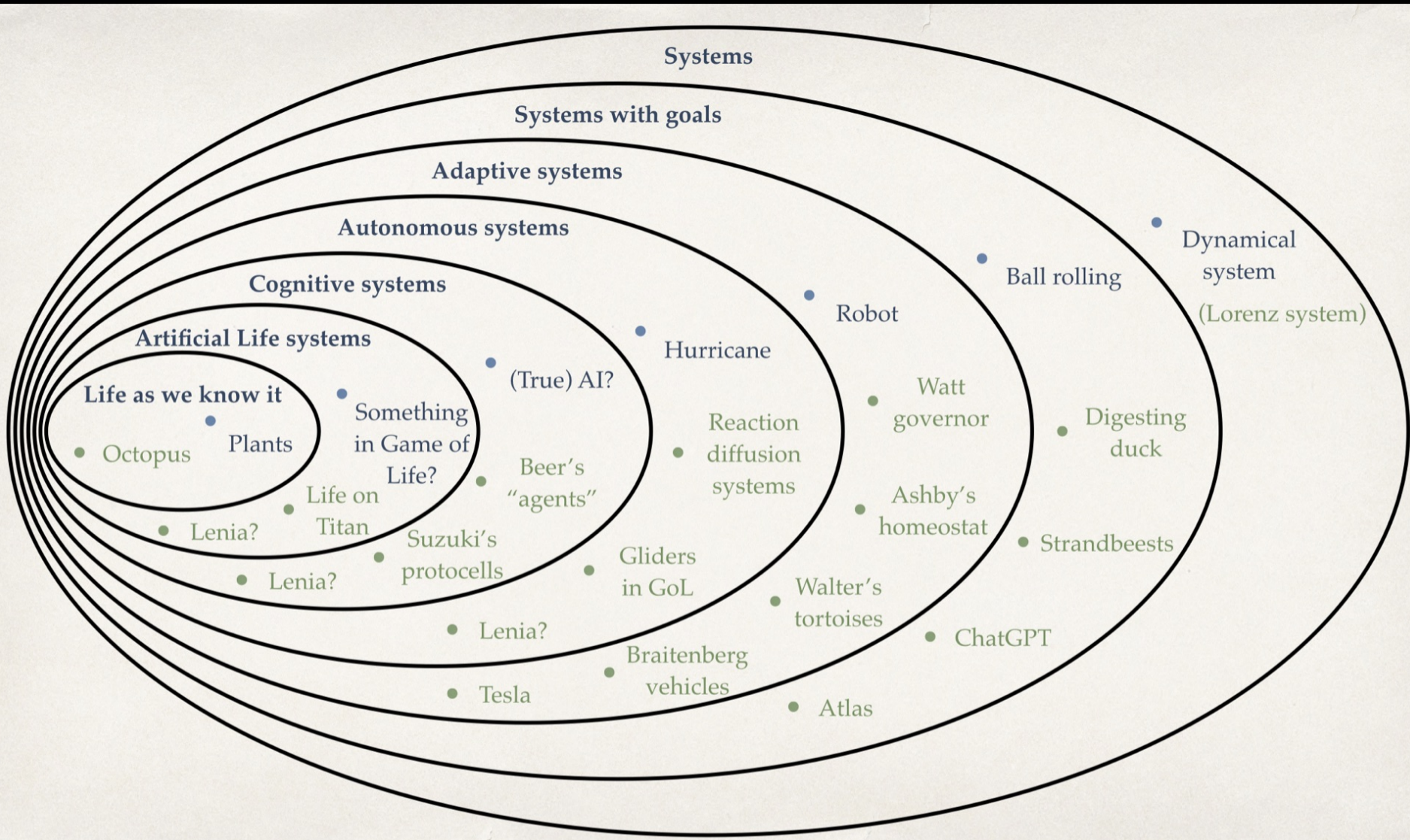
Minimal Agency

"Intelligent agency"

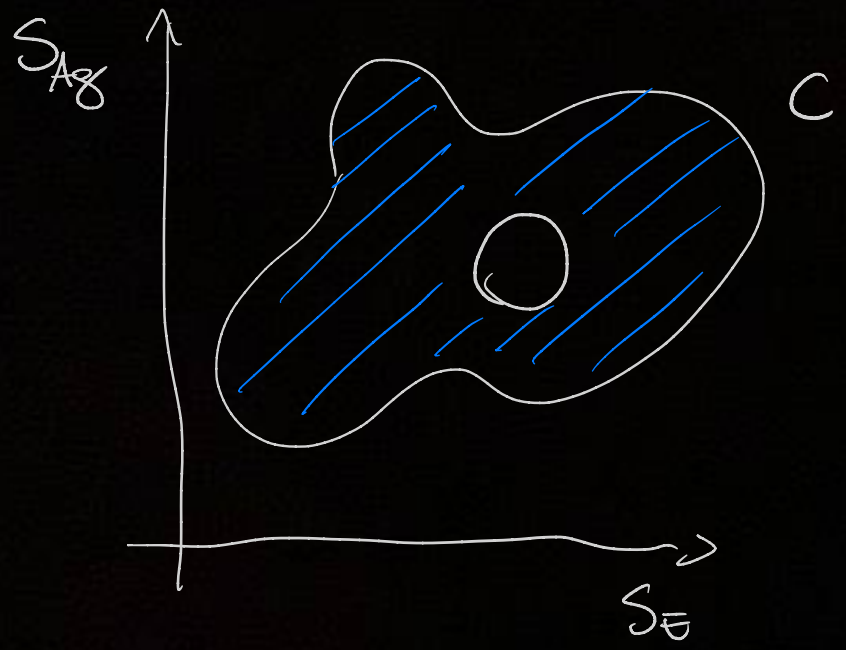
- human reasoning
- causal reasoning
- learning

Minimal agency
(artificial life?)
e.g. gliders, bacteria?

- no probabilities (for now)
  - → no info theory
  - → no (Pearl) causality
  - → ....
- boundaries
- dynamical systems
- agent - env relations

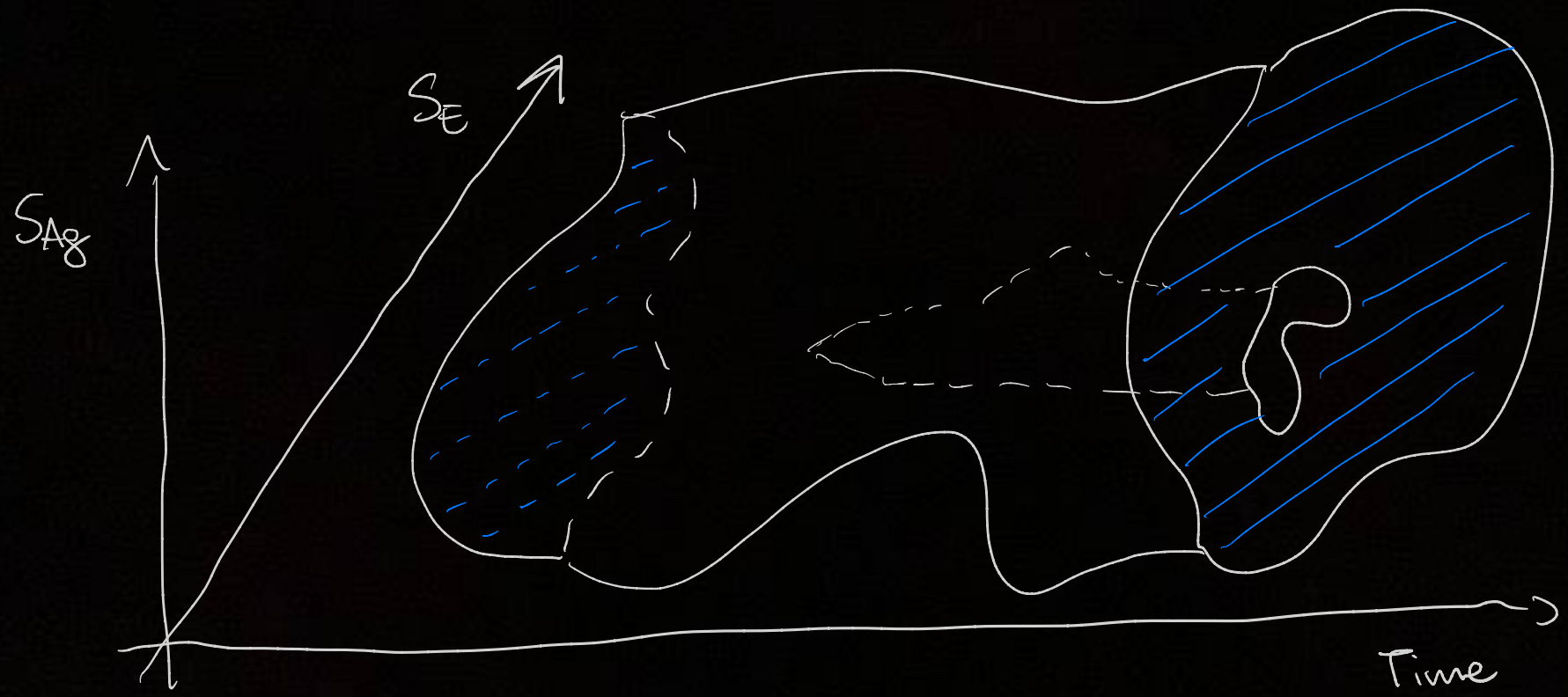

Systems
Systems with goals
Adaptive systems
Autonomous systems
Cognitive systems
Artificial Life systems
Life as we know it
Octopus
Plants
Something in Game of Life?
Life on Titan
Lenia?
Lenia?
Suzuki's protocells
(True) AI?
Beer's "agents"
Lenia?
Hurricane
Reaction diffusion systems
Gliders in GoL
Braitenberg vehicles
Tesla
Robot
Watt governor
Ashby's homeostat
Walter's tortoises
Atlas
Ball rolling
Digesting duck
Strandbeests
ChatGPT
Dynamical system
(Lorenz system)

An agent's constraints

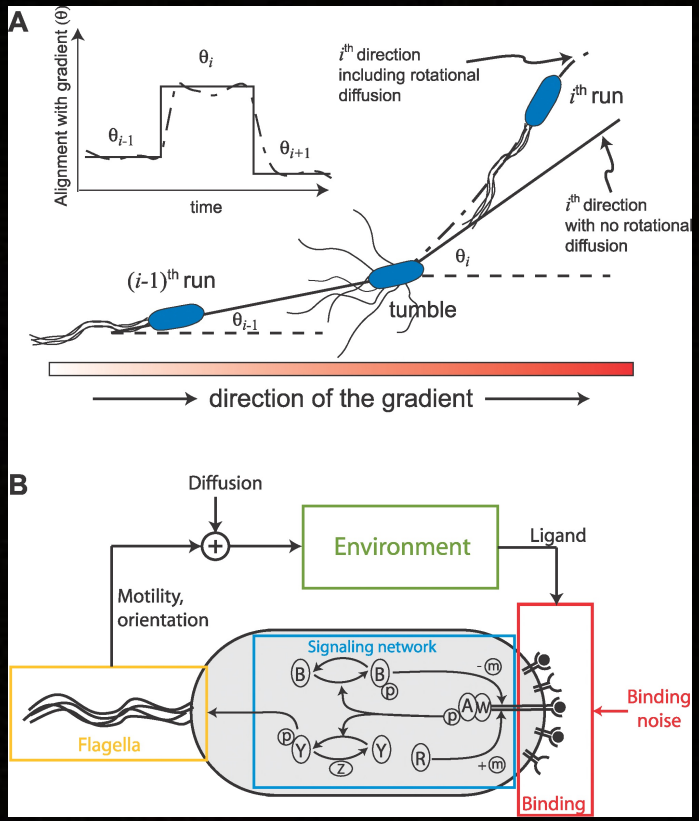


$$C \subset S_{Ag} \times S_E$$

... over time (~ viability theory)



Minimal notions of "models"



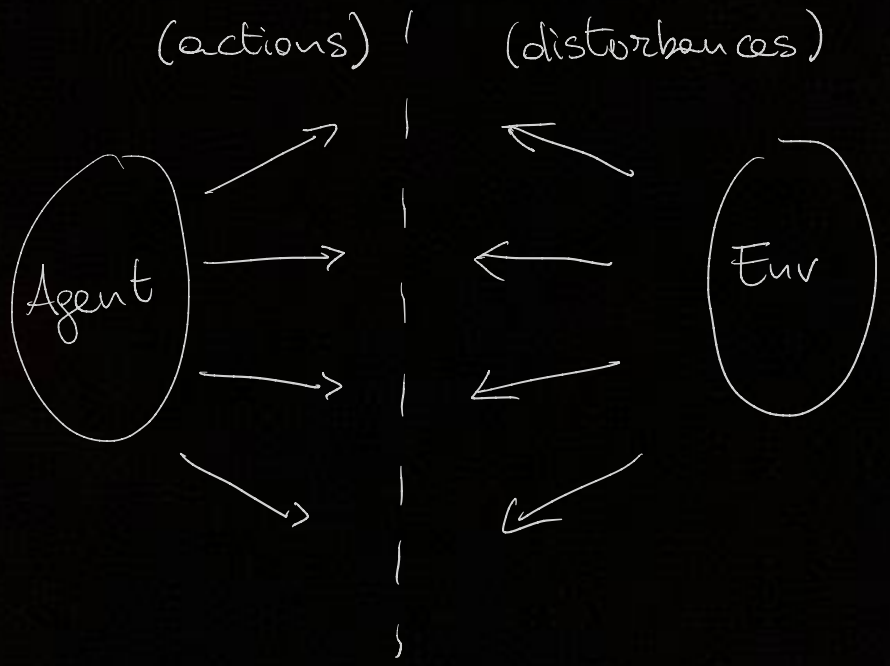
"perfect adaptation"

"integral control"

Good regulator "theorem"

"Every good regulator of a system must be a model of that system"

(Conant & Ashby, 1370)

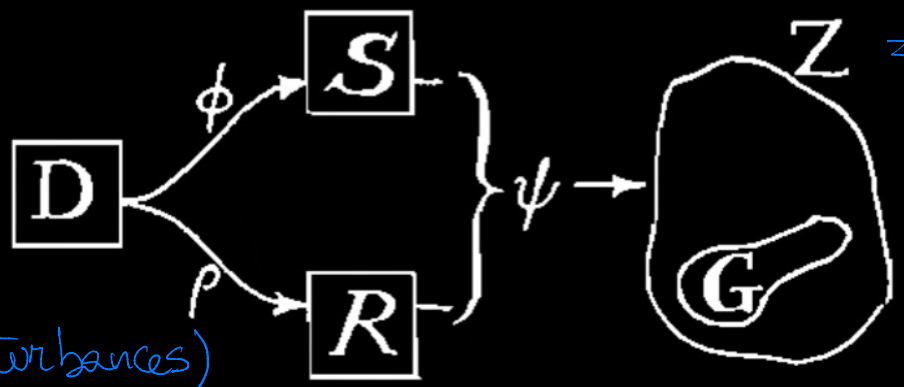


(law of requisite variety)

The setup of the GRT

(System)

Fig. 1



(Disturbances)

(Regulator)

$Z = S \times R \times ?$

$G \subset Z$

Issues with the GR "T"

→ Confusing math. statement ("theorem")
- set-theoretic setup

→ No proof
- probabilities for a "proof"

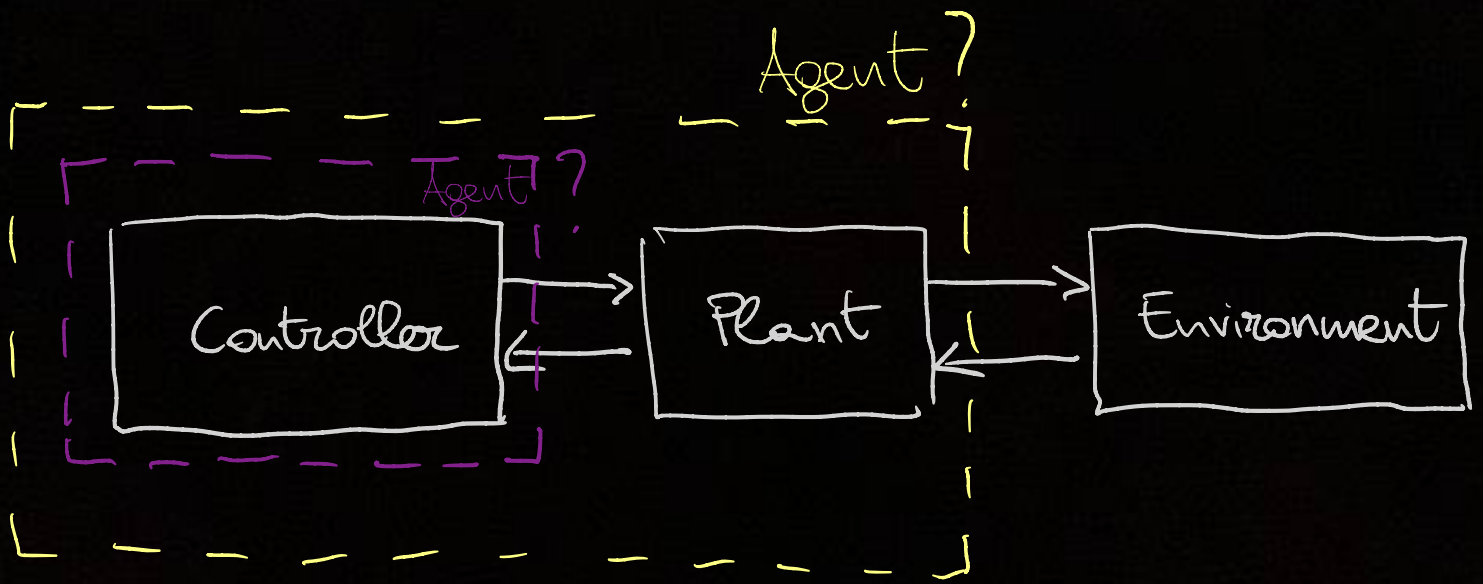
→ No explicit use of dynamical systems
- my problem with it

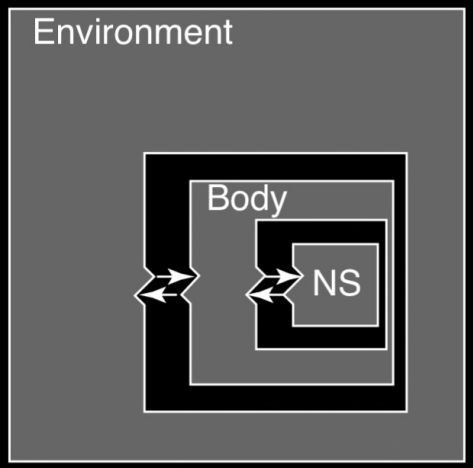
Solutions

→ set-theory (internal model principle)

→ probabilities (John?)

Internal model principle (setup)



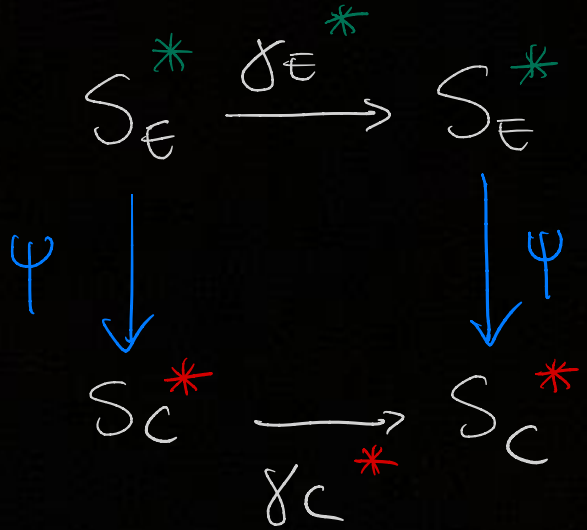


Internal model principle

IMP (sets, functions, relations)

$\gamma_E : S_E \times S_P \to S_E$

$\gamma_C : S_C \times S_P \to S_C$



Bayesian IMP (?)

Bayesian inference

Ass. ψ is surjective

If $\psi : S_E^* \to S_C^*$ is surjective, $\exists\, \xi : S_C^* \to \mathcal{P}S_E^*$ s.t. (powerset $\setminus \{\}$)

$$\begin{array}{ccc} S_C^* & \xrightarrow{\alpha_C^*} & \mathcal{P}S_C^* \\ {\scriptstyle \xi}\downarrow & & \downarrow{\scriptstyle \mathcal{P}\xi} \\ \mathcal{P}S_E^* & \xrightarrow[\mathcal{P}\alpha_E^*]{} & \mathcal{P}S_E^* \end{array}$$