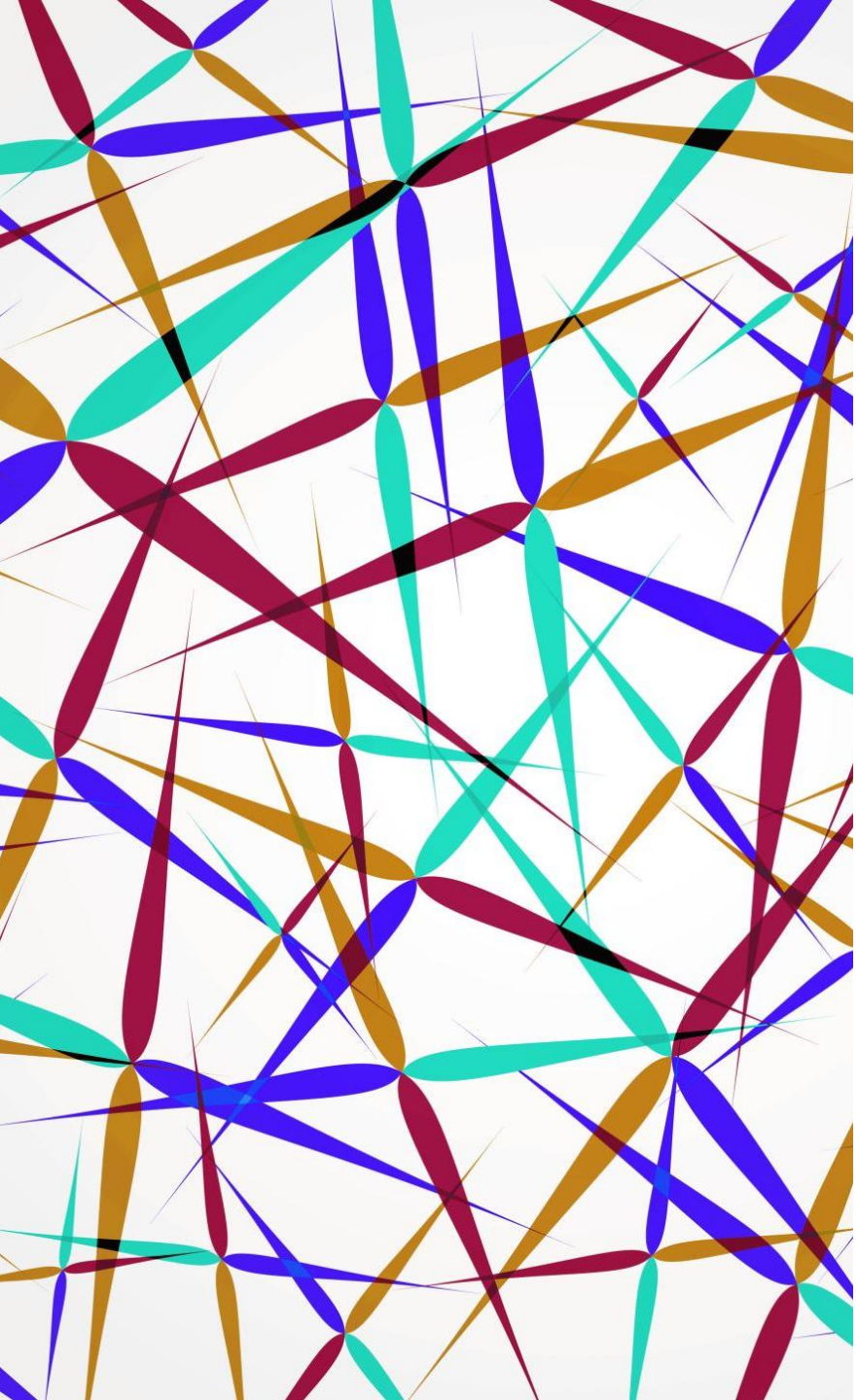
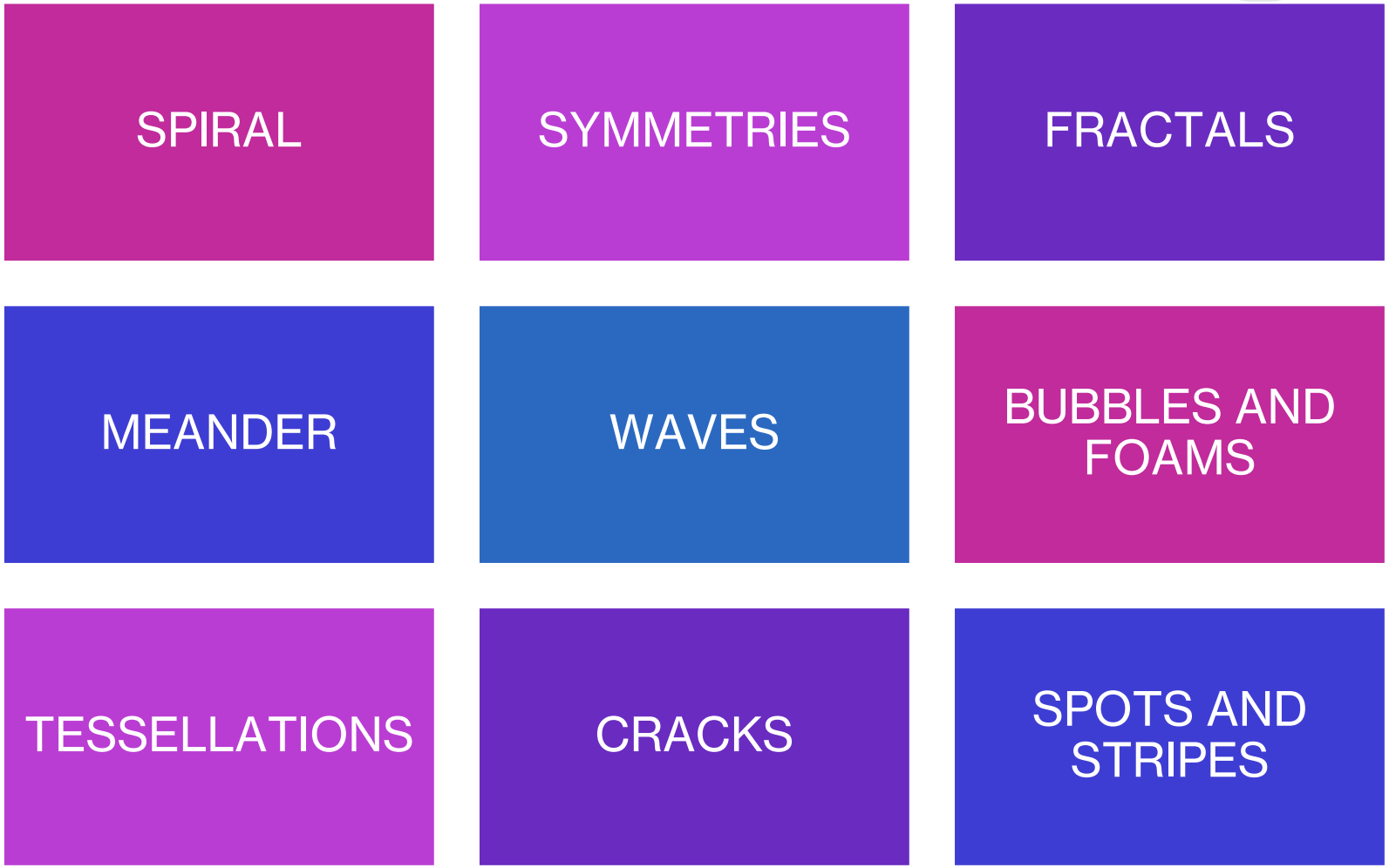


Mathematics in our World

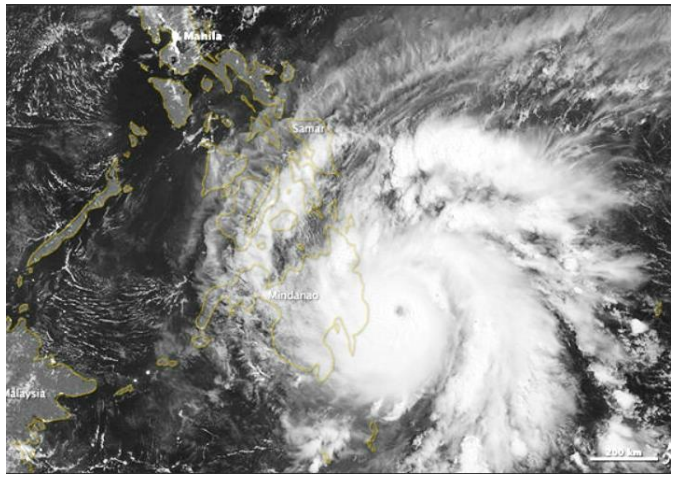
Mr. Robin B. Donquillo
Lecturer

Lesson 1.1.1 Patterns in Nature



SPIRALS – curve revolves around a center with increasing dimension.

Fossil remains



Typhoon

Rose petal

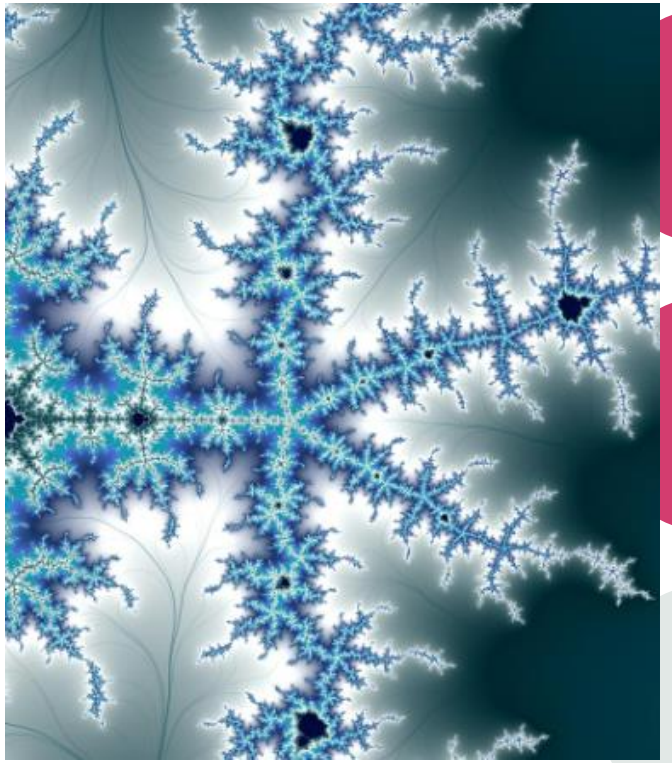
Thumbprint

Photo Credits: https://thesmarthappyproject.com/spirals-in-nature/
https://www.fi.edu/math-patterns-nature

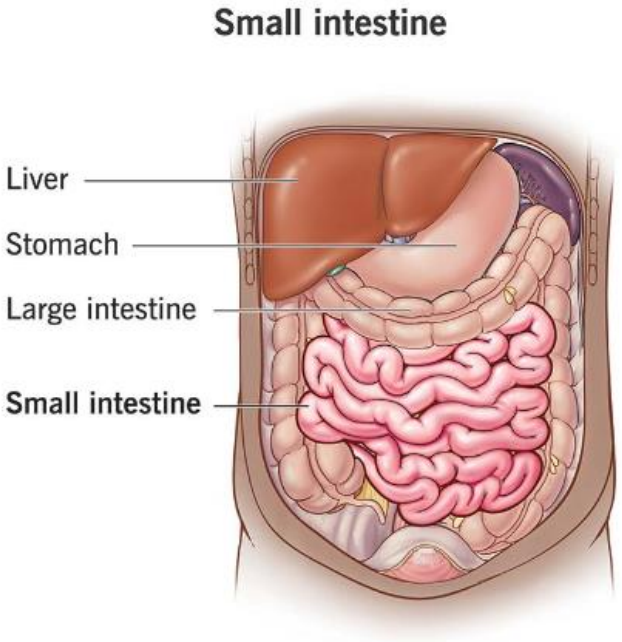
https://www.youtube.com/watch?v=kkGeOWYOFoA&t=1s

SYMMETRY - one part of the object retains its form or shape after some form of change.

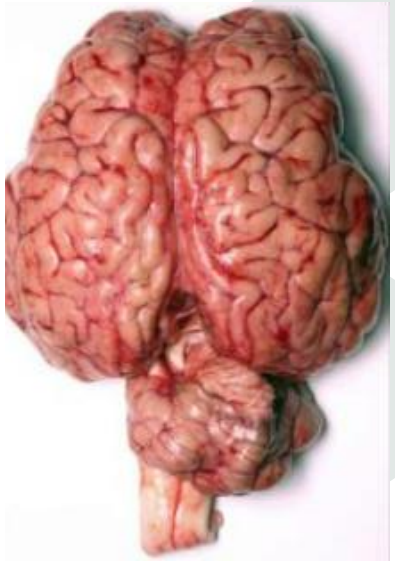
FRACTALS - self repeating iterations having fractal dimensions



Meanders - regular sinuous or winding curve pattern



Rivers

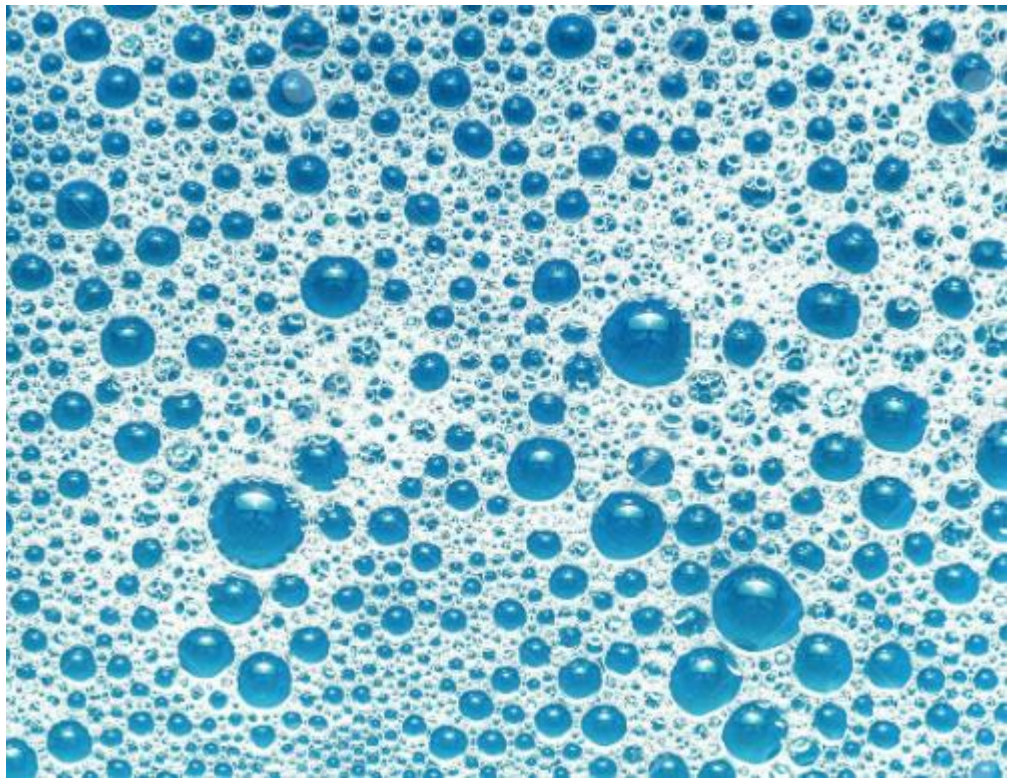


Brain

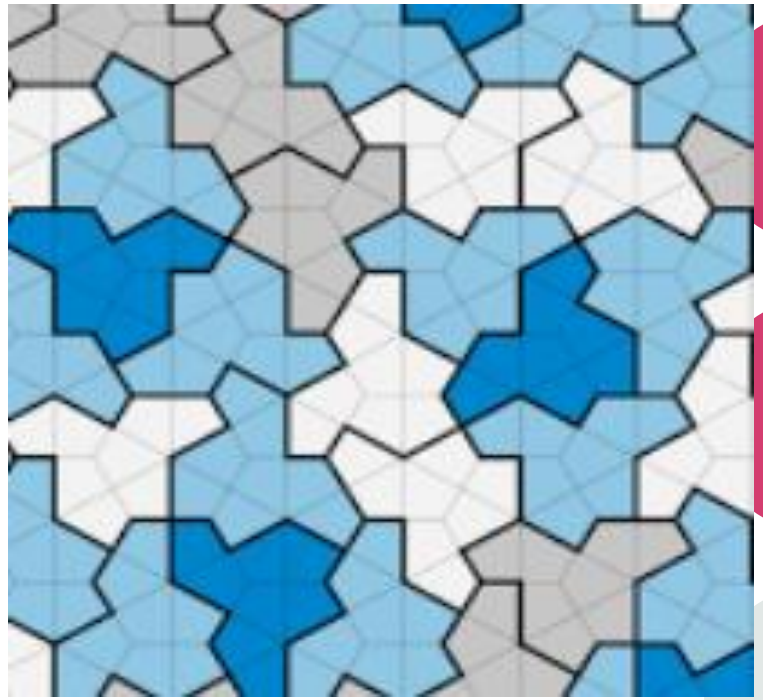
Photo Credits: https://my.clevelandclinic.org/health/body/22135-small-intestine
https://eartheclipse.com/science/geography/meander-definition-formation-facts.html

WAVES - disturbances as energy is transferred from one place to another, without the actual transfer of matter.

FOAMS – spherical patterns covering a certain volume with smallest surface area.

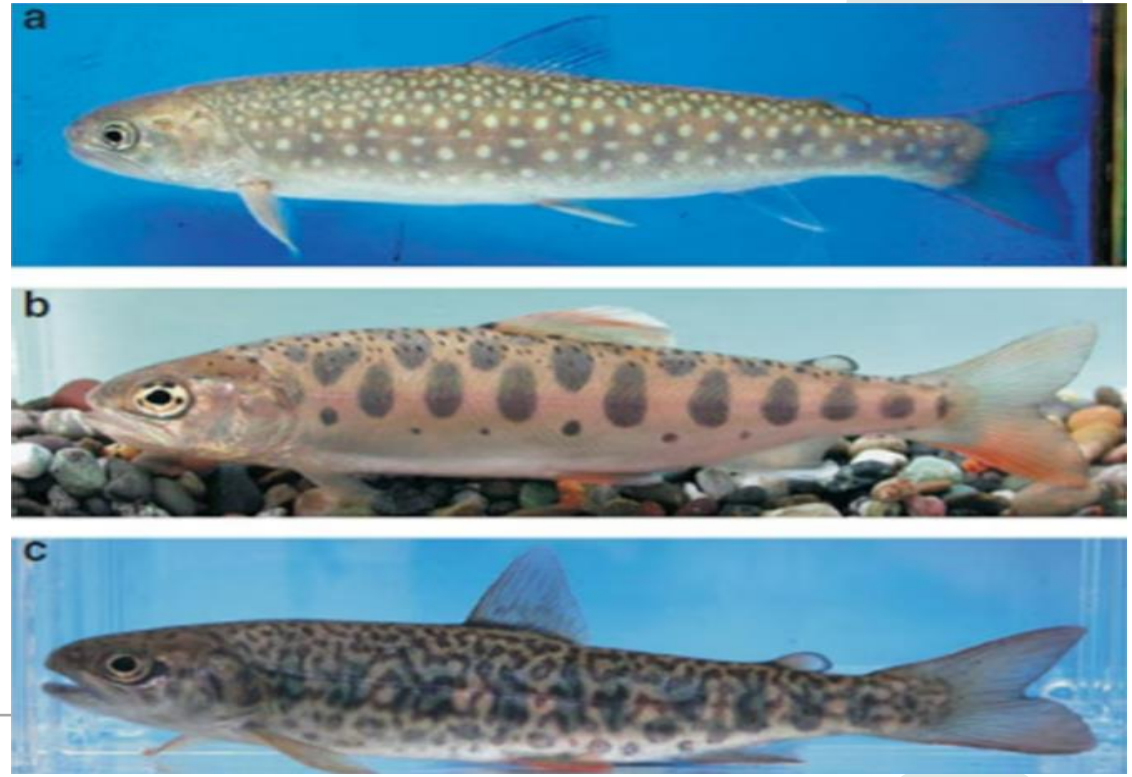


TESSELATIONS - patterns on surfaces covered by regularly repeating two-dimensional shapes.



CRACKS - linear openings on surfaces breaking into several parts.

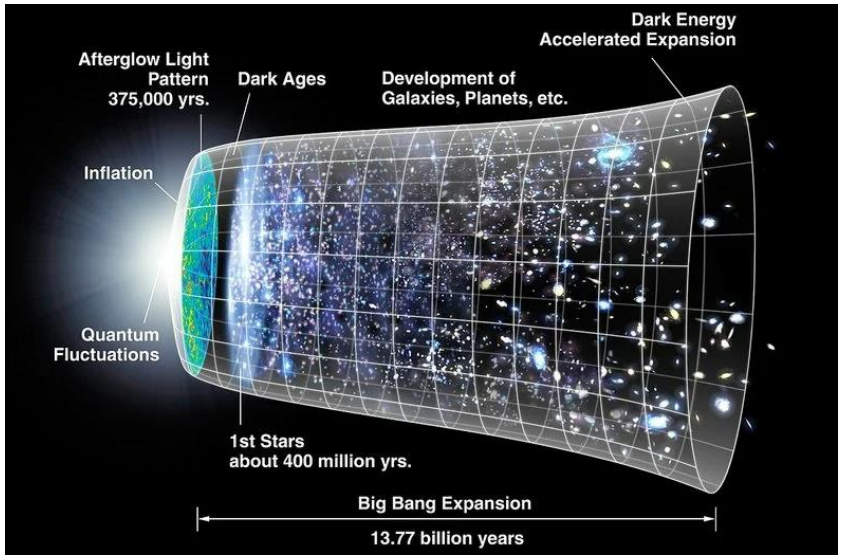
SPOTS AND STRIPES - skin patterns on animals and plants were developed for different purposes such as camouflage, and temperature control



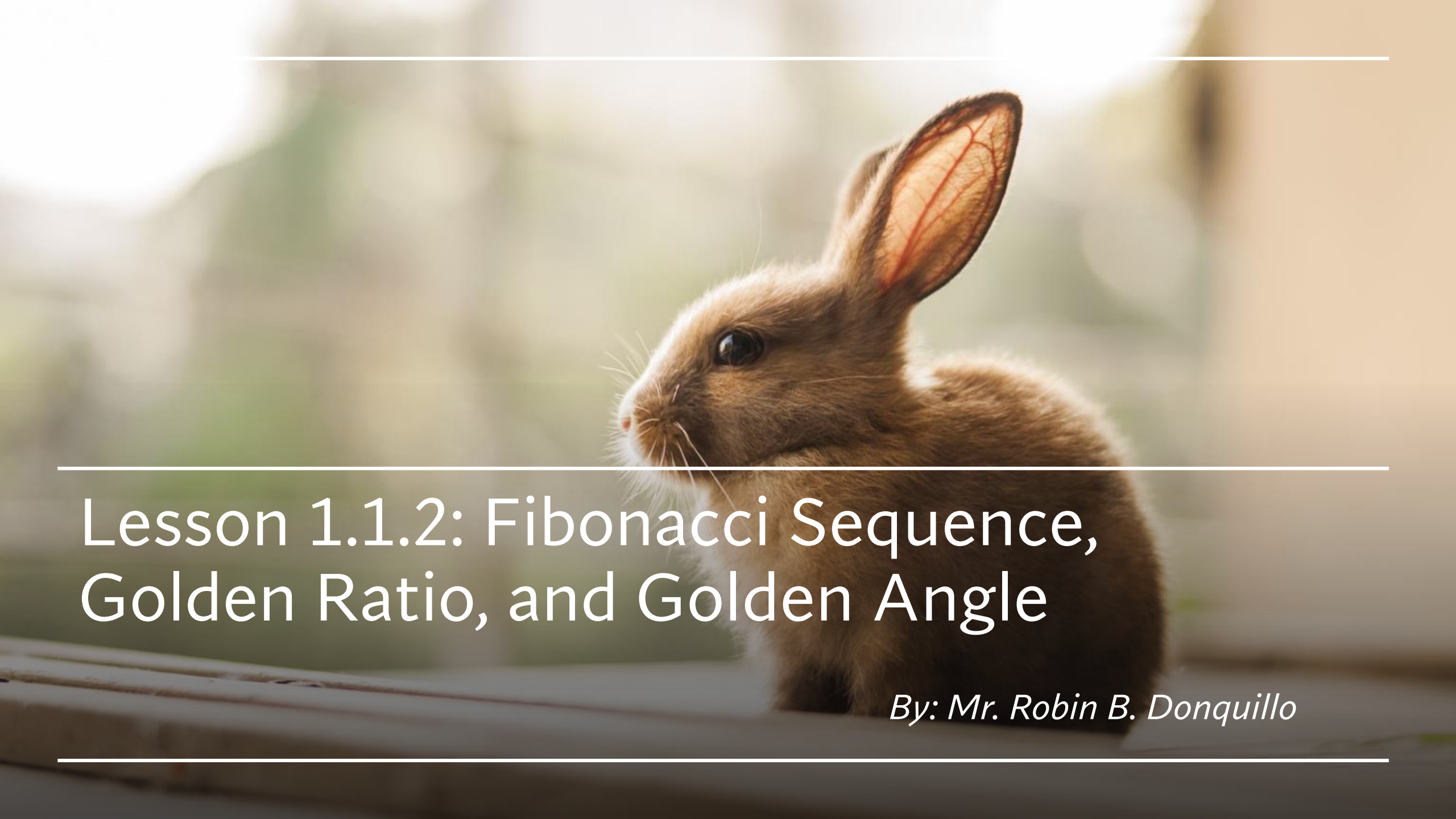
Chaos

- Defined scientifically as pattern that lacks predictability.

- Study of small changes that completely transform the future of a system. Examples are Big Bang Theory, Butterfly Effect, and Nonlinear Systems.



https://www.slideserve.com/chuong/patterns-in-nature



Lesson 1.1.2: Fibonacci Sequence, Golden Ratio, and Golden Angle

By: Mr. Robin B. Donquillo

Rabbit Problem by Leonardo Fibonacci

"A certain man put a pair of rabbits in a place surrounded on all sides by a wall. How many pairs of rabbits can be produced from that pair in a year if it is supposed that every month each pair begets a new pair, which from the second month on becomes productive?"

From Fibonacci sequence:

Golden ratio can be derived by getting the succeeding ratio of every two consecutive Fibonacci numbers.

$$\phi \approx 1.618 \text{ or } \frac{1+\sqrt{5}}{2}$$

Golden angle is the smaller central angle formed using two consecutive Fibonacci number.

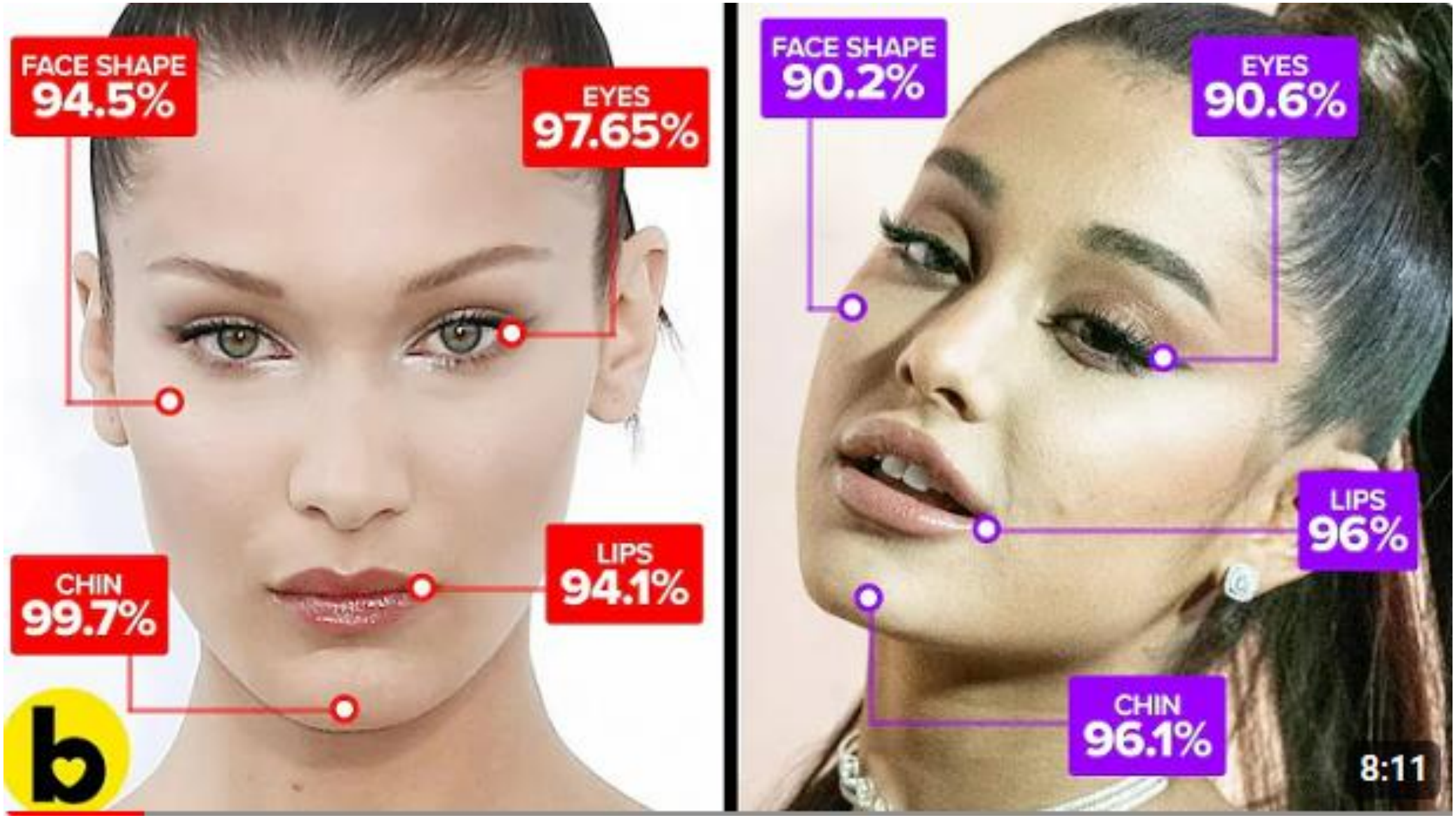
$$137.5°$$

https://www.academia.edu/11284788/Golden_Ratio_in_the_Nature

Binet's Formula

$$f_n = \frac{1}{\sqrt{5}}\left[(\phi)^n - (\phi')^n\right]$$

where $\phi = \frac{1+\sqrt{5}}{2}, \quad \phi' = \frac{1-\sqrt{5}}{2}$



https://www.youtube.com/watch?v=MGRAxDa-_Vg

Activity 1.1: “My Face Ratio”

Direction: We will be doing our own version of Dr. Julian de Silva’s research. Using a measuring tape or ruler, obtain the following measurements as shown below. Write your data in the table provided. Then, calculate the prescribed ratios and percentages.

1. Fill-out the following table with your measurements:

Measurement	Description	Symbol	Measurement (cm)
Face height	Top of forehead to bottom of chin	h	
Face width	Left side upper cheek to right side upper cheek	w	
top-eye	Top of forehead to point in between the eyes	c	
Eye-bottom	In between the eyes to bottom of the chin	d	
Top-nose	Top of the forehead to the bottom of the nose	a	
Nose-bottom	Bottom of the nose to bottom of the chin	b	

Activity 1.1: “My Face Ratio”

Direction: We will be doing our own version of Dr. Julian de Silva’s research. Using a measuring tape or ruler, obtain the following measurements as shown below. Write your data in the table provided. Then, calculate the prescribed ratios and percentages.

2. Calculate the following ratios and percentages.

Proportion	r (in 3 decimal places)	**Percent error (p)** $p = \frac{\lvert r - 1.618 \rvert}{1.618} \times 100\%$	**Phi Score (s)** $s = 100\% - p$
Height-to-width: $\frac{h}{w}$			
Forehead proportion $\frac{d}{c}$			
Chin proportion $\frac{a}{b}$			

3. In what proportion were you closest to the golden ratio?

_____

4. In your opinion, is the golden ratio a legitimate standard of beauty?

Recommended Readings and Resources

Ma. Carolina L. Boyon. “Patterns & Series, Part 1.” YouTube, 24 Aug. 2022, www.youtube.com/watch?v=6SUaCPqW7i0&list=PLeLlT2bkCpe8li6t3gN7mhNlX0JjYofZl&index=1. Accessed 8 Aug. 2024.