

Nouveau Cybernetics?

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Workshop on
Beyond Shannon: The Meaning & Structure of Information
Institute for Advanced Study
University of Amsterdam
6 May 2019

Cybernetics

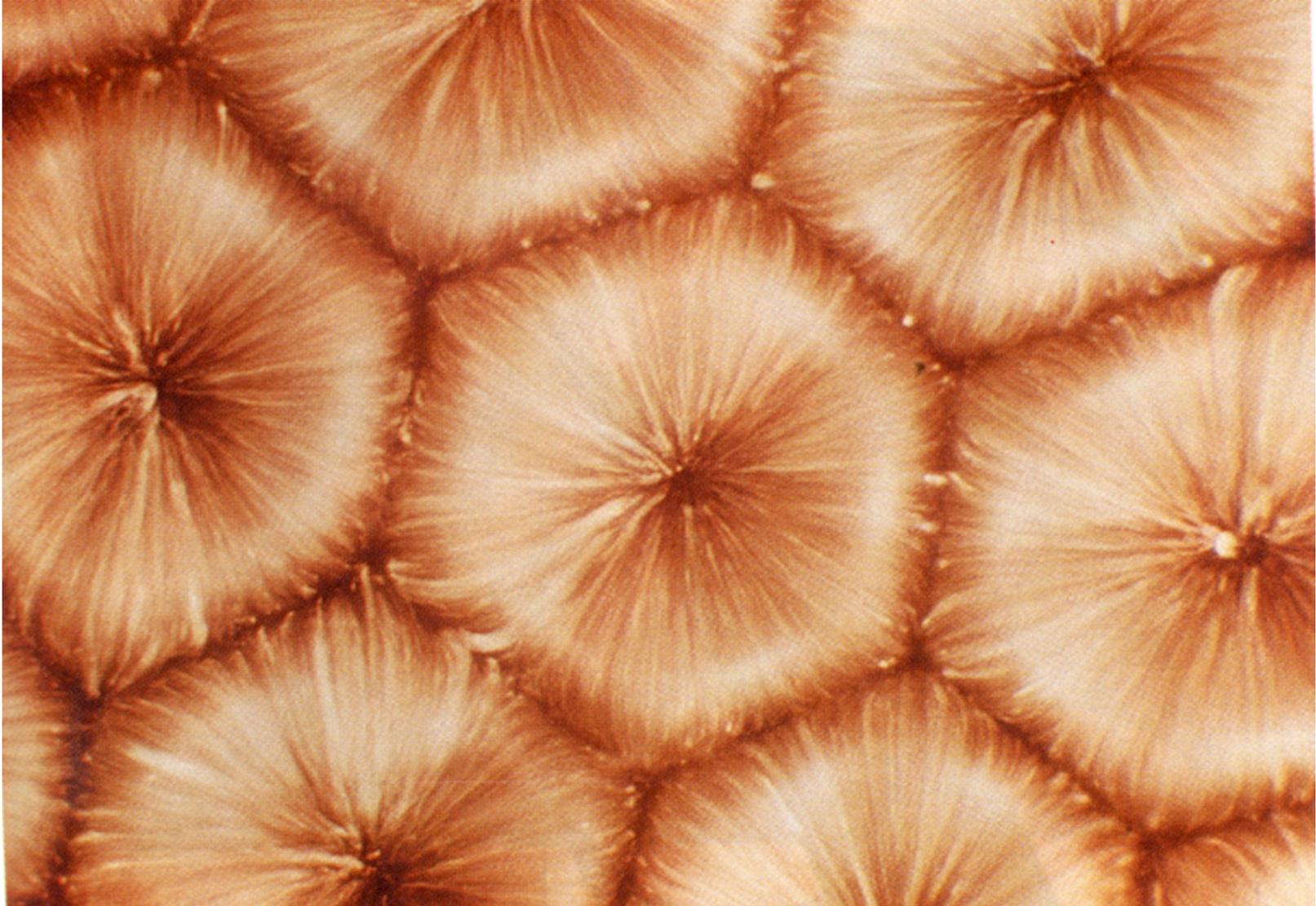
Cybernetics

“The science of communications and automatic control systems in both machines and living things.”

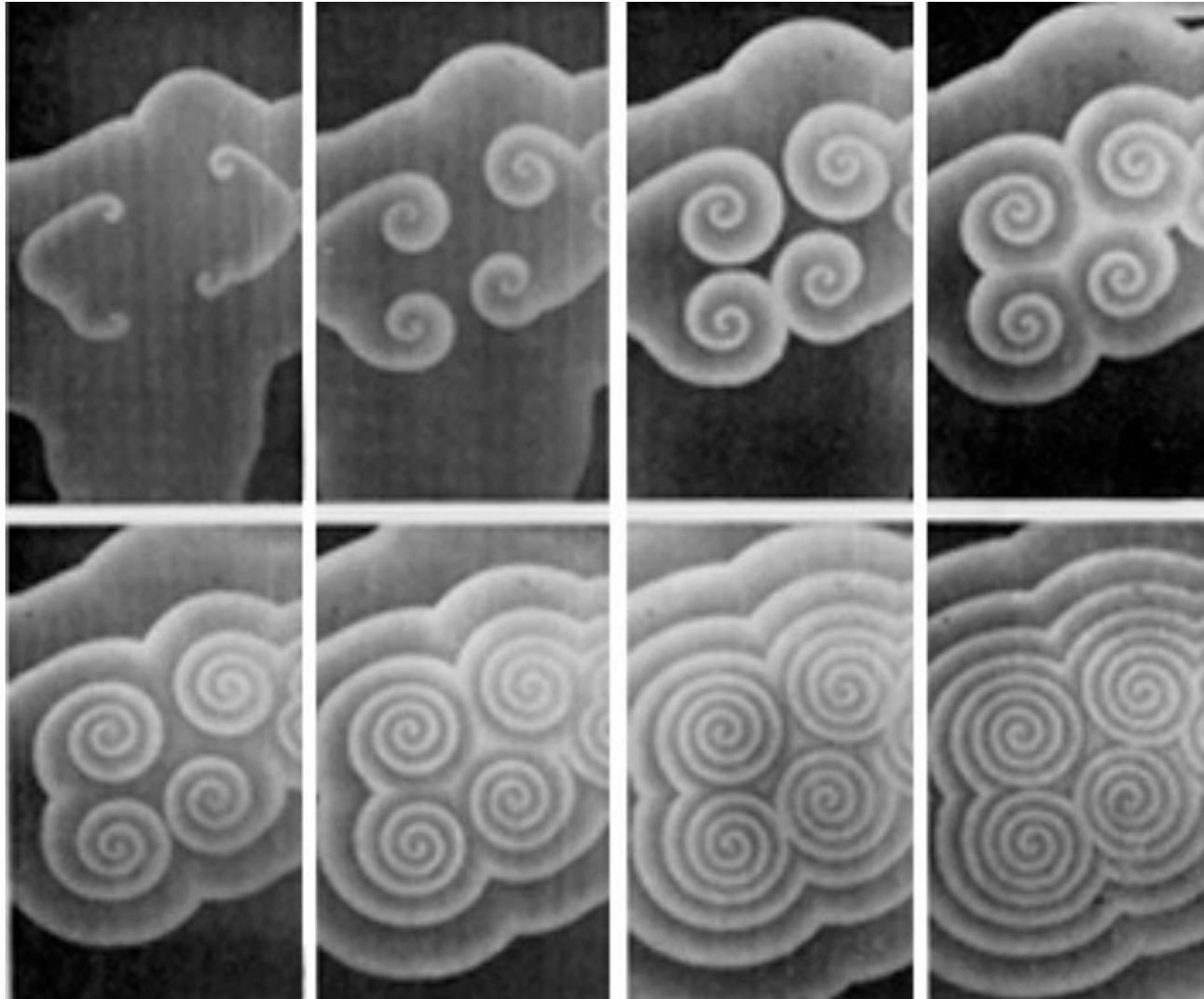
Announced by Norbert Wiener (1948)

Such as?

FREE-SURFACE BÉNARD CONVECTION

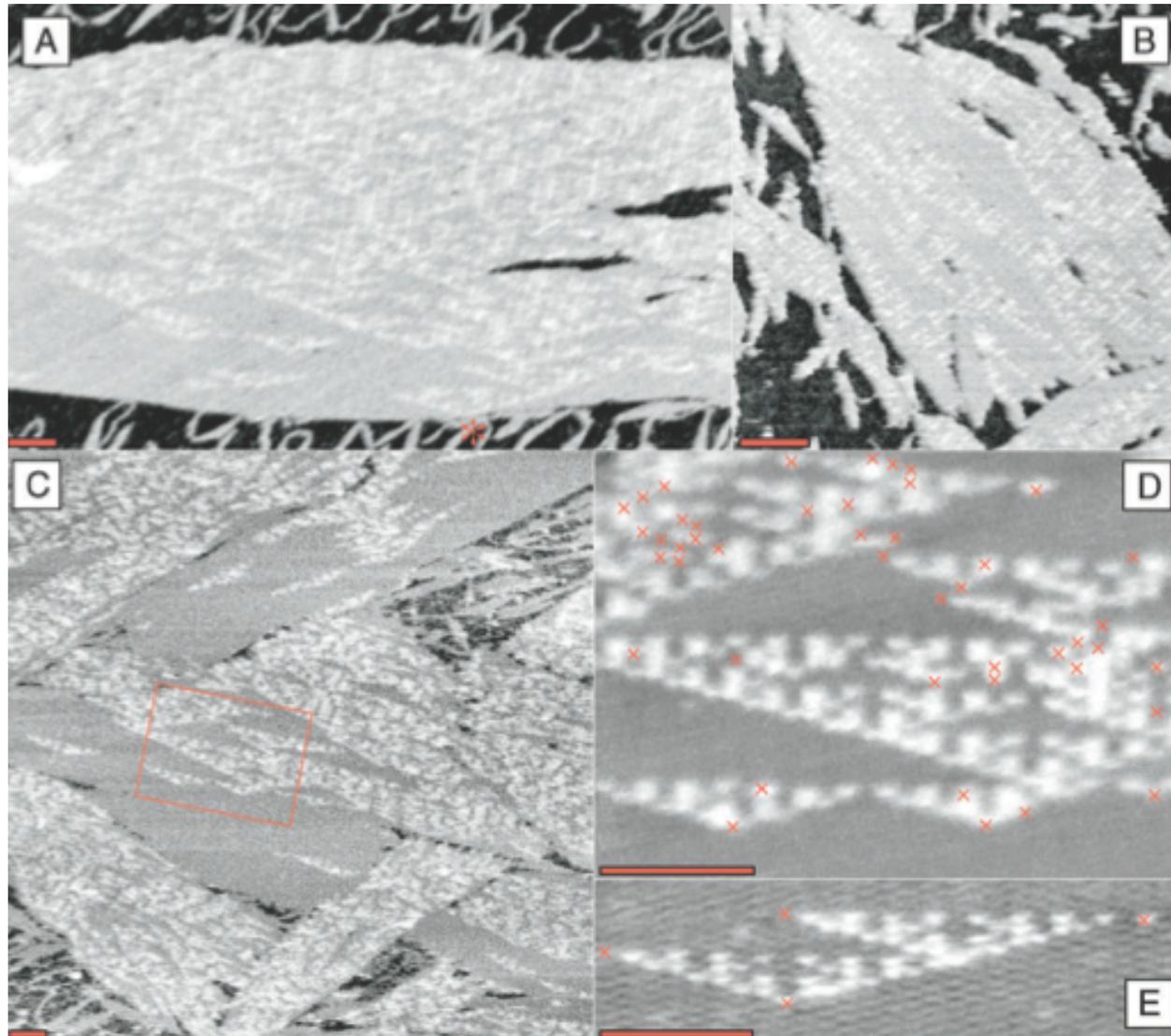


BELOUSOV-ZHABOTINSKY CHEMICAL REACTION

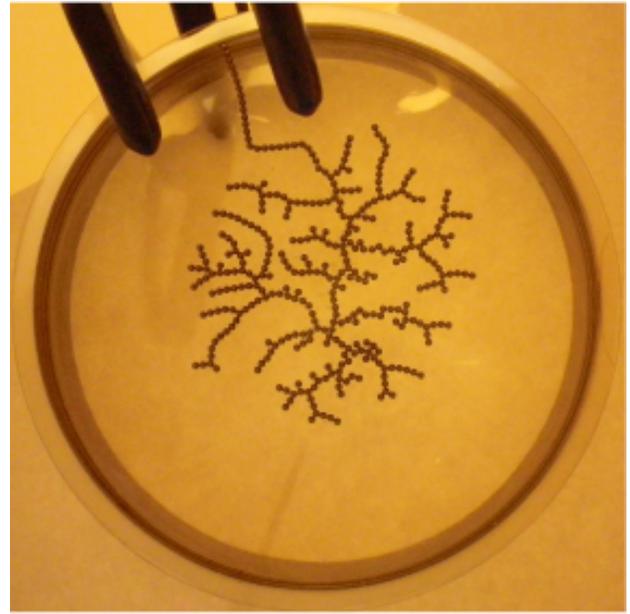
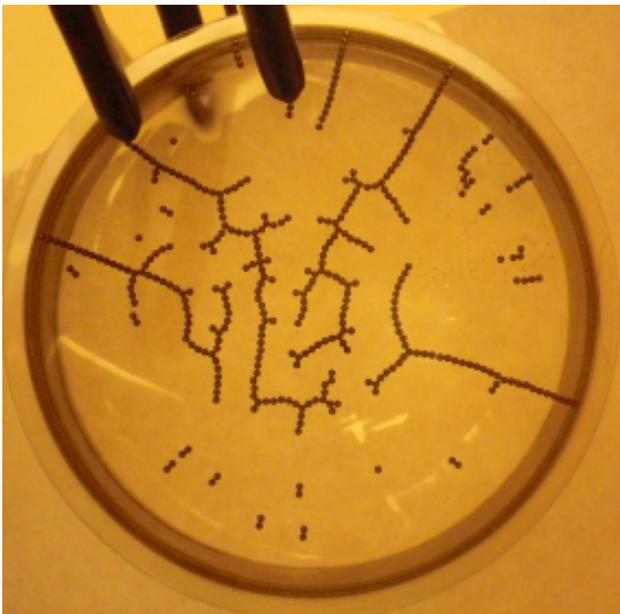
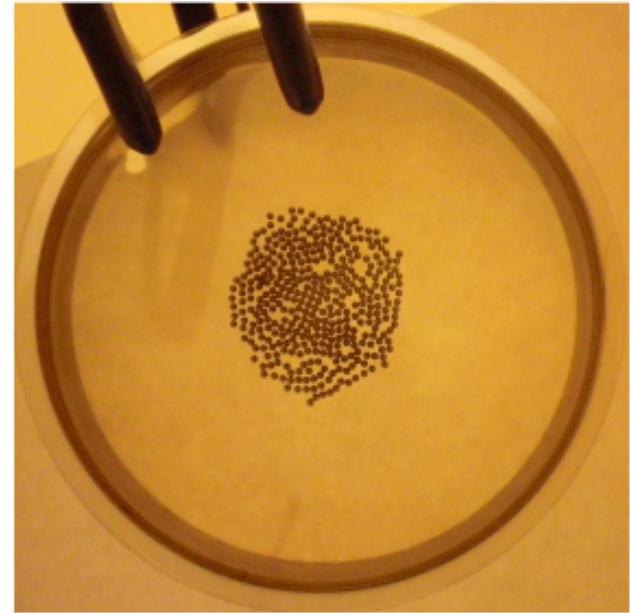
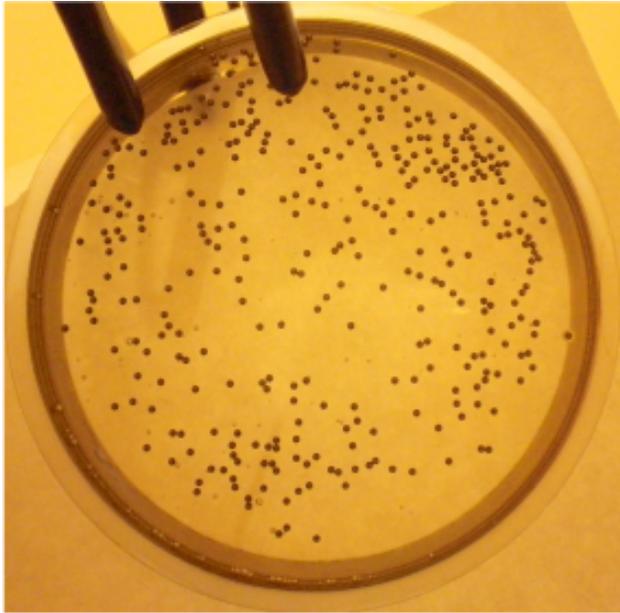


2D DNA = 1+1D CA

ALGORITHMIC SELF-ASSEMBLY OF DNA SIERPINSKI TRIANGLES



ARBORTRONS



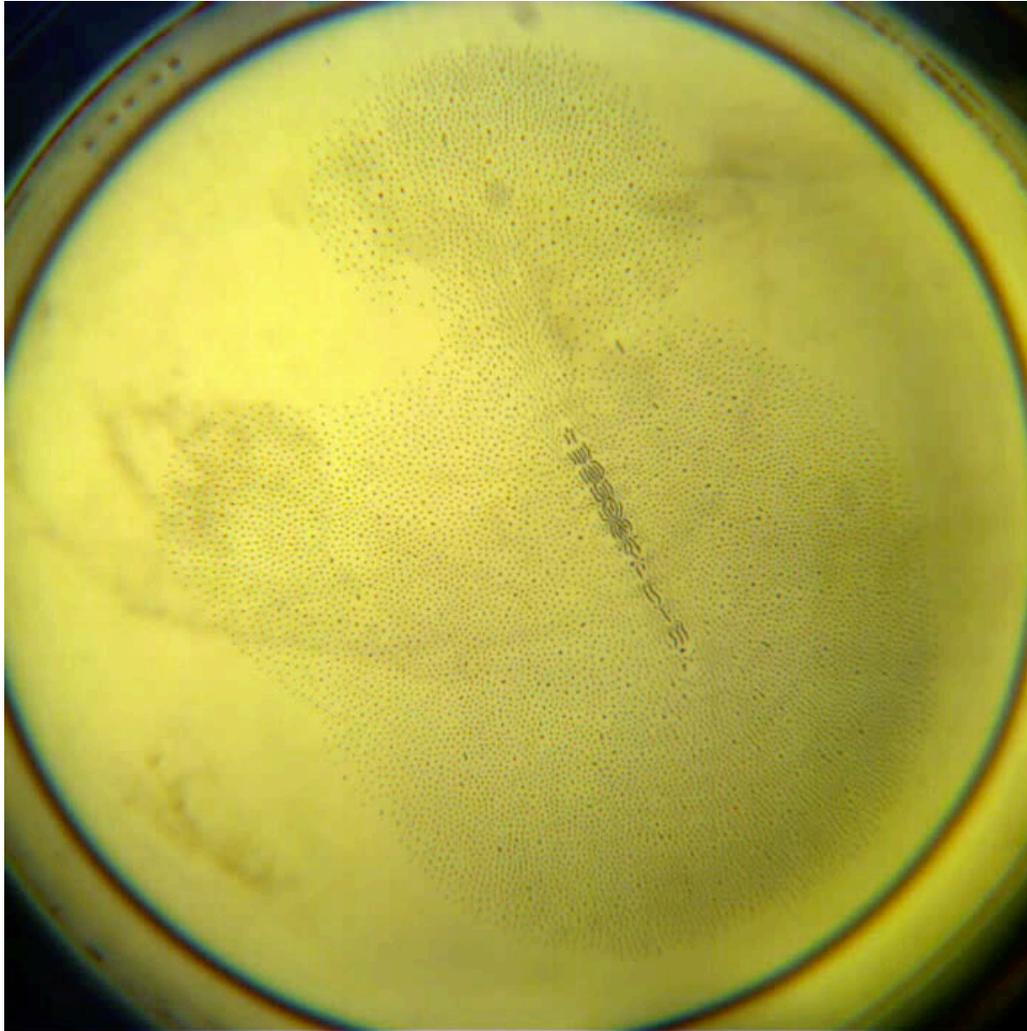
ALFRED HUBLER (1957 - 2018)

MOBILE OIL DROPLETS

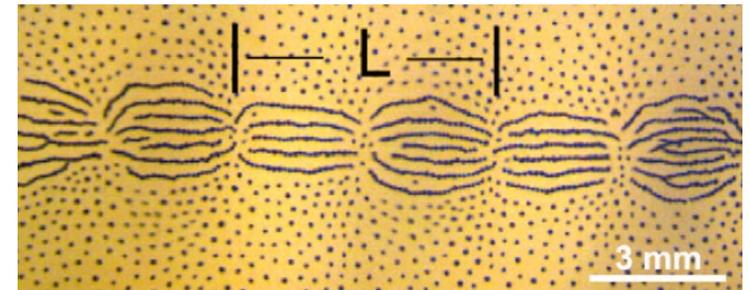


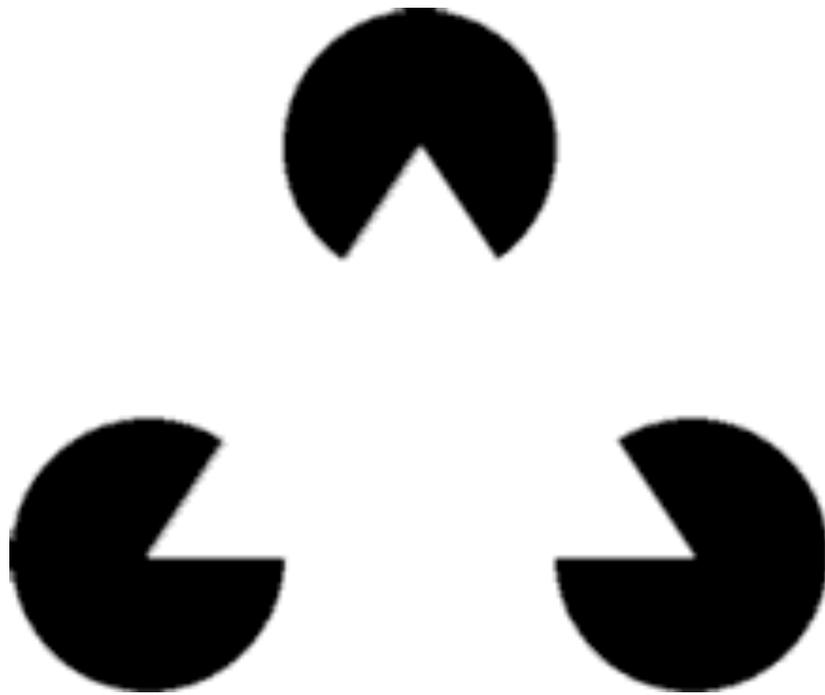
M. M. Hanczyc et al, *J. Am. Chem. Soc.* **129** (2007) 9386-9391.

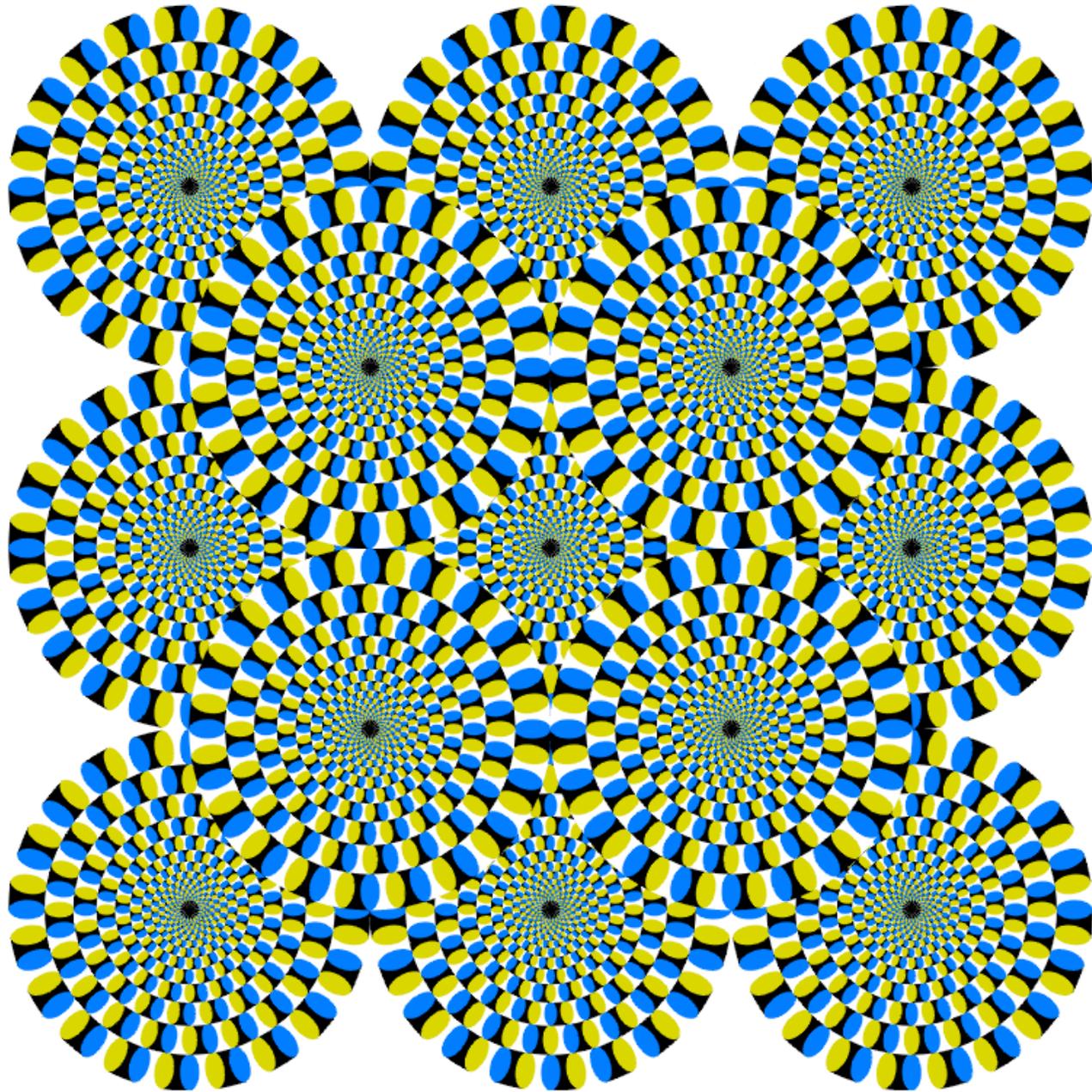
MAGNETIC SNAKE

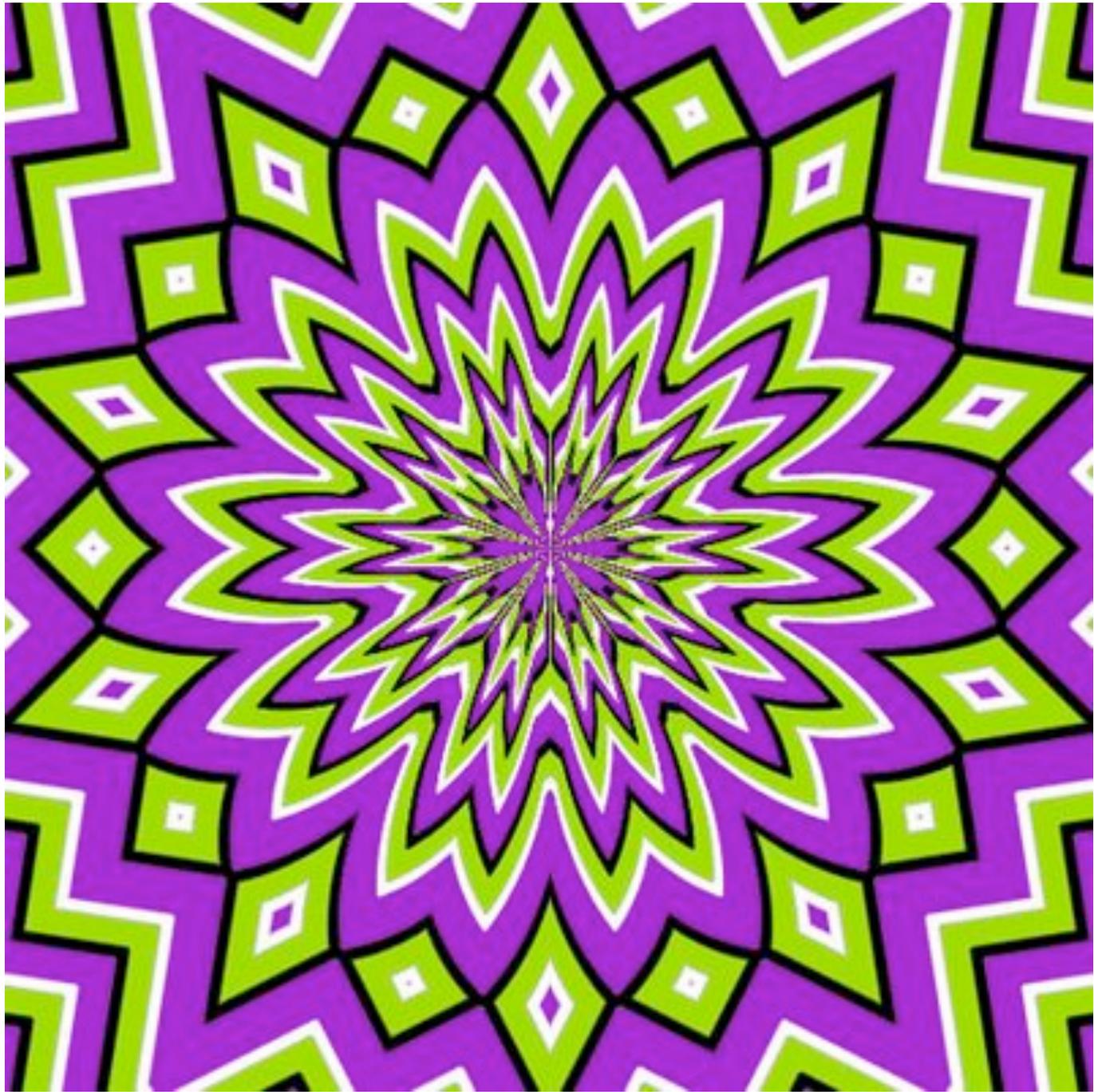


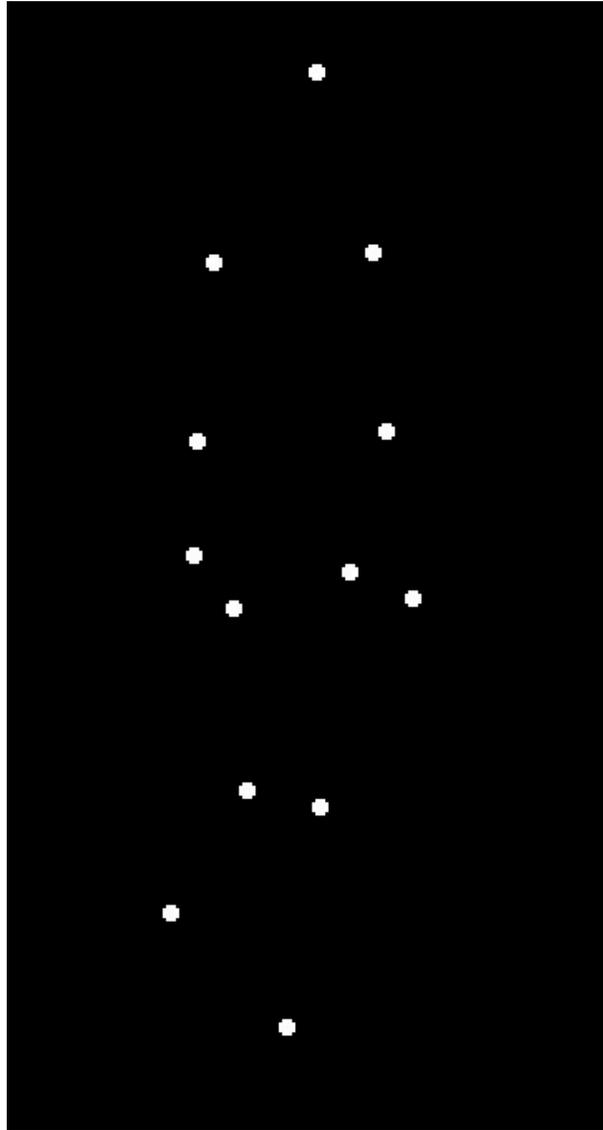
Magnetic 90 μm nickel spheres are suspended over the surface of water being supported by surface tension











Cybernetics

Announced by Norbert Wiener in 1940s

2019: A largely unrealized research program

Topics

(Informational Calculus for Cybernetic Systems)

- Information theory
- Informational measures
- Correlation/dependency/flow/causality
- Shannon's First Theorem

Not discussing

- Communication theory (Shannon's Second Theorem)
- Coding theory
- Rate distortion
- Large deviations
- Semantics
- Structure
- Hierarchy
- Emergence
- Function
- Nonequilibrium thermodynamics
- ...

Agenda

- Information in Complex Systems
- Historical Information
- Beyond Shannon

Today

Wednesday?

Shift to Technical Review