# The Nature of Complexity in Organizational Growth: A Chaos Theory Perspective

***Complexity in Design Kills***

# Introduction

## Overview

- Premature complexity in management initiatives often leads to early failure. Over-engineering structures before they are fully understood can overwhelm employees, creating confusion about purpose, processes, and priorities within their daily work.

## Core Argument

- Organizations, like natural entities, evolve from simple to complex structures through non-linear aggregation—a process shaped by emergent interactions rather than rigid, top-down design.

## Purpose

- To apply insights from chaos theory and natural systems to organizational development, demonstrating how simplicity, repetition, and adaptive growth drive sustainable success.

# Complexity in Nature: Lessons for Organizations

## Fundamental Simplicity

- Nature begins at a simple level—cells, molecules, and other elements combine to form complex entities over time.

## Non-Linear Aggregation

- Growth and aggregation are influenced by external factors such as temperature, humidity, and gravity—mirroring the unpredictable scalability of organizational initiatives.

## Fractals and Patterns

- The natural world displays self-replicating patterns, suggesting that organizations may evolve in a similar fractal-like manner.

# Aggregation – Non-Linear

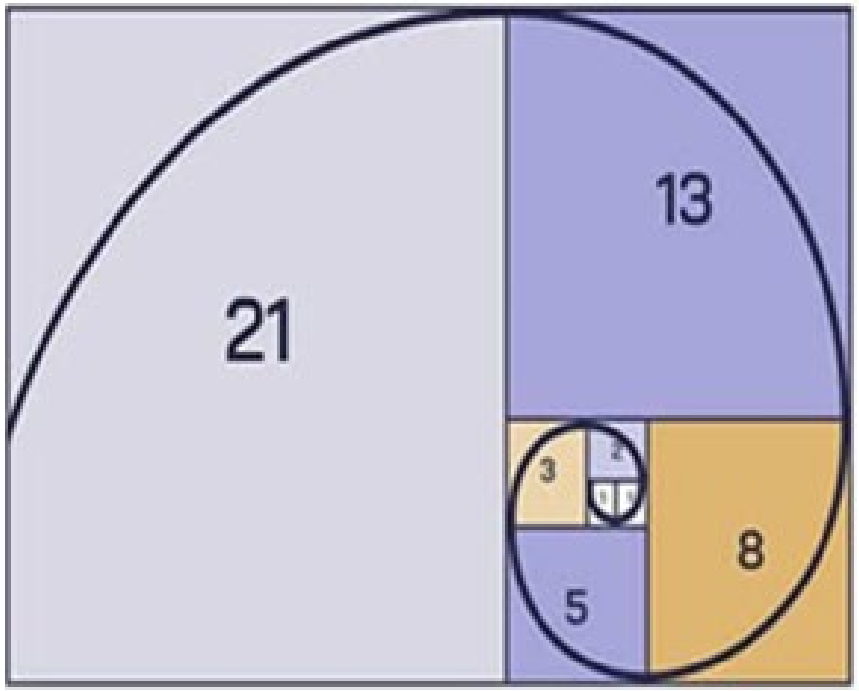
## The Fibonacci Sequence

**Each number is the sum of the two that preceded it.**

**0 1 1 2 3 5 8 13 21**

**0 + 1 = 1**
**1 + 1 = 2**
**1 + 2 = 3**
**2 + 3 = 5**
**3 + 5 = 8**
**5 + 8 = 13**
**8 + 13 = 21**

**2/1, 3/2, 5/3, 8/5, 13/8, 21/13 …. = 1.618**



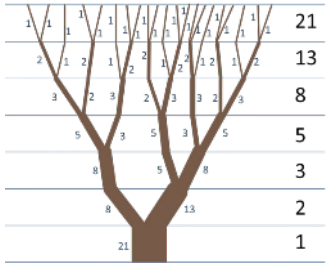

**1.618**

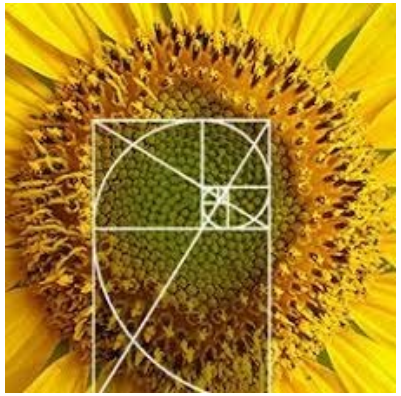
**The Golden Ratio**

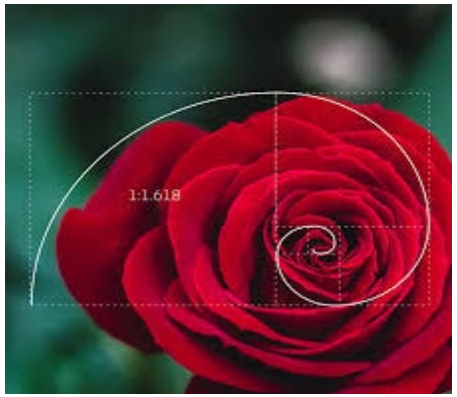
**As the Fibonacci numbers increase, the ratio of successive terms approaches the Golden Ratio**

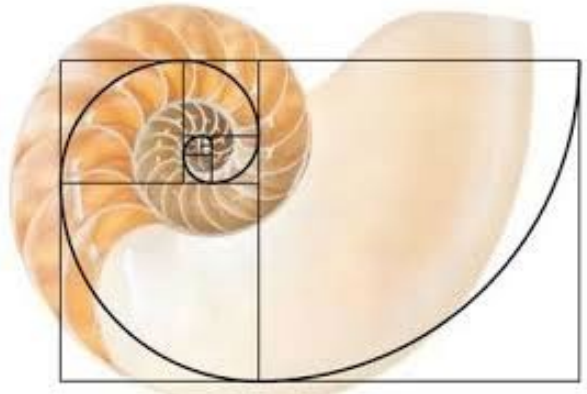
# The Golden Ration in the Corporeal World

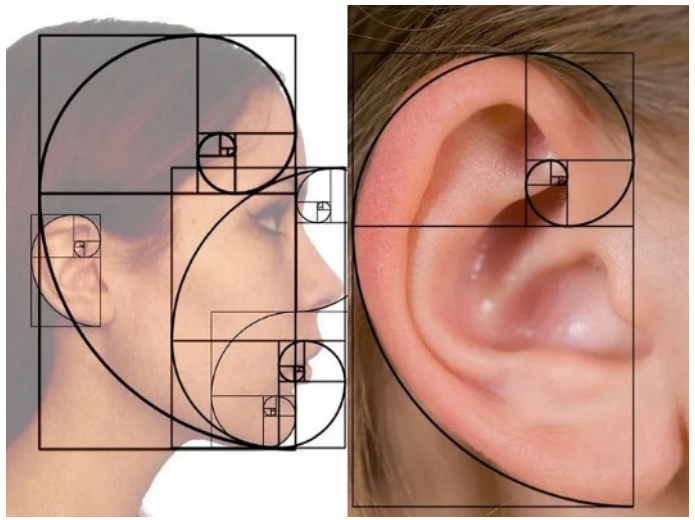
**The Golden Ratio** occurs naturally in biological forms, such as the spiral of seashells and the growth patterns of plants. Its use in art and design during the Renaissance reflected a belief that nature's mathematical principles could guide human creations, symbolizing beauty, harmony, and divine proportion.



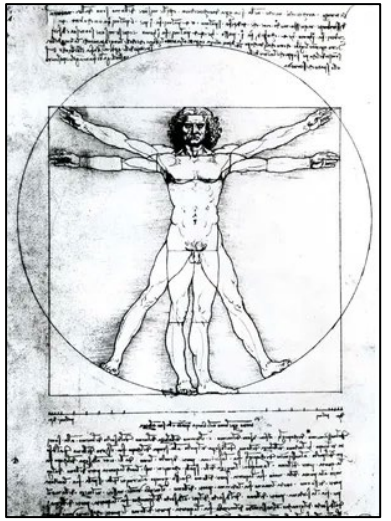







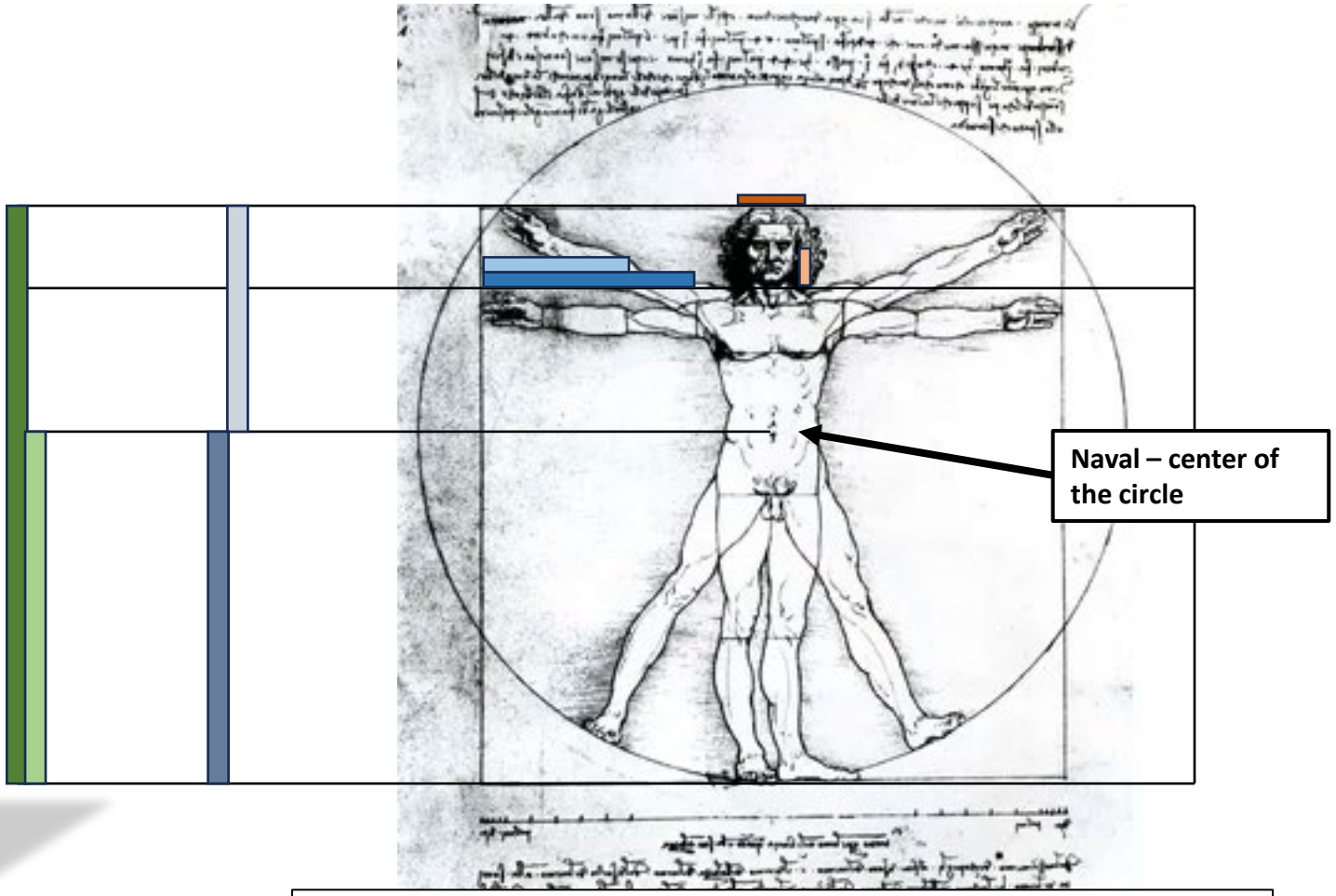




# The Vitruvian Man

**Take Aways**

- Complexity results from the accurate repetition over time of simple elements, quantities, and actions.
- This stacking or aggregation is often non-linear and unpredictable at different scales, whereas it may be predictive at other scales.
- Complexity upfront in the design of human endeavors kills success.
- Complexity is birthed from effective execution, not design.
- Management models and processes need to be relatively simple at the outset; they need to and will evolve over time.




**The Vitruvian Man by Leonardo da Vinci incorporates several examples of the Golden Ratio ($\phi$, approximately 1.618).**

# Organizational Structures as Natural Systems

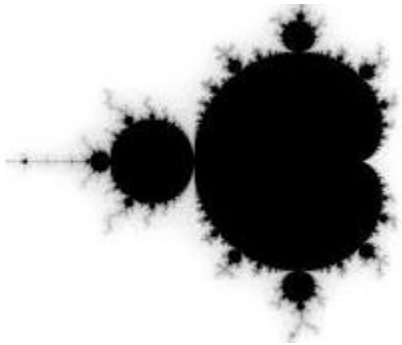
- Organizations, composed of human interactions, function as complex adaptive systems.
- Like biological entities, organizations aggregate resources, knowledge, and processes in unique ways based on their environment.
- The necessity of viewing organizations as evolving entities rather than rigid structures.

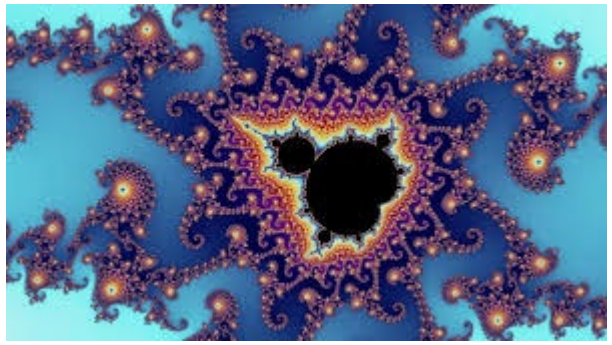
"**Organ, organic**, and **organization**" are all derived from the Greek word ὄργανον (organon), meaning "tool," "instrument," or "work."

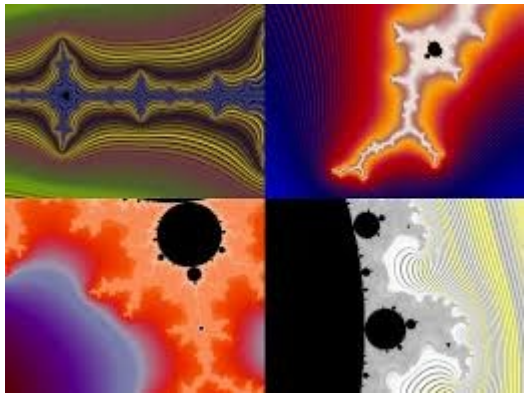
- **Organ** (biological): part of a living organism with a specific function, viewed as a "tool" or "instrument" that contributes to the body's overall operation.
- **Organic**: "pertaining to an organ" or "living." Over time, it has evolved to mean something related to life processes or natural growth.
- **Organization**: structured group or system of interconnected people designed to function as a whole for a shared purpose, **similar to how the organs in a body work together to maintain life**.

**The shared conceptual focus is on functionality and interconnected systems.**

# The Mandelbrot Set – Limits on Aggregation and Disaggregation to Retain Corporeal Relevance







Consists of an equation where you take the solution and feed it back into the same equation.

$Z_{n+1} = Z_n^2 + C$ C can be any number but we'll use 1

$0 = 0^2 + 1 = 1\ldots$

$1^2 + 1 = 2\ldots$

$2^2 + 1 = 5\ldots$

$5^2 + 1 = 26\ldots$

$26^2 + 1 = \mathbf{....}$

**Mandel Brot Set Video** (1:45 mins)
Search for: Mandelbrot Zoom Sequence, YouTube, Mathigon Apr 2, 2020

# The Power of Simple, Repetitive Actions

- Accuracy, timeliness, transparency, predictability, and authoritative execution in simple tasks build a foundation for **scalable complexity**.
- Just as consistent cellular processes (i.e., aggregation of simple components) build complex organisms, sustained and disciplined organizational actions build capability.
- Example cases:
  - How consistent, quality, and disciplined execution at the tactical level fosters emergent strategic advantages.
  - Decision support best practices for aligning DoD governing boards and organizational unity of effort

# Management Implications and Applications

- Why managers must avoid over-engineering complexity at the outset.
  - Overly complex plans fail because people do not share a common understanding of them when they are first implemented.
  - Instead, focus on simple, well-executed steps that build toward more sophisticated structures.

- The importance of enabling organic evolution and aggregation rather than enforcing rigid structures.
  - If a subordinate presents a 70% solution, let them run with it….no, insist they do.
  - This is more than good leadership delegating autonomy.
  - Early-stage plans need room to evolve.
  - Initial iterations should be "squishy" to allow necessary refinements.

- Embrace these principles when considering transformation and growth in your organization.

# Conclusions

- **Summary of key insights**:  Complexity emerges from simplicity, organizations function as adaptive entities, and transitions between levels of organizational activity require careful management.

- Final thoughts on taking into account natural aggregation to drive sustainable organizational success.
  **Examples:**
  - Each level of activity requires different management models and processes.
  - Data accountability at each level.
  - Accountability for data sensitivity--adding resources to improve one performance  metric is being taken from somewhere else in the organization.