

Synthesizing Emergence

Karsten Droste
droste@arch.ethz.ch

**"That I may detect the
inmost force, which
binds the world, and
guides its course."**

**"Daß ich erkenne, was
die Welt
im Innersten
zusammenhält."**



Faust - Der Tragödie Erster Teil, Nacht
Goethe, Johann Wolfgang von, 1749-1832



This time lapse movie of the slime mold *Physarum polycephalum* represents 10 days of growth on an agar plate sprinkled with oatmeal flakes.
Images were taken at 15 minute intervals.



Cornell University
College of Agriculture
and Life Sciences



Emergence is the process of complex pattern formation from more basic constituent parts or behaviors, and manifests itself as an emergent property of the relationships between those elements.

- from wikipedia -

Simple System

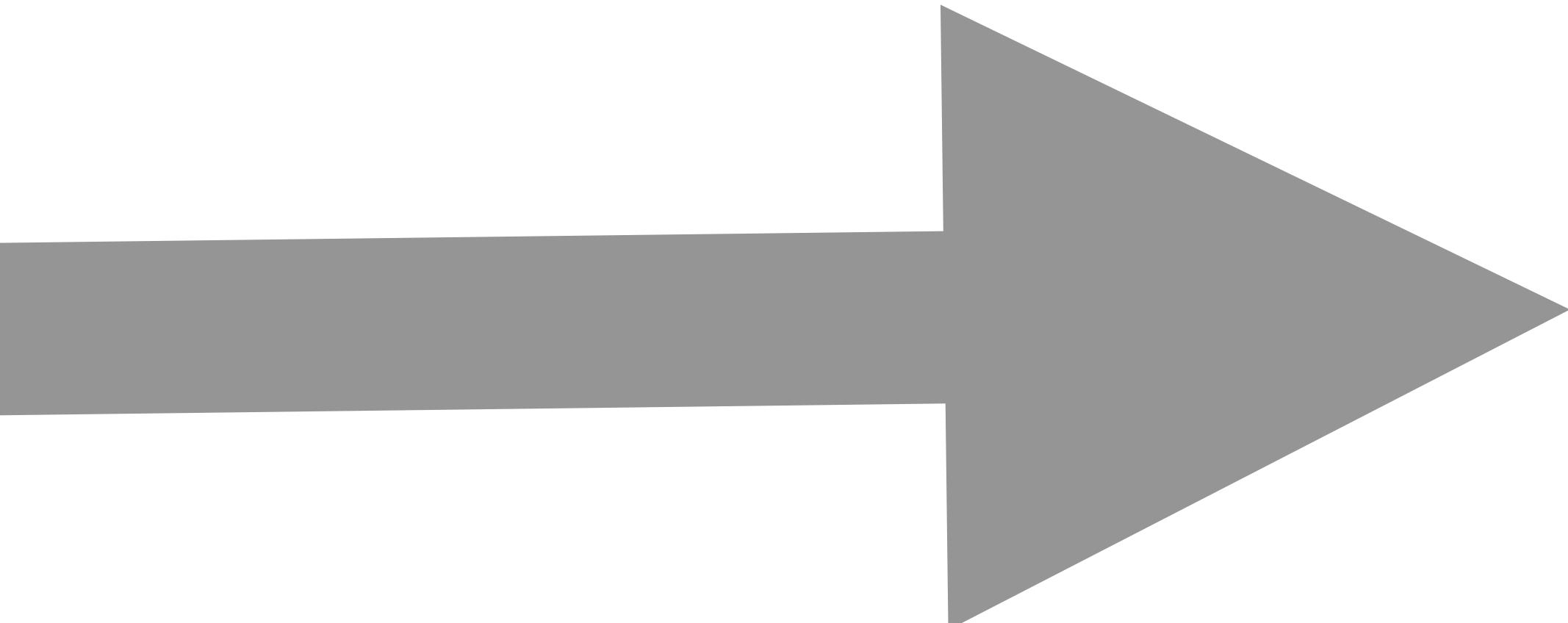
System of Organized Complexity

System of Disorganized Complexity

Weaver's Broad Camps of Scientific Research

emergence
analysis

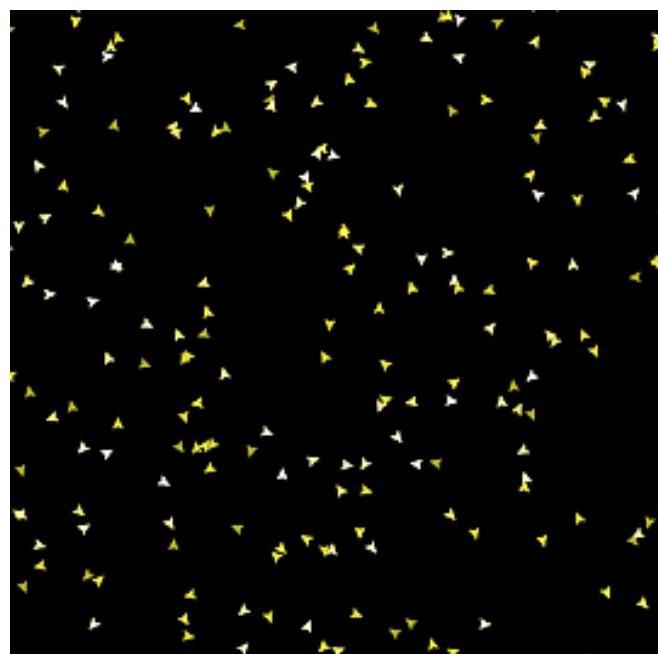
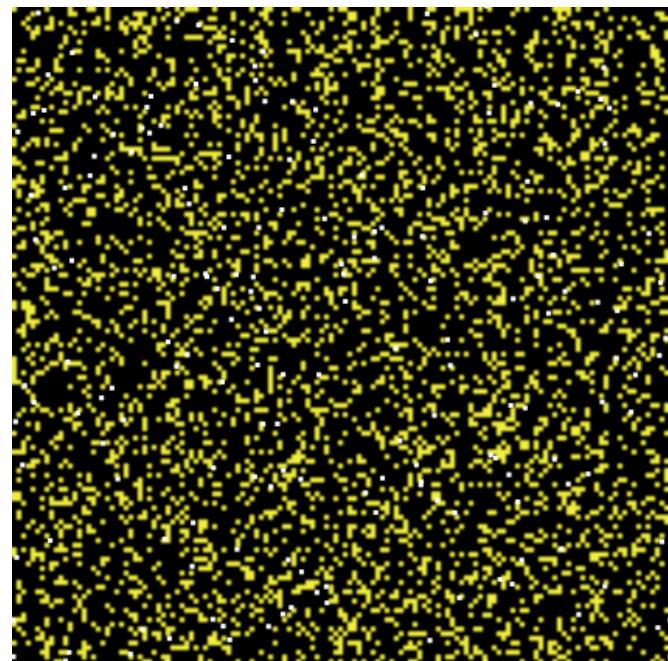
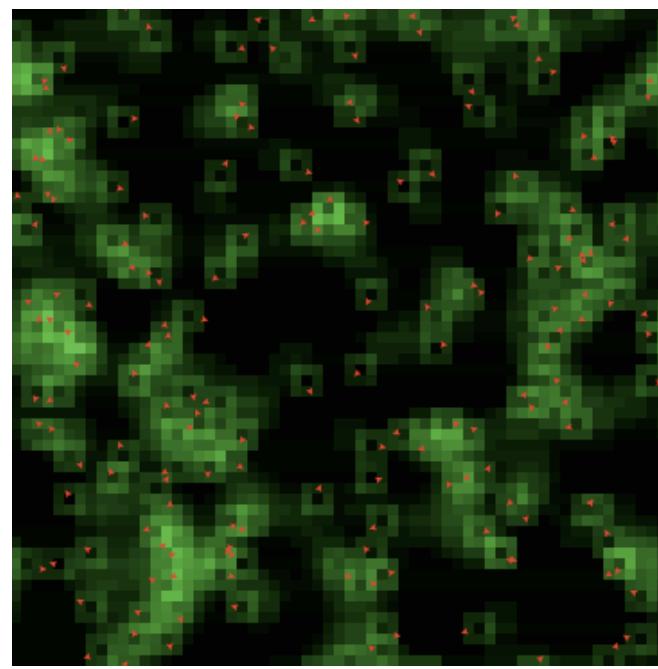
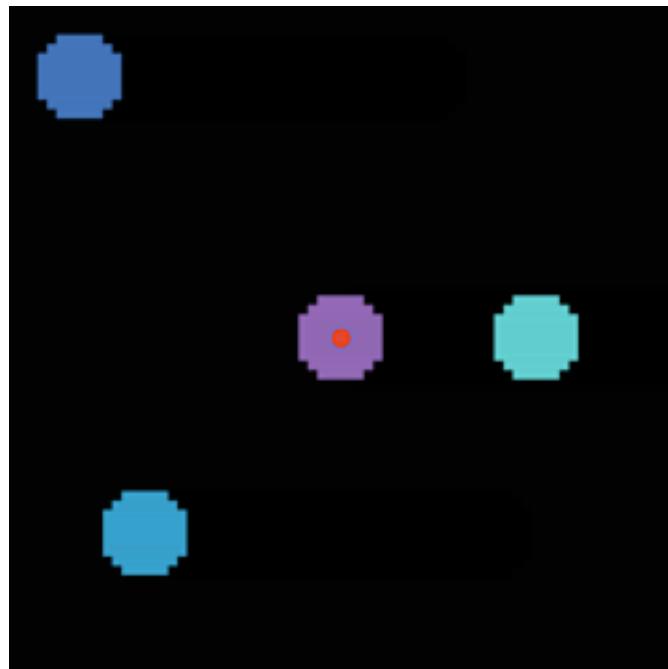
emergence
synthesis





"Ich bin vielleicht
synthetisch, aber ich
bin nicht blöde."

Lance Henriksen as Bishop,
in Aliens, 1986





Größeres Bild

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von Donald E. Knuth

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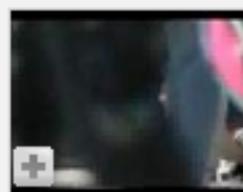


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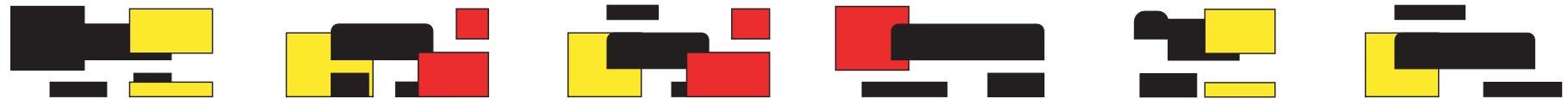


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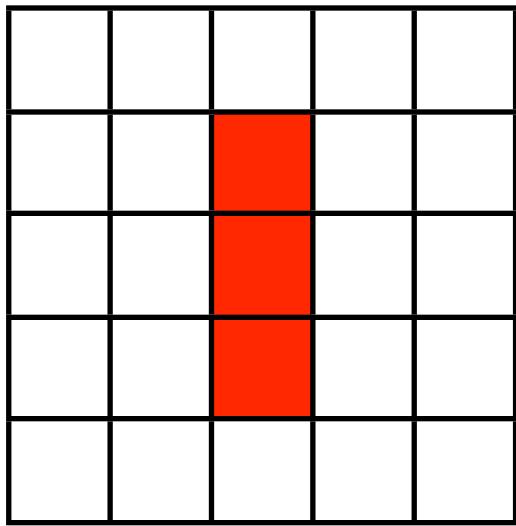


Conway's Game Of Life

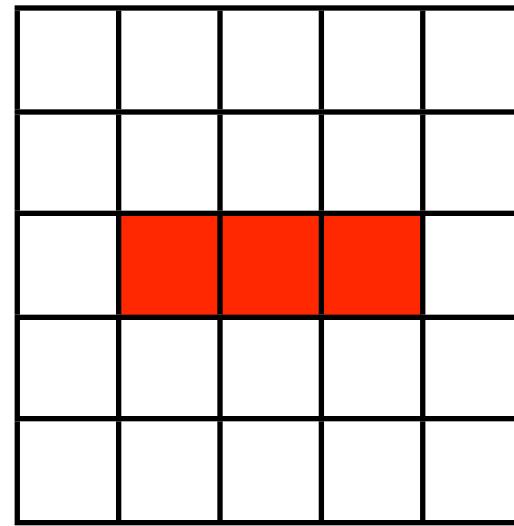
Given an infinite two-dimensional grid of cells.

- Any live cell with fewer than two neighbours dies.
- Any live cell with more than three neighbours dies.
- Any live cell with two or three neighbours lives.
- Any dead cell with exactly three neighbours comes to life.

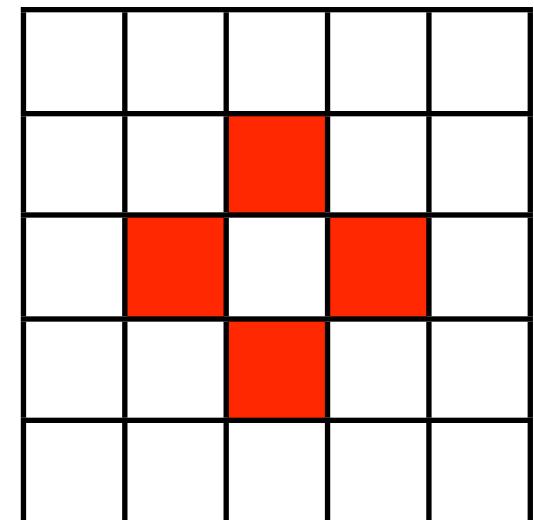
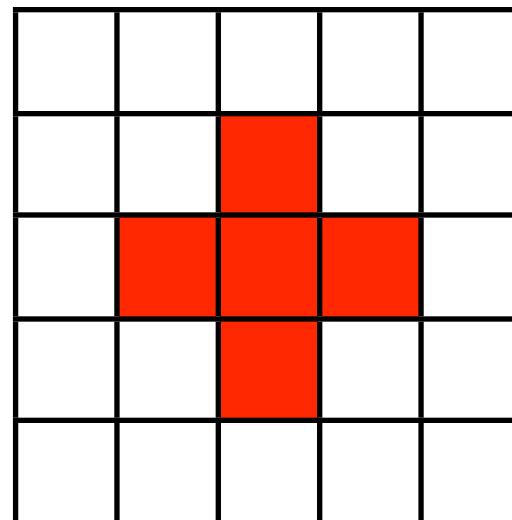




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Self-Organizing Systems

Bottom Up Behaviour

Hierachical Systems

Top Down Behaviour

You Tube

Internet Routing

Stock Market

Amazon

Conway's Game of Life

Ant Hill

Flocks

Wikipedia

TV Station

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City Market

Schools

“The shape of those clusters
– with their lifelike irregularity ... –
is the shape that will define the coming decades.”

Steven Johnson in *Emergence*, 2001, about Mitch Resnick’s Slime Mold Simulation

seconds of fame



The word "coming" is written in a bold, sans-serif font. It is oriented diagonally from the bottom-left towards the top-right. The letters are primarily a bright orange-red color, with some white space and black outlines. A large, solid black rectangle is positioned vertically behind the first few letters ("sec"). To the right of the rectangle, a large black circle overlaps the text. The word "coming" continues across the circle, with its letters partially obscured by the circle's edge. The "o" in "coming" has a small white dot at its top center, and the "m" has a white vertical bar through its middle.

homework

- 1.Identify an hierarchical system
- 2.Describe it
- 3.Identify a self-organizing system
- 4.Describe it

