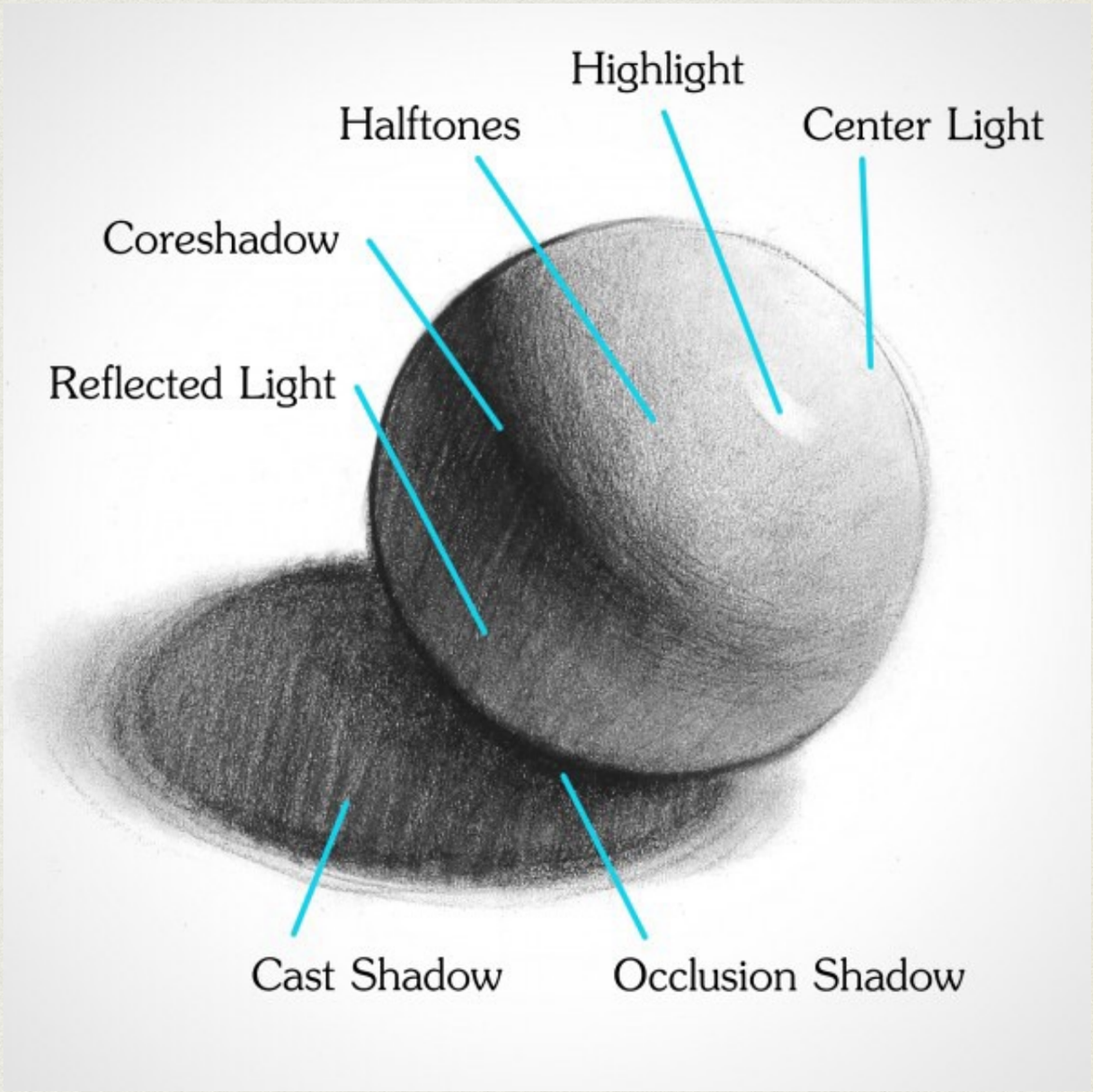




DRAWING BASICS

Structure (Line)
Shape
Value

Work together to create the illusion of form.



SEEING INSTEAD OF LOOKING

- Frederick Franke text "The Zen of Seeing"
- Importance of seeing patterns and relationship of parts informs not only our intellectual understanding, but our ability to create meaningful works of art.
- "I have not truly seen until I have drawn."

INSPIRATION

- Artists: Pierre Joseph Redoute, Albrecht Durer, Martin Heade, William Trost Richards.

- Collections: Shirley Sherwood Collection and the Hunt Library.

- Text: Wilfred Blunt, A History of Botanical Illustration; Mary and John Gribbin, The Flower Hunters.