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Introduction to Artificial Life

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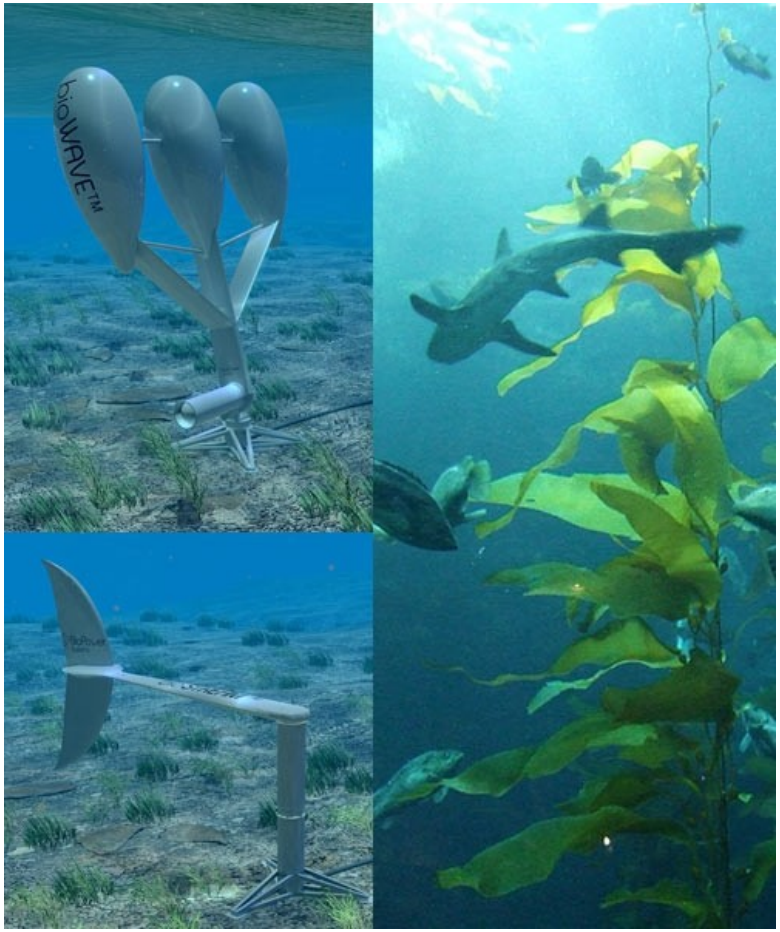
What are we learning

- What is Artificial Life
- History of Artificial Life
- Principles (Keyword: emergent behavior)
- Artificial Life vs Artificial Intelligence
- Summary

What is Artificial?



hint

Artificial:

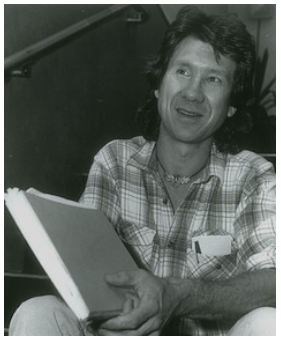
Made or produced by humans

Not made by nature

Inspired by nature

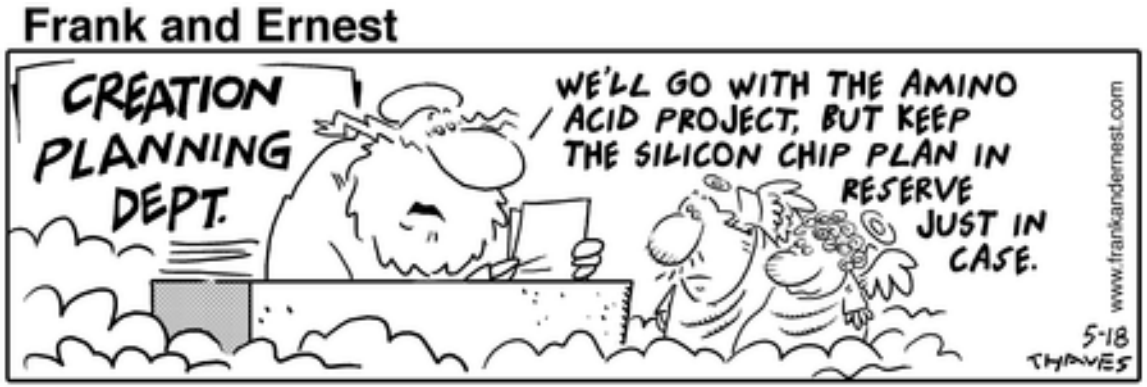
Artificial Life:

"Life made by Man rather than by Nature",
C. Langton 1987



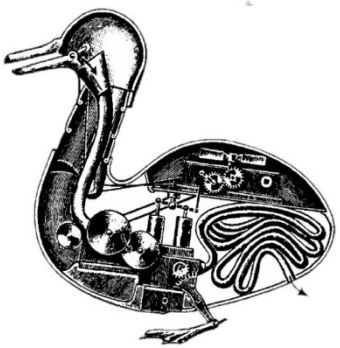
Life

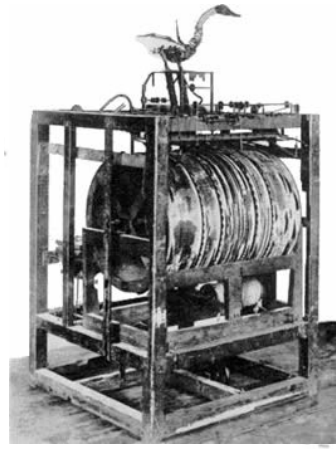
1 kind of life on earth: carbon-chain



History

Egyptians: Clepsydra

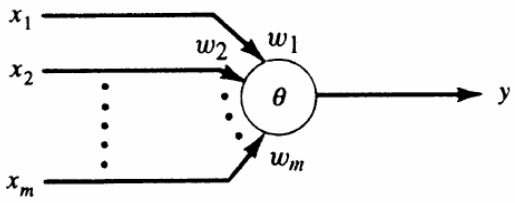




1735: Jacques de Vaucanson's duck

1930/40: Turing test (Artificial Intelligence)

1943: Mc.Culloch & Pitts – artificial neuron



1950: Von Neumann self-replicating automata

(Codd, 1968)

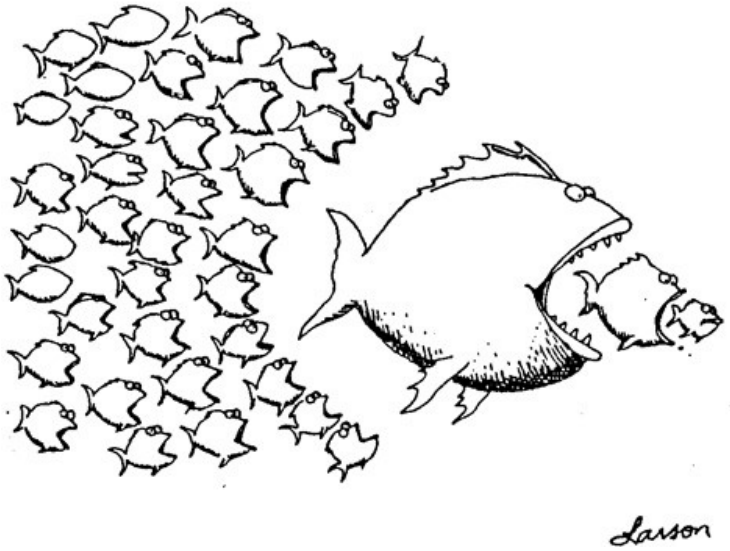
Artificial

AL is the study of man-made systems that exhibit behaviors characteristic of natural living systems

Life —— Biology

• Biology: attempts to *analyze* (top-down) living organisms

• AL: attempt to *synthesize* (bottom-up) life-like behaviors within computers and other artificial media



The Biology of Possible Life

- life-as-we-know-it ⟶ biology

  vs

- life-as-it-could-be ⟶ alife

ALife principles

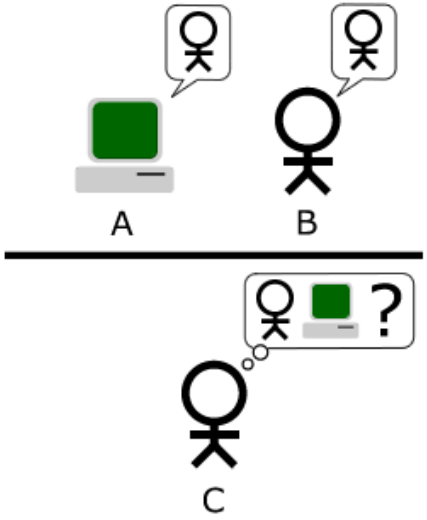
- Population: collection of simple elements
- No central controller
- Each element only knows the status of few neighbours
- No rules for the global behavior, only local rules
- Global behavior: emergent from the local behaviors

INTERACTION: the behavior seems alive

KEY IDEA: Emergent Behavior

Artificial Life vs Artificial Intelligence

- AI: intelligence by machine or software (Turing test)



- AL: new computational paradigm based on natural processes that support living organism (computer as a tool)

...take home thoughts

- How can we take it upon ourselves to create life, even within the artificial domain of computers, and then snuff it out again by halting the program or pulling the plug?
- What right to existence does a physical process acquire when it is a “living process”, regardless of the medium in which it takes place?
- AL is a technical as well as a social, moral, philosophical and religious challenge.

Summary

- What is Artificial
- What is Life
- What is Artificial Life
- What is not (Artificial Intelligence)
- Top down vs bottom up
- Emergent Behavior
- Ethics