



# Self-Organising Systems

## Some Concepts

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- Complexity
- Self-Organisation / Homeostasis
- Dynamic Equilibrium
- Entropy
- Open Closed Systems
- Phase Space
- Attractor
- Non-Equilibrium Phase Transition
- Positive / Negative Feedback Loops

# Feedback

- Positive Feedback
  - Explosion
  - Backcoupling
- Negative Feedback
  - Thermostat
  - Body functions

# Phase Space

- Diagram containing all variables describing the system
- Examples:
  - Start of Rocket: Speed/Height
  - Pendulum



# Attractor / Limit Cycle

- Phase Space Diagram: Pendulum?
- Hunter / Prey diagram

- Open / Closed Systems
- Order
  - Low Energy equilibrium systems
  - Dissipative Structures (far away from equilibrium)
- Co-Evolution
- Entropy / Negentropy
- Homeostasis - Resistant to Change (Feedback Loops):  
autopoietic Systems

# Self-Organisation

“A system, that builds structures with an increasing degree of organisation without direct force from outside.”

Morfill, Scheingraber: “Chaos ist überall...und es funktioniert”, Ullstein Sachbuch

## Searching for ...

- ... Henri Poincaré's three body problem and Newton; Kolmogoroff, Arnold und Moser
- ... strange attractors
  - Lorenz Attractor
  - Rössler Attractor
- ... Bifurcation
- ... Period-doubling
- ... Turbulence
- ... Iterations and chaotic behaviour
- ... Stretched images and Poincaré's return
- ... Weierstrass and the differential equation leading to Peano and Mandelbrot



Thank You... Still Questions open?

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**Faust...**