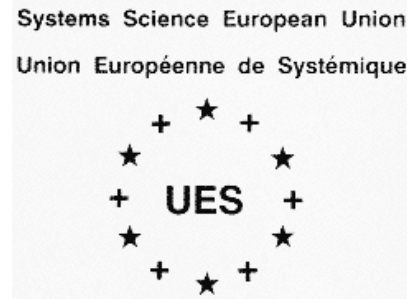# Hard and Soft System Intentionality

Hermínio Duarte-Ramos

Systemic Complexity for human development in the 21st century
Systemic Complexity : new prospects to complex system theory
7th Congress of the UES Systems Science European Union Lisbon, Dec. 17-19, 2008
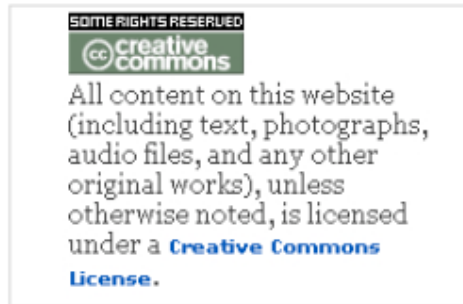
This work is licensed under the
Creative Commons
Attribution-NonCommercial-NoDerivs
License
Ce travail est protégé par une licence
Creative Commons
(559 Nathan Abbott Way, Stanford, California 94305, USA)

au profit de l' UES
Union Européenne de Systémique

**Il peut être copié et distribué gratuitement, uniquement dans un but non-commercial,
mais sans modification, et à condition que soit indiqués
It can be copied and distributed, only in a non-commercial purpose, but without modification, and provided with the indications of**

the origin/la source : http://afscet.asso.fr/resSystemica/Lisboa/DuarteRamosLisboa08Lecture.pdf
the title/le titre : **Hard and Soft Systems Intentionality. (slides presentation)**
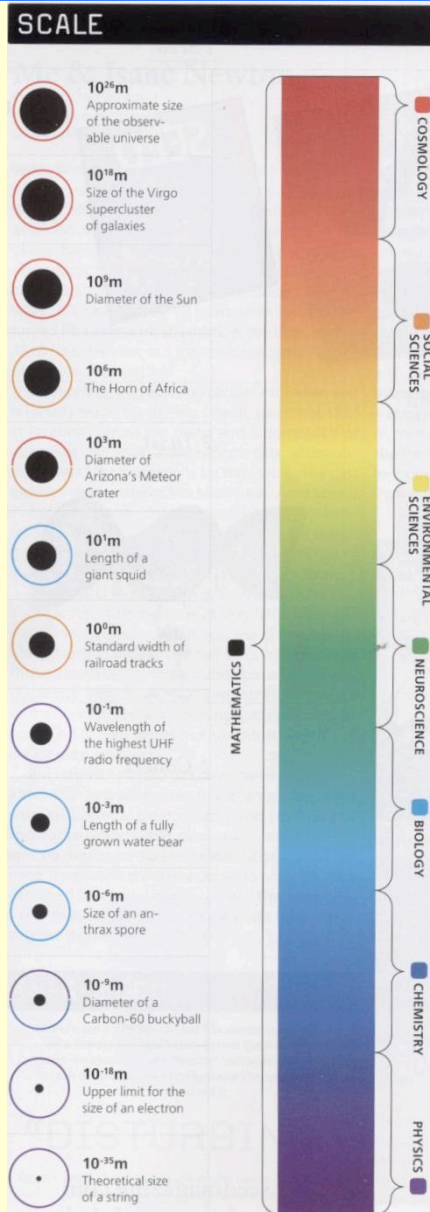the author/l'auteur : **DUARTE-RAMOS Herminio**
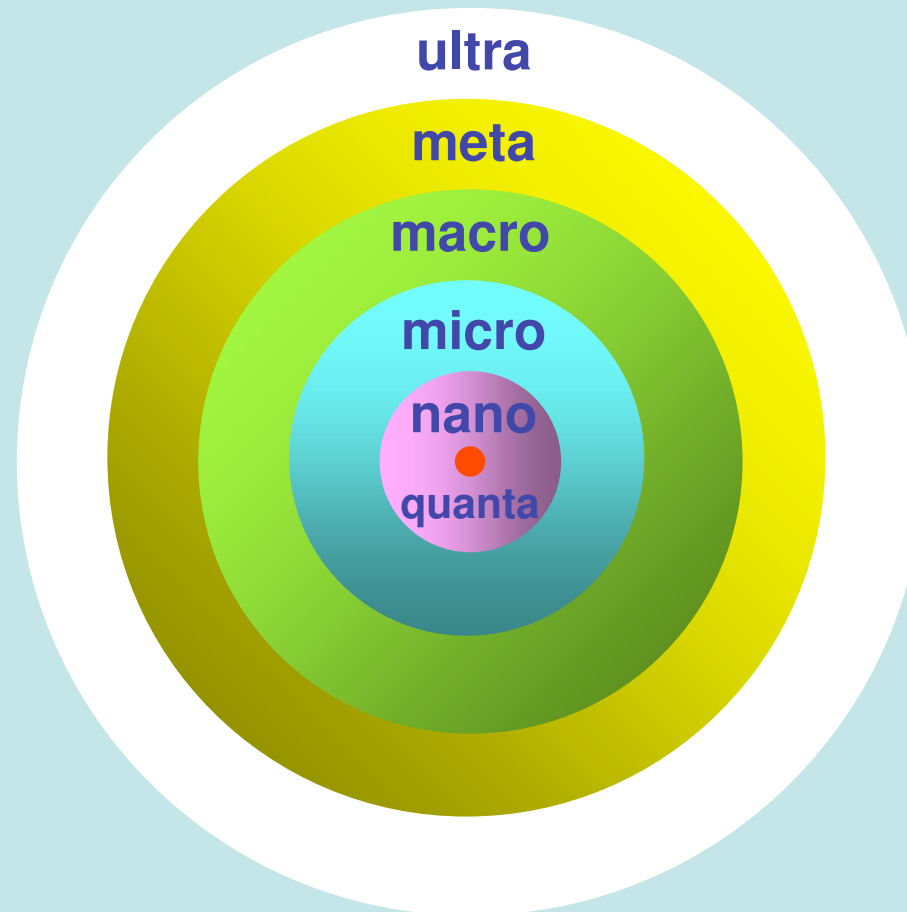the pages/la pagination : **46 p.**
the year/l'année : **2008**
& the book/la publication: **7th Systems Science European Union Congress Proceedings,**
                 Lisboa, Portugal.

Attribution Non-Commerciale, Partage À l'Identique
Urhebernennung, Nicht-kommerziell, Gegenseitigkeit
Atribución No comercial, Compartir en igualdad
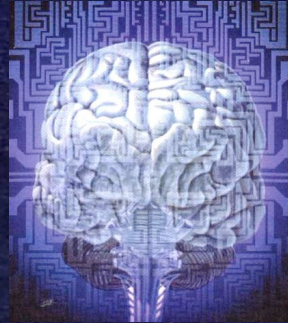Atribuição Não-Comercial, Partilha em Igualdade

APOCOSIS Associação Portuguesa de Complexidade Sistémica Faculty of Science & Technology, Lisbon
Systems intentionality, Herminio DUARTE-RAMOS   p. 0 / 46

1. Basic Principles

SCALE

10^{26}m	Approximate size of the observable universe
10^{18}m	Size of the Virgo Supercluster of galaxies
10^9m	Diameter of the Sun
10^6m	The Horn of Africa
10^3m	Diameter of Arizona's Meteor Crater
10^1m	Length of a giant squid
10^0m	Standard width of railroad tracks
10^{-1}m	Wavelength of the highest UHF radio frequency
10^{-3}m	Length of a fully grown water bear
10^{-6}m	Size of an anthrax spore
10^{-9}m	Diameter of a Carbon-60 buckyball
10^{-18}m	Upper limit for the size of an electron
10^{-35}m	Theoretical size of a string

COSMOLOGY
SOCIAL SCIENCES
ENVIRONMENTAL SCIENCES
NEUROSCIENCE
BIOLOGY
CHEMISTRY
PHYSICS
MATHEMATICS

natural world **in the** **real space**

ultra

meta

macro

micro

nano

quanta

2. System Concept

brain neuron axons

2. System Concept

Space

Matter *signals* **Mind**

2. System Concept

natural world

input

System

ouput

environment

2. System Concept

Outside world

material reality

Mind

ideal imagenality
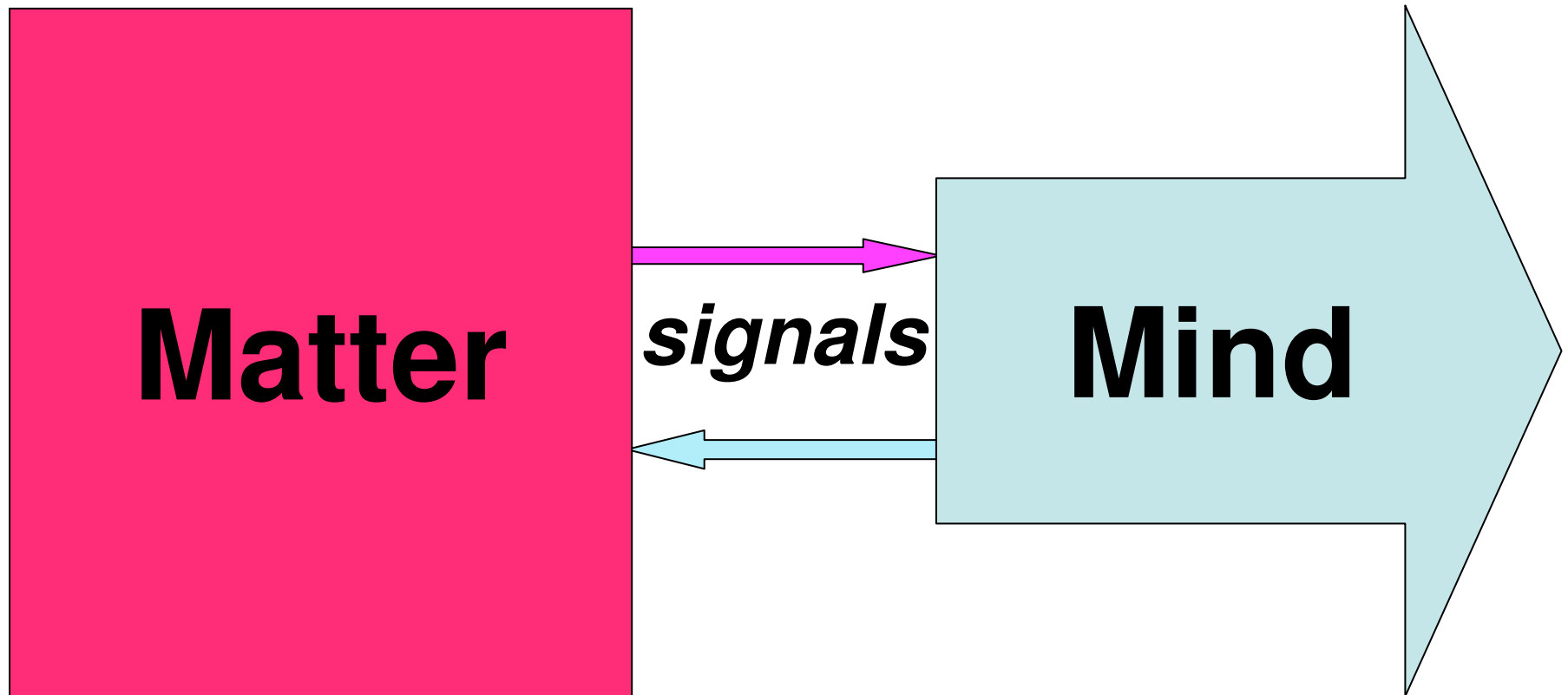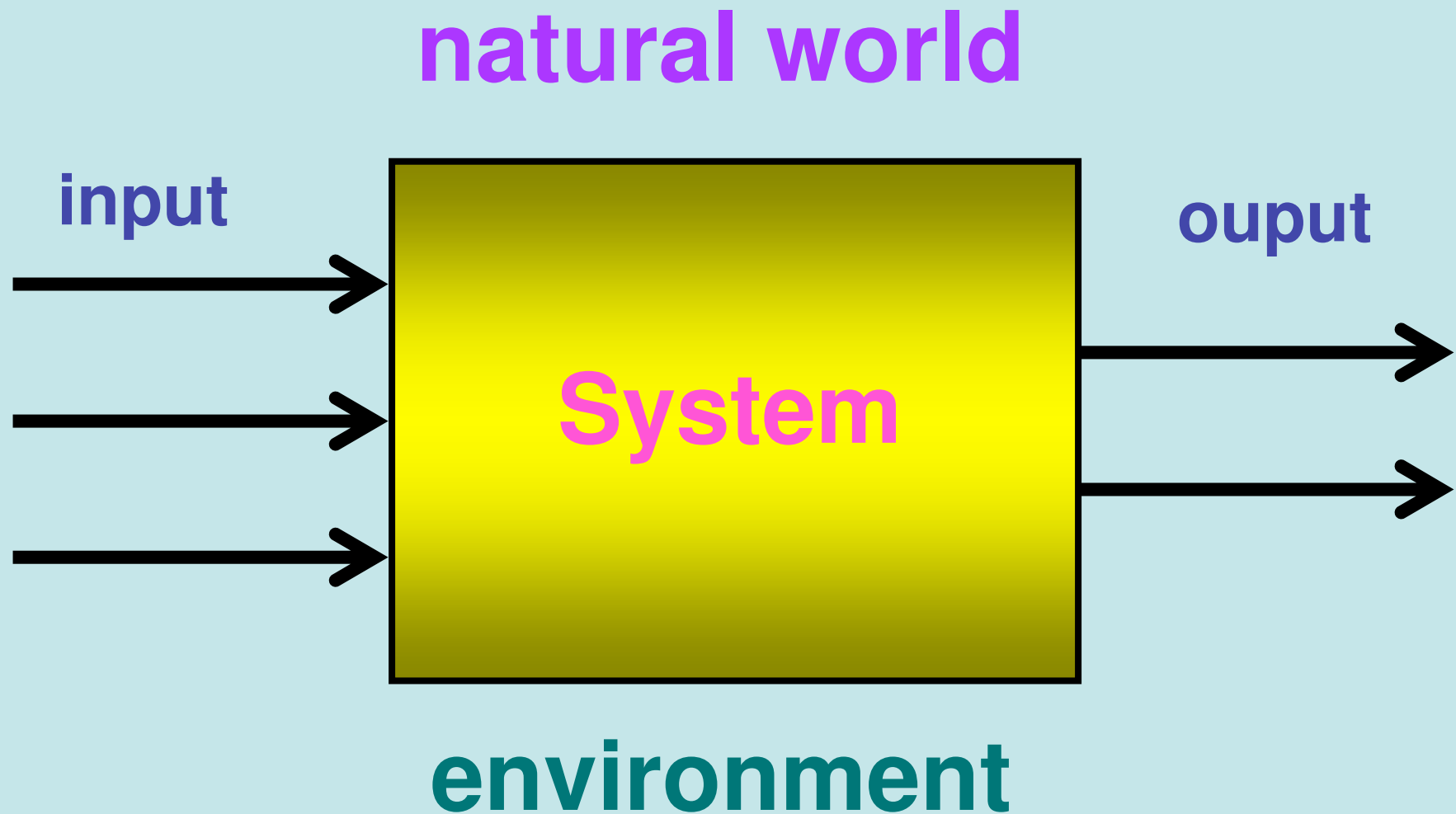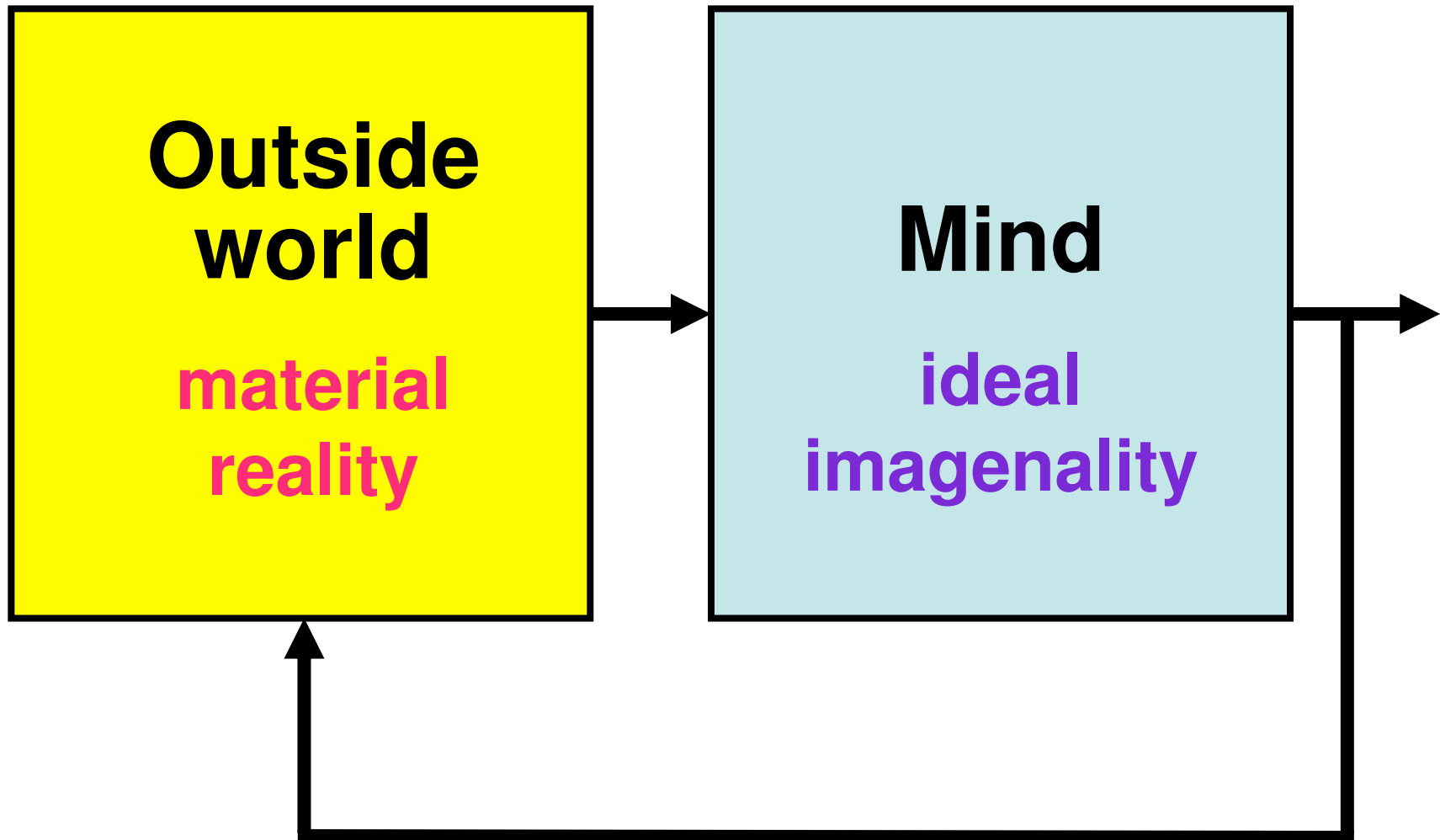
2. System Concept

System

is an organizing *structure*
with several *functional* **componentes**
and *signal* **interactions**
within a *virtual* or *real* **boundary**
pursuing an **adaptive** *operation*
according to its own *intentionality*
towards a *purpose* or **telonomy**
emerging as an *action*

3. General Theory of Systems

Reality

is composed of

material objects

and

immaterial signals

3. General Theory of Systems

Systemic essentials

- **acrony**   composition by functional components

- **axony**   interactivity between components by signals

- **aquadry**   frame boundary of the strict functional structure

- **adaptacy**   process adaptation to the working conditions

- **telonomy**   quintessence as emergence from intentionality

4. Systemic Essentials

Traditional system configurations:
series, parallel, feedback
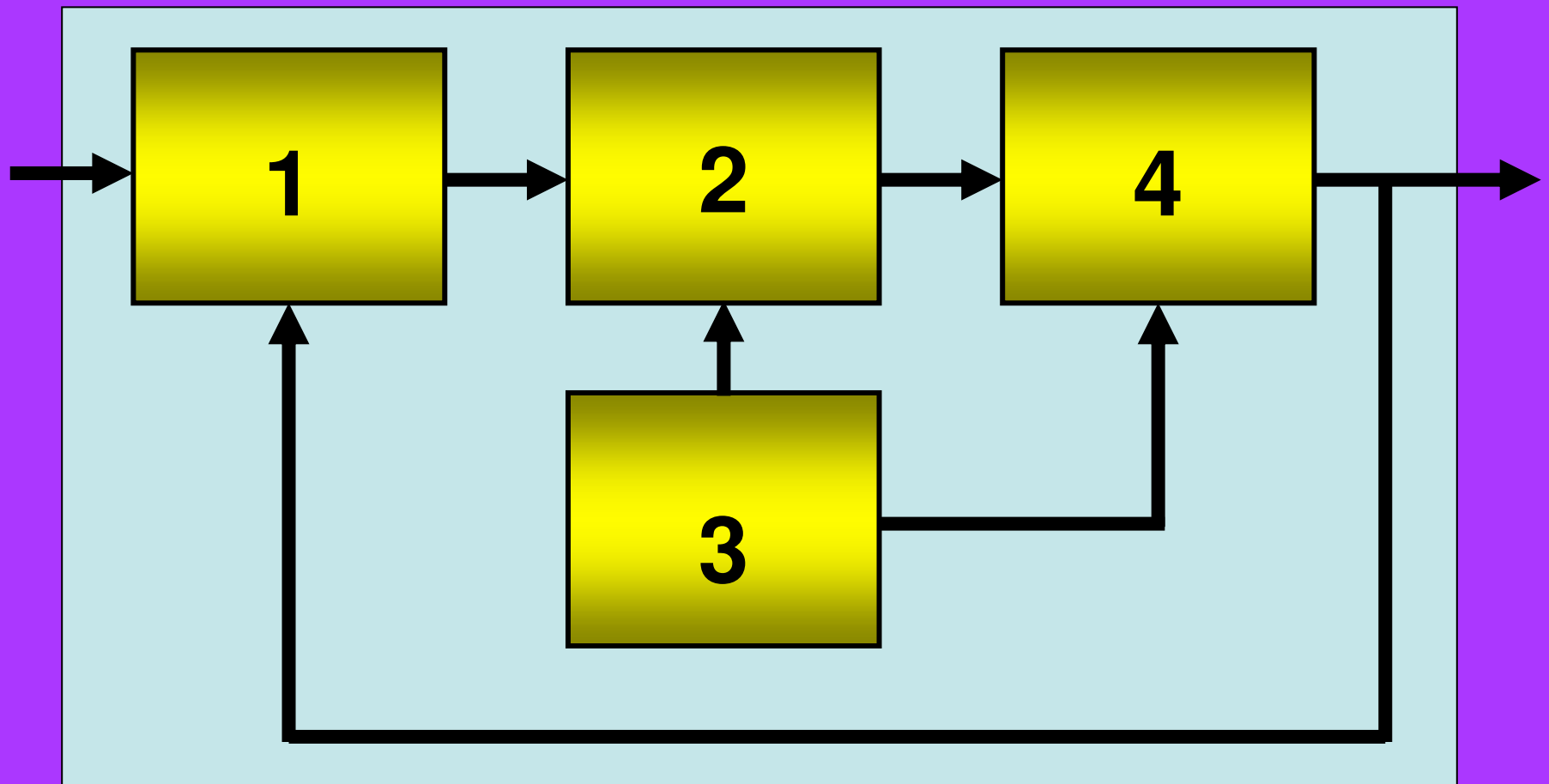
4. Systemic Essentials

- **acrony**

- **axony**

- **aquadry**

- **adaptacy**

a + chronos = not time

axon = axis

a + quadra = not square

adaptatione = adaptation
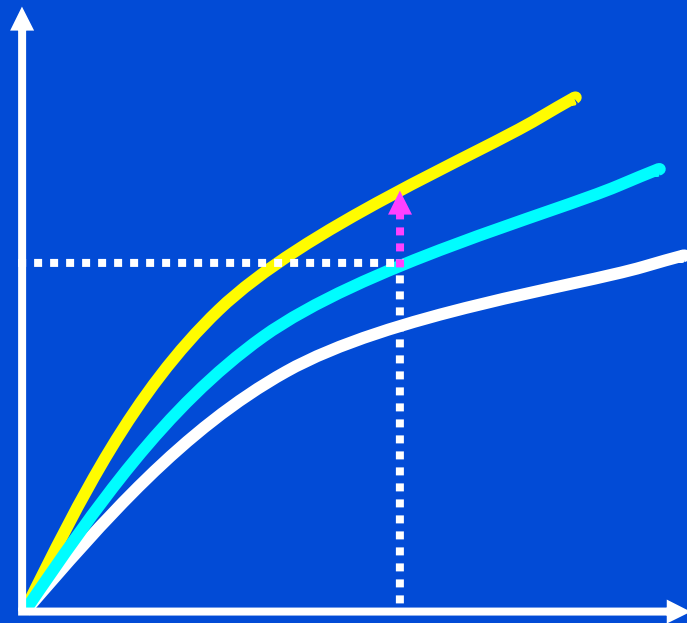
4. Systemic Essentials

Adaptacy

Philogenetic evolution
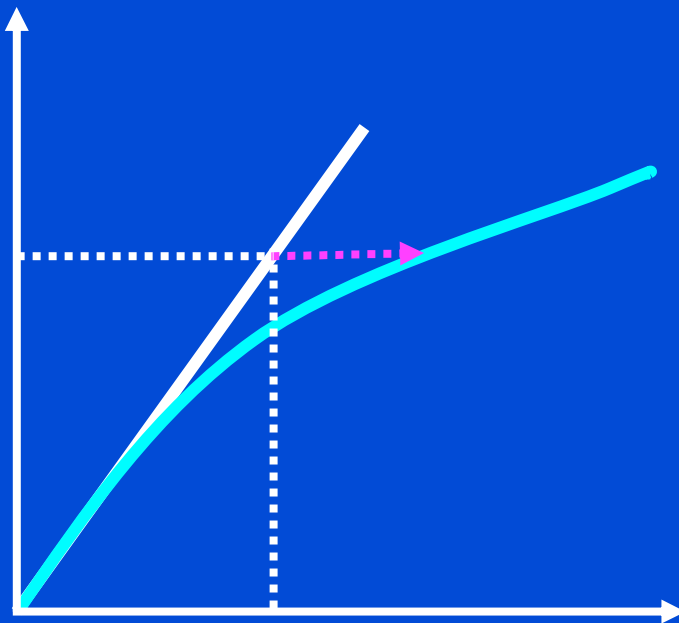
4. Systemic Essentials

Adaptacy

Ontologic evolution

4. Systemic Essentials

- **acrony**

- **axony**

- **aquadry**

- **adaptacy**

- **telonomy**   *telos* = end, aim

5. Fixed Telonomy

A lamp
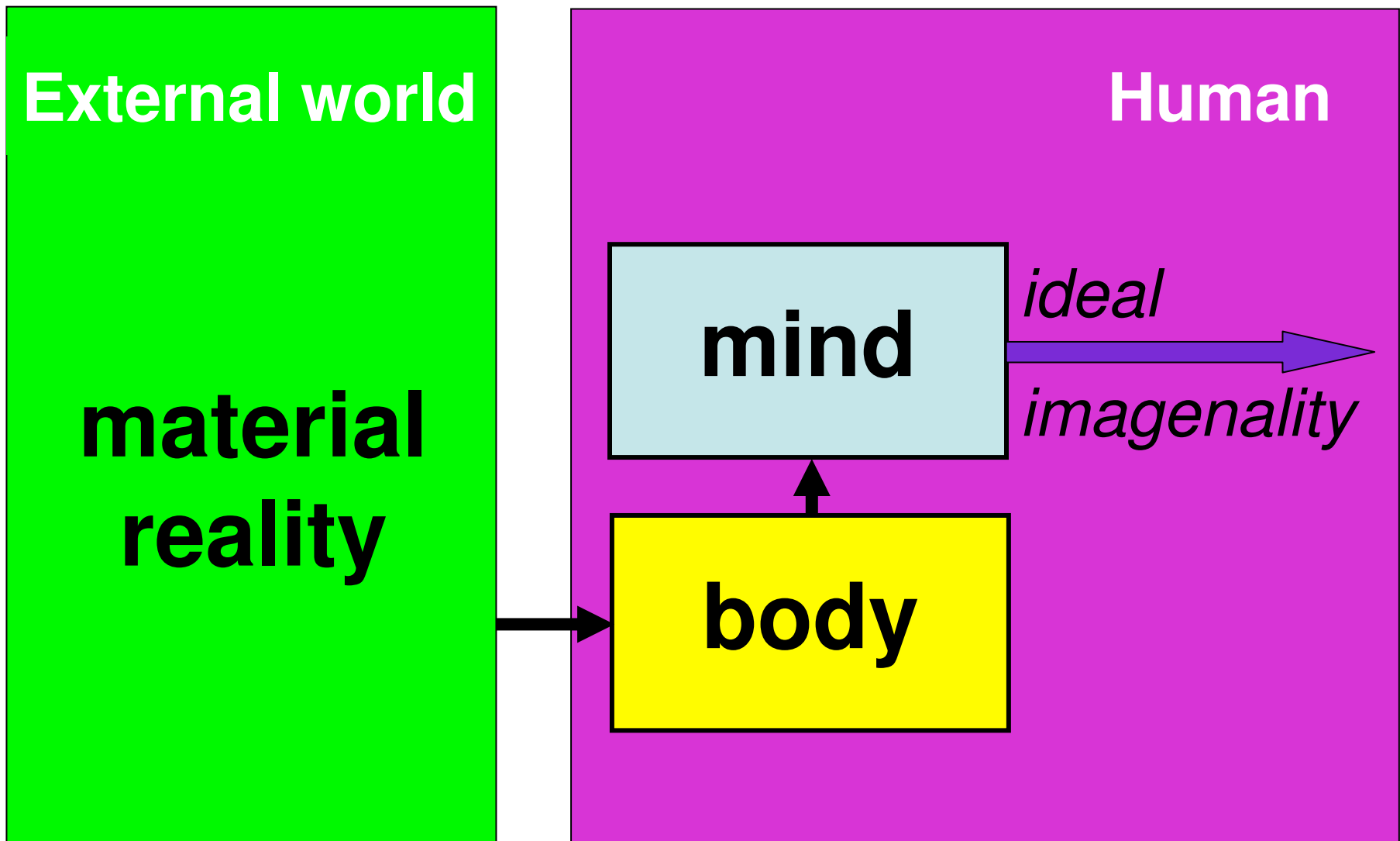is structured
to light out

A lamp
has a fixed
telonomy

5. Fixed Telonomy

fixed telonomy
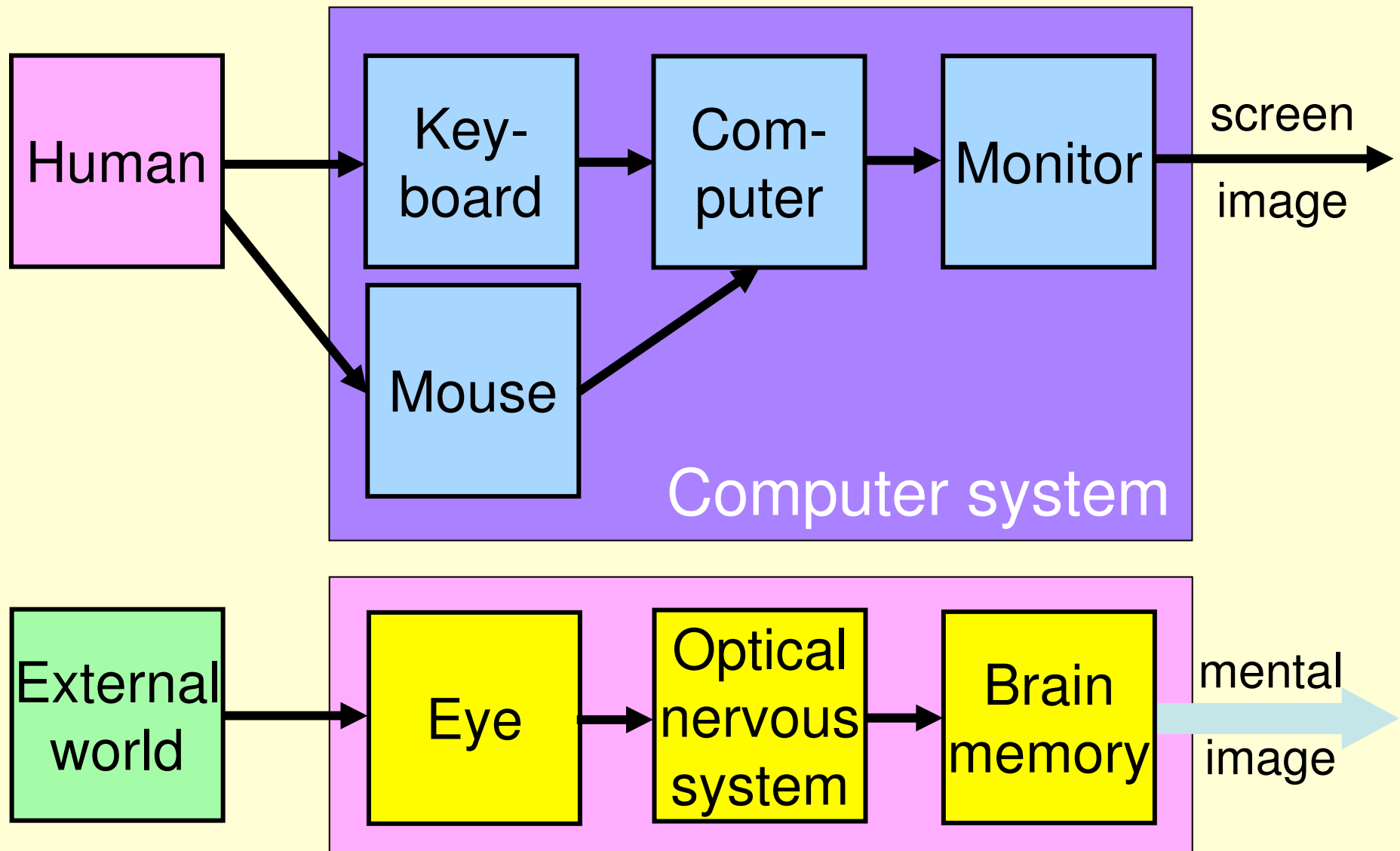
rigid or variable purpose

hard intentionality

6. Flexible Telonomy

External world

Human

material reality

mind

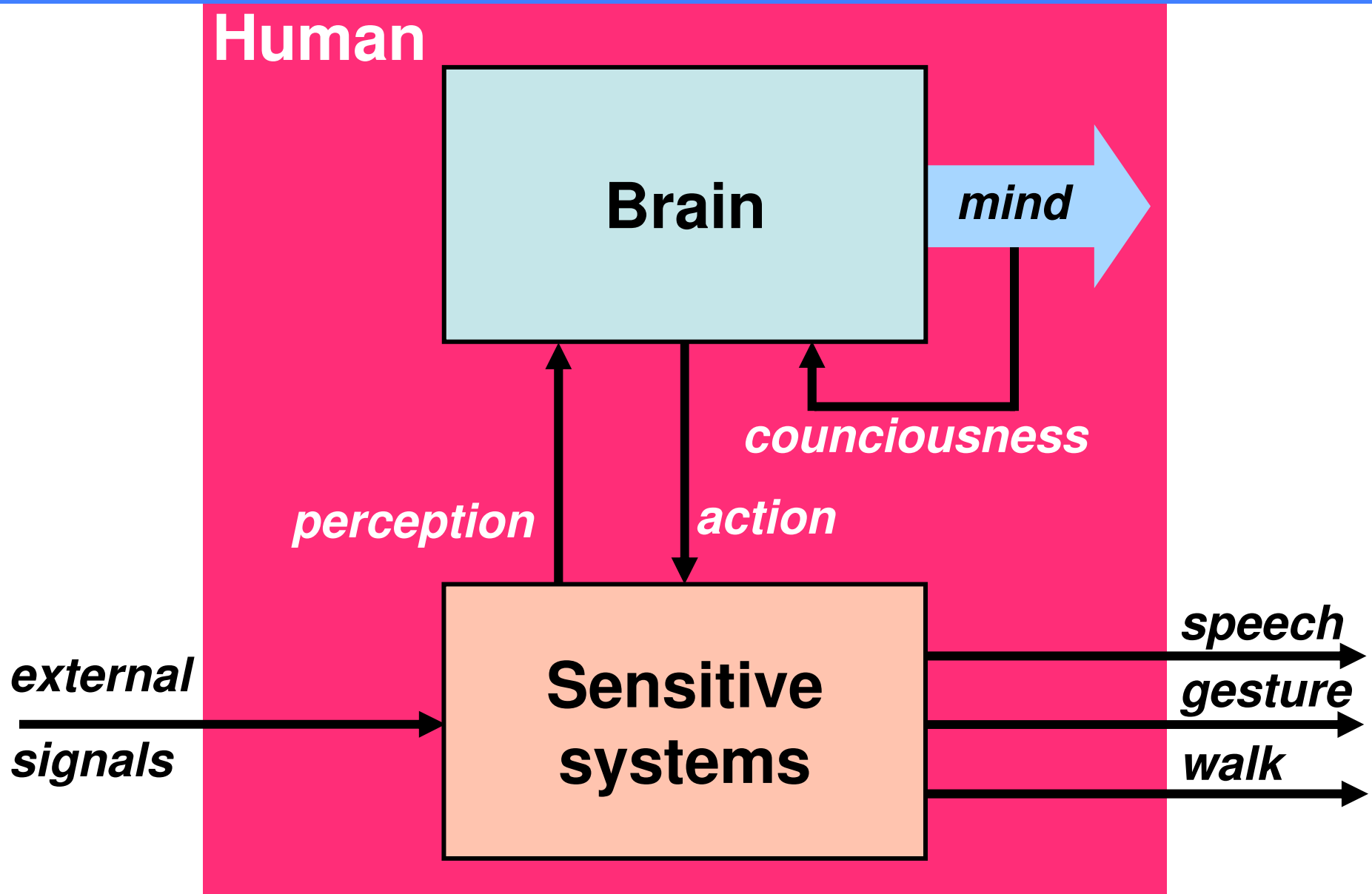*ideal*

imagenality

body

6. Flexible Telonomy

6. Flexible Telonomy

acrony: biological sensitive system
          and central nervous system

axony: brain-mind supervenience
          and mind-brain subvenience

aquadry: variant neural configurations

adaptacy: self-adaptative body-mind
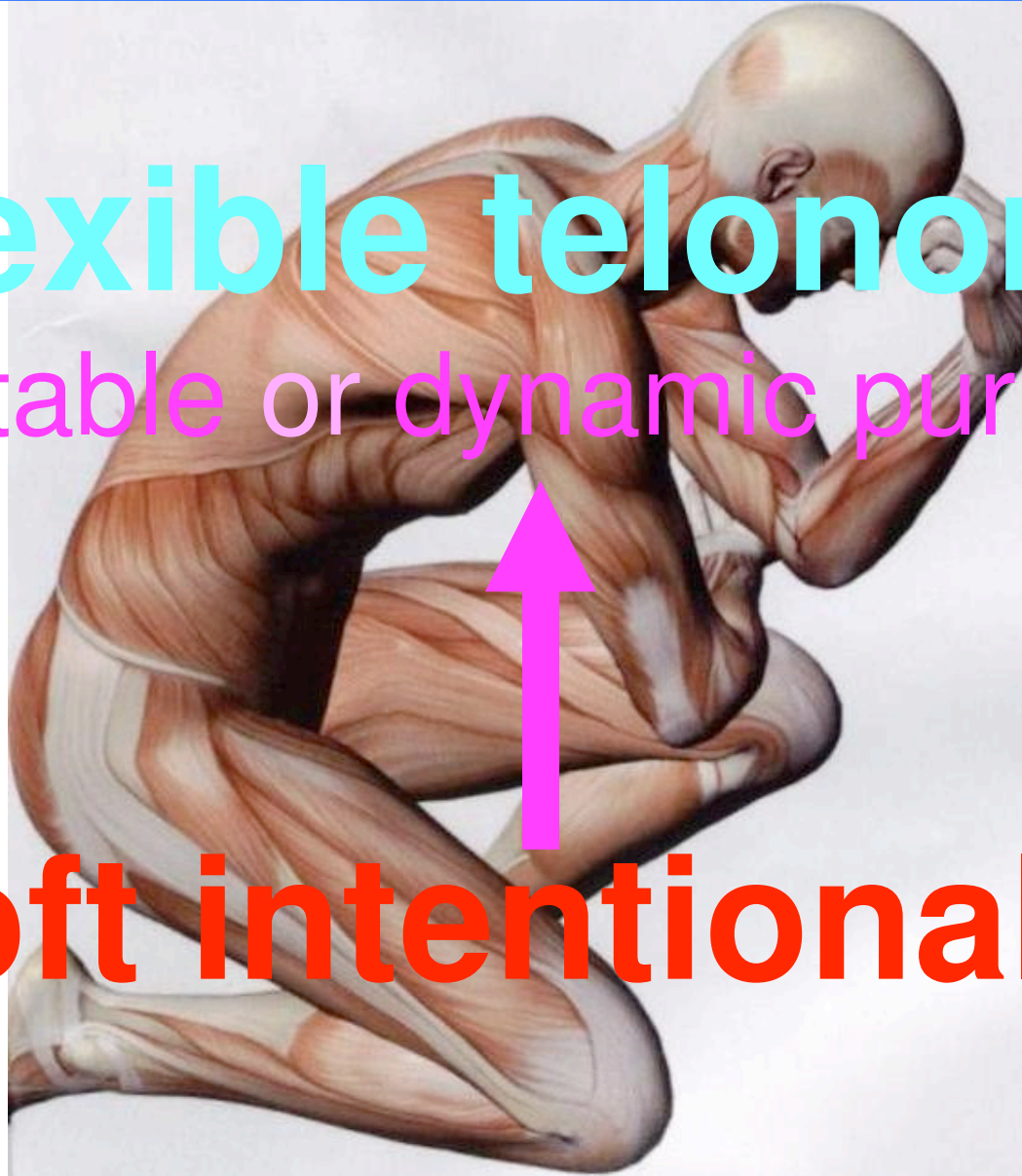
6. Flexible Telonomy

Human

Brain

mind

counciousness

perception

action

Sensitive systems

external signals

speech

gesture

walk

6. Flexible Telonomy

flexible telonomy

mutable or dynamic purpose

soft intentionality

7. Simplexity and Complexity

Simple simplex system: material structure

energy → | **Proton** and **gravitacional electron** | → *H atome*

Complicated simplex system: electric grid

E_{water} → Gene-rator → Line / L → Station / S / S → $E_{electric}$

E_{coal} → G → L

E_{wind} → G → L
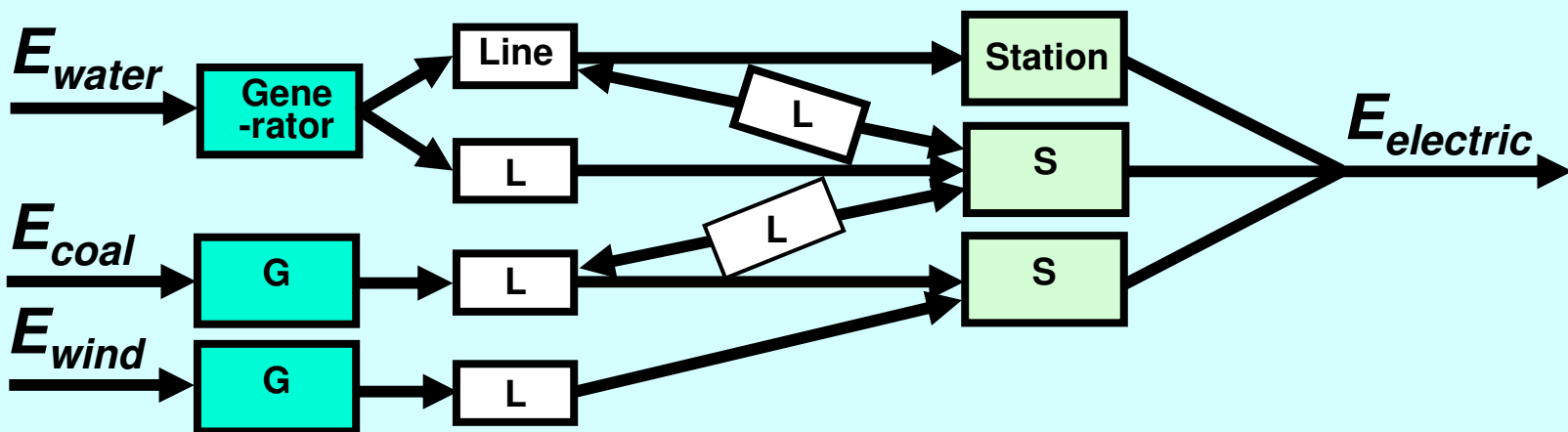
7. Simplexity and Complexity

Simplex system:

    definite acrony

    complete axony

    certain aquadry

    determined adaptacy

    expected telonomy

7. Simplexity and Complexity

Complex system:

indefinite acrony

incomplete axony

uncertain aquadry

undetermined adaptacy

unexpected telonomy

7. Simplexity and Complexity

Simple complex sytem: electron

energy → | **Electron: struture?** | → *particle?*
wave?

Complicated complex system: air navigation
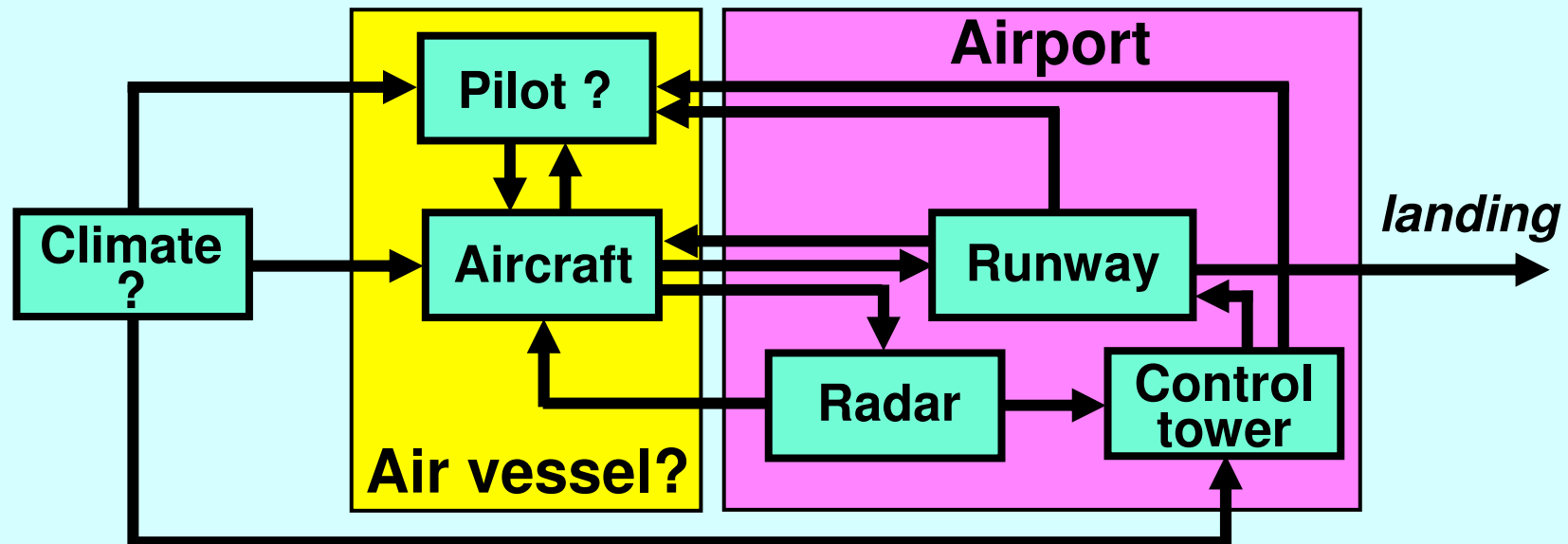
7. Simplexity and Complexity

- **Simplexity**

  characterizes simplex systems

  possess hard intentionality

  reveals fixed telonomy

- **Complexity**

  characterizes complex systems

  possess soft intentionality

  reveals flexible telonomy

8. Telonomy gap

- system intentionality = theoretical telonomy
  desired output, potential output
- system response = practical telonomy
  concrete output, real output

- **telonomy gap = telonomy – intentionality**
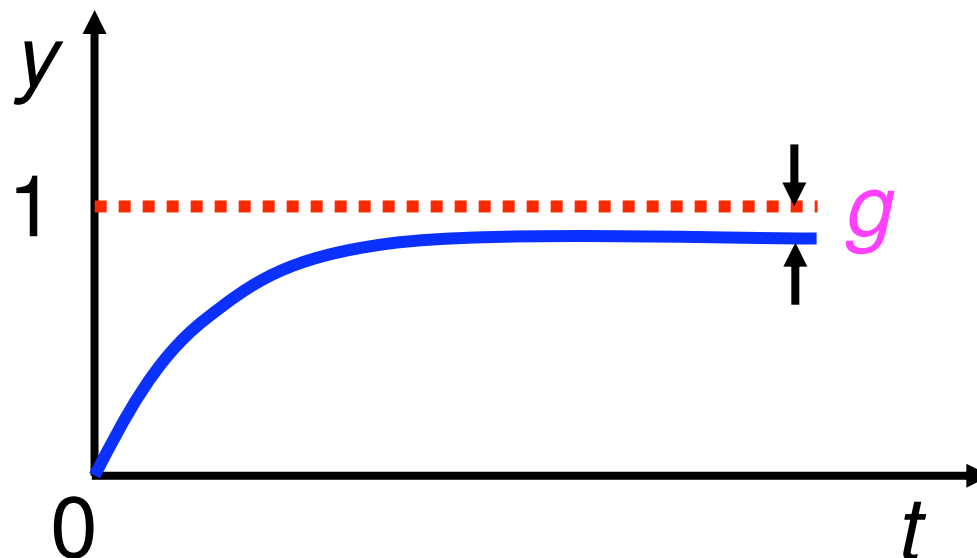
9. Telonomy and Emergence
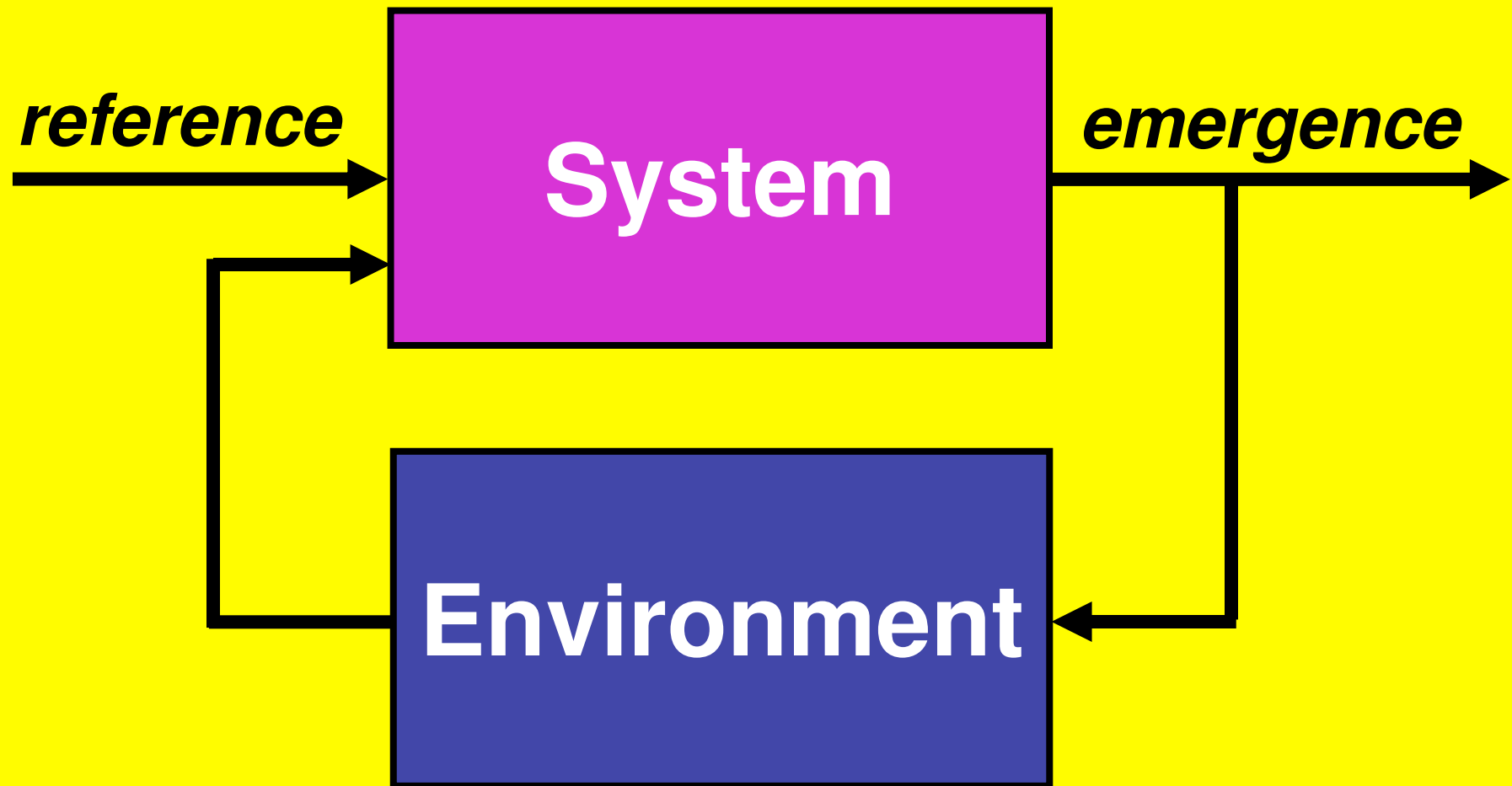
9. Telonomy and Emergence

emergence is:

expected telonomy
in simplex systems

unexpected telonomy
in complex systems

10. Degree of complexity

System complexity (physics)

is quite different from

computational complexity (maths)

10. Degree of complexity

System complexity degree:

.1st order:　**lacking of acrony**

. 2nd order: **lacking of axony**

. 3rd order:　**lacking of aquadry**

. 4th order:　**lacking of adaptacy**

Problems:

. *a priori* assential gaps are not clear

. *a posteriori* observations reveal troubles to purify the systemic model

11. Soft Intencionality in Humans

11. Soft Intencionality in Humans

Systemic cognitive model

Human body

Sensory organs → Brain memory

supervenience → **mind**

subvenience ←

Motion organs → *actions*
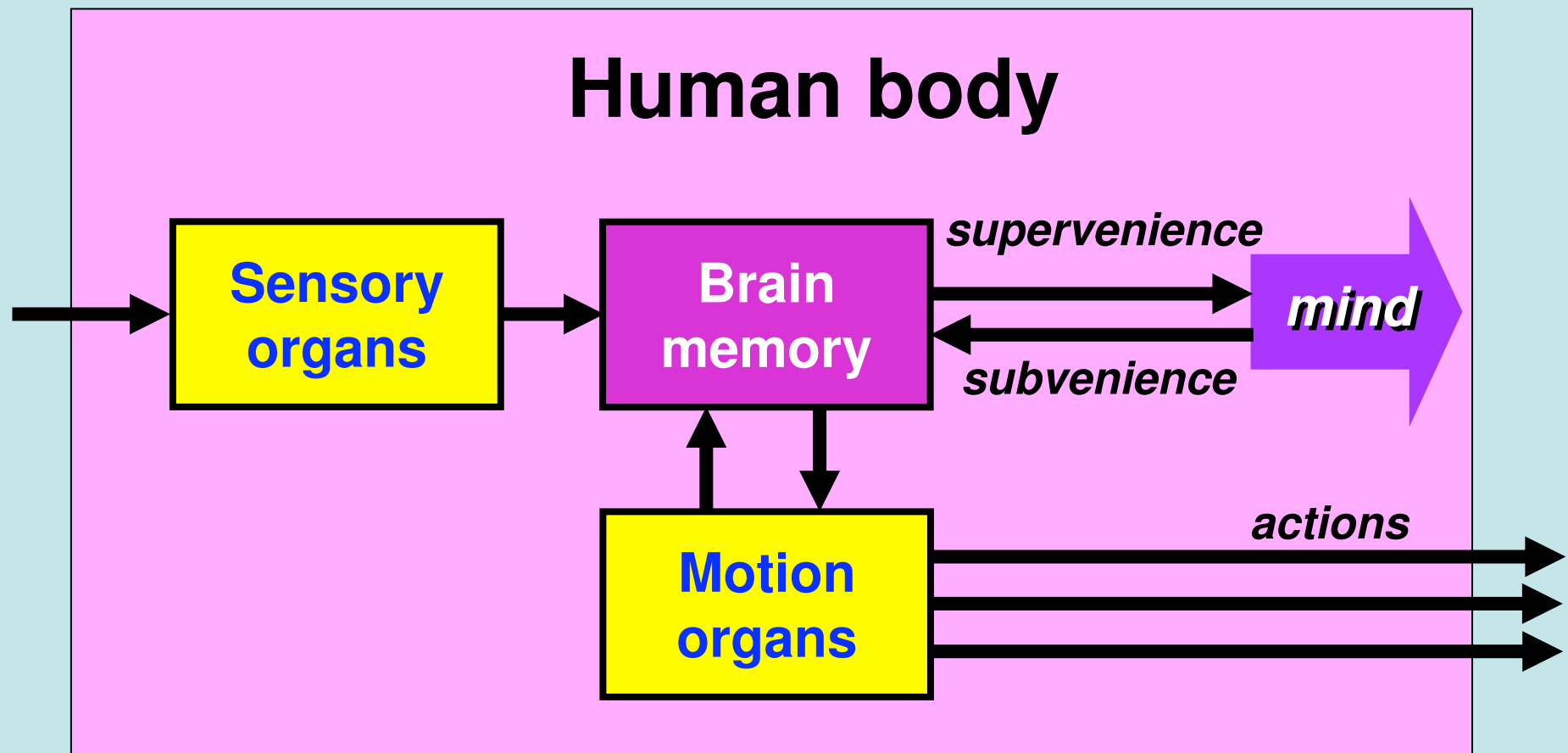
11. Soft Intencionality in Humans

process-signal of the mind
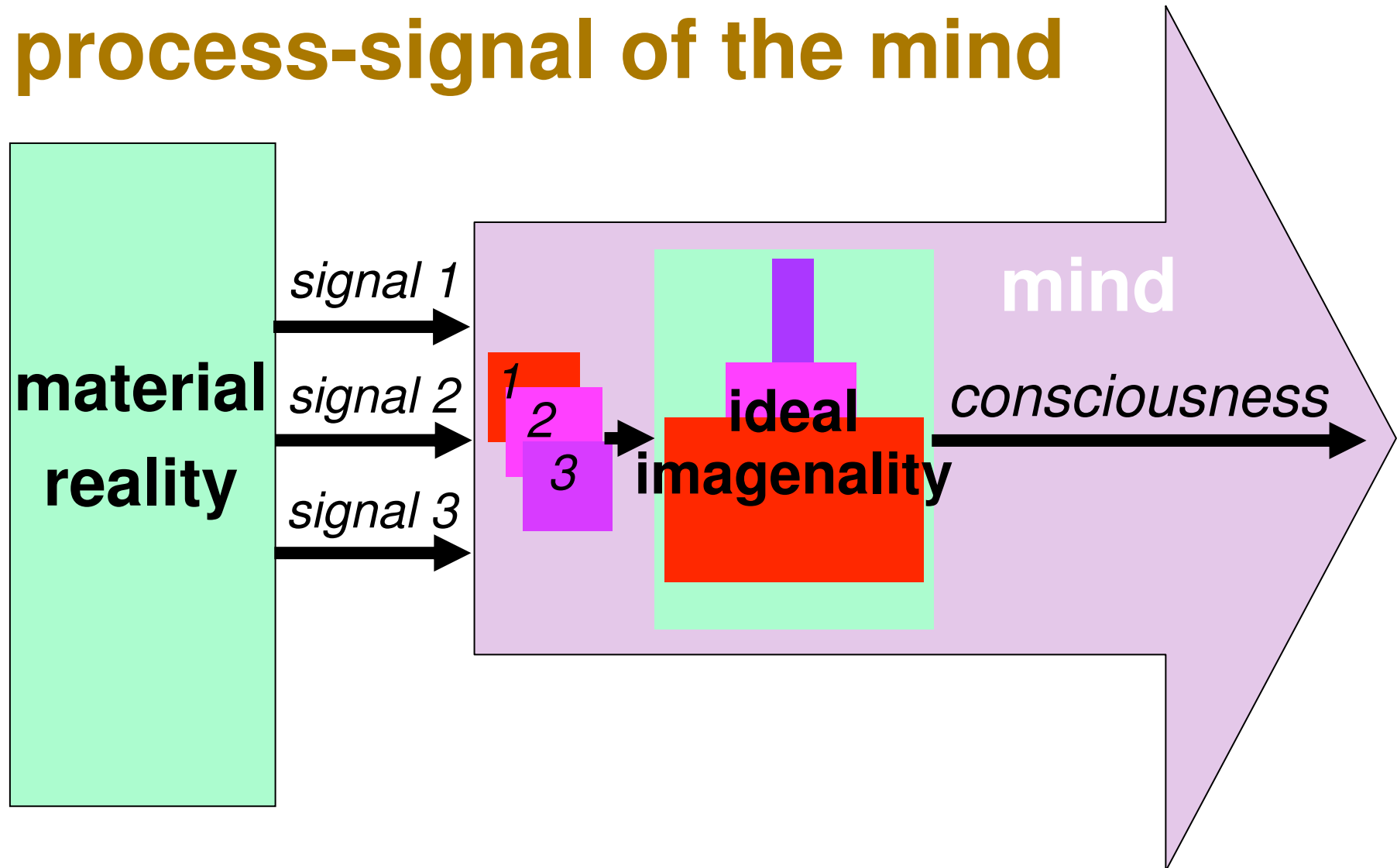
12. Hard Intentionality in Robots

A robot moving door components in an industrial production line

12. Hard Intentionality in Robots

inteligence:

> **human "reads" a solution**
>
> among infinite possibilities
>
> using **flexible telonomy**, **soft intentionality**

intelegence:

> **robot "elects" a solution**
>
> among finite possibilities
>
> using **fixed telonomy**, **hard intentionality**

13. Human-Machine Systems

Inteligent-Non-intelegent system:

Human	→	**Lever**	→ *action* →

Inteligent-Intelegent system:

Human	→	**PDA**	→ *action* →
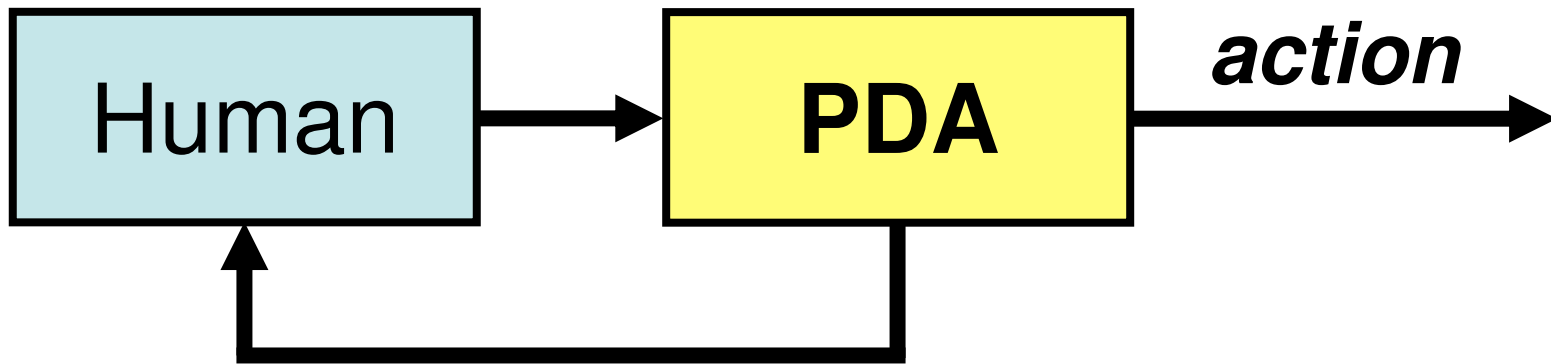
14. Soft Intentionality
in Collective Systems

individual system:

a few, different components

colective systems:

many, repeated components

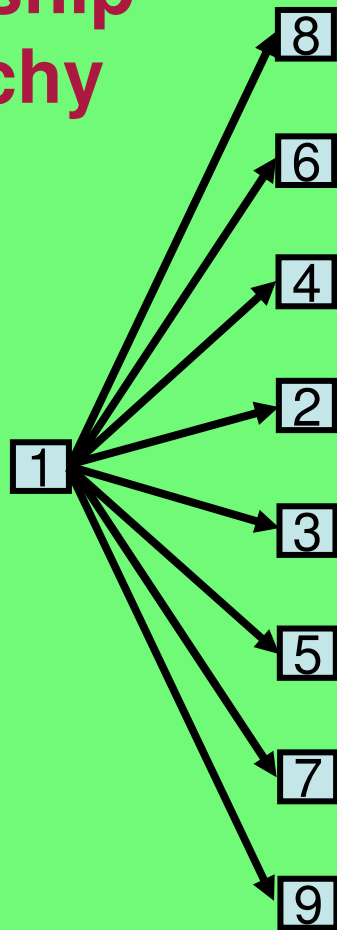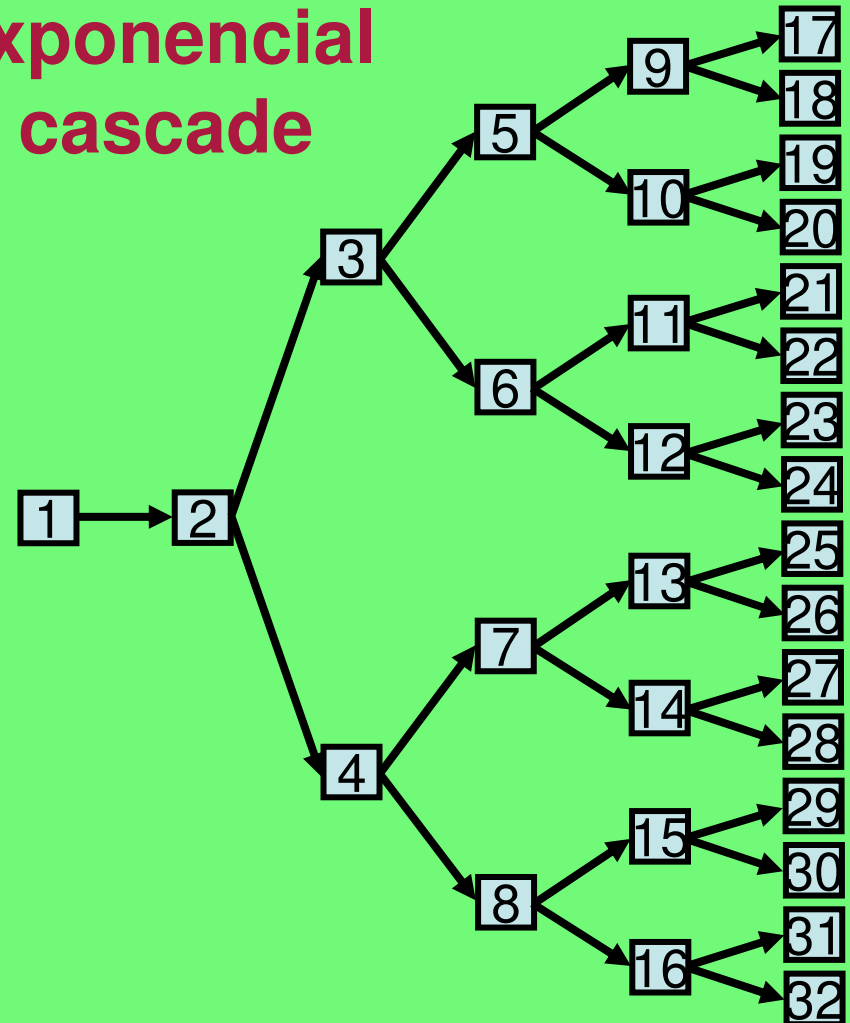# 14. Soft Intentionality in Collective Systems

Electron motion in a rod
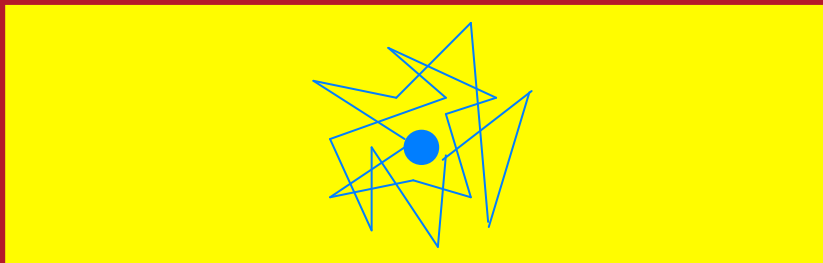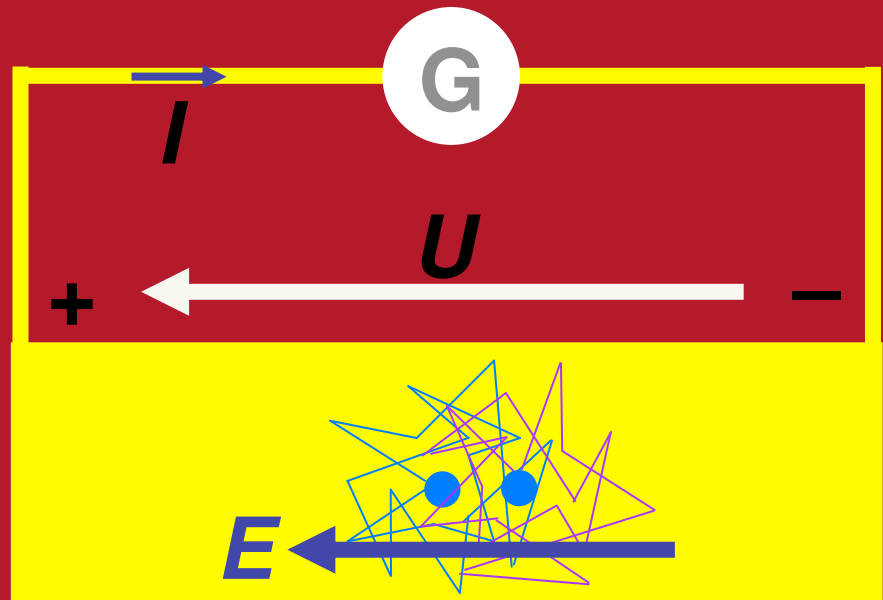
Thermal motion　　　　　**Thermal and drift motion**
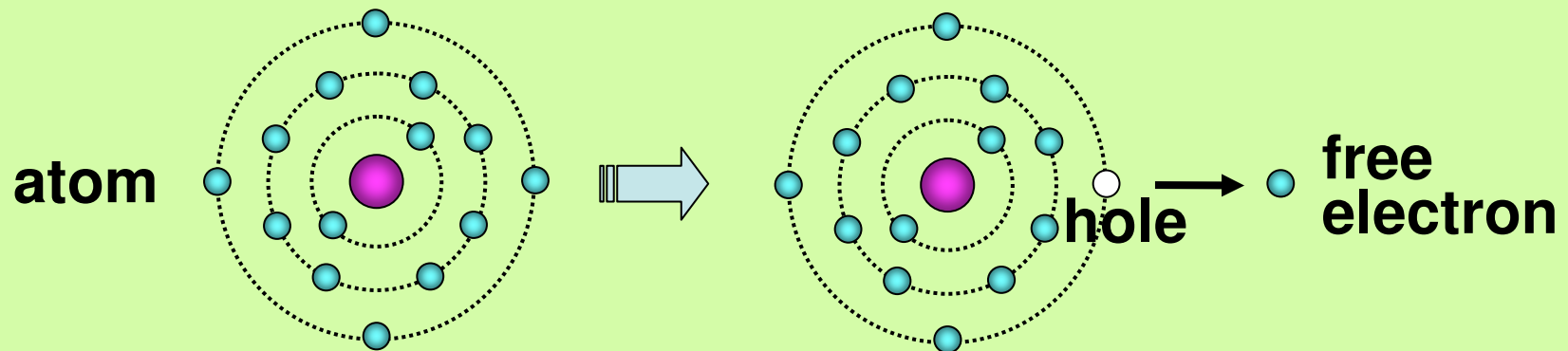
14. Soft Intentionality
in Collective Systems

15. **Complexity of Dual Motions**
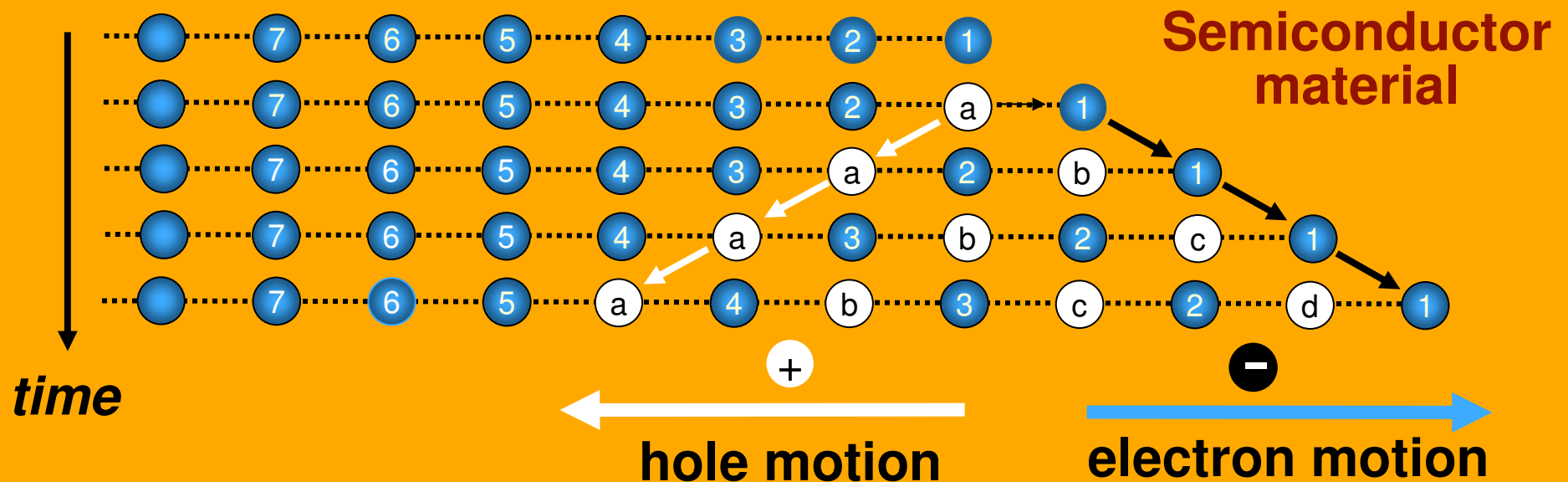
15. Complexity of Dual Motions

Car line movement

time

car move
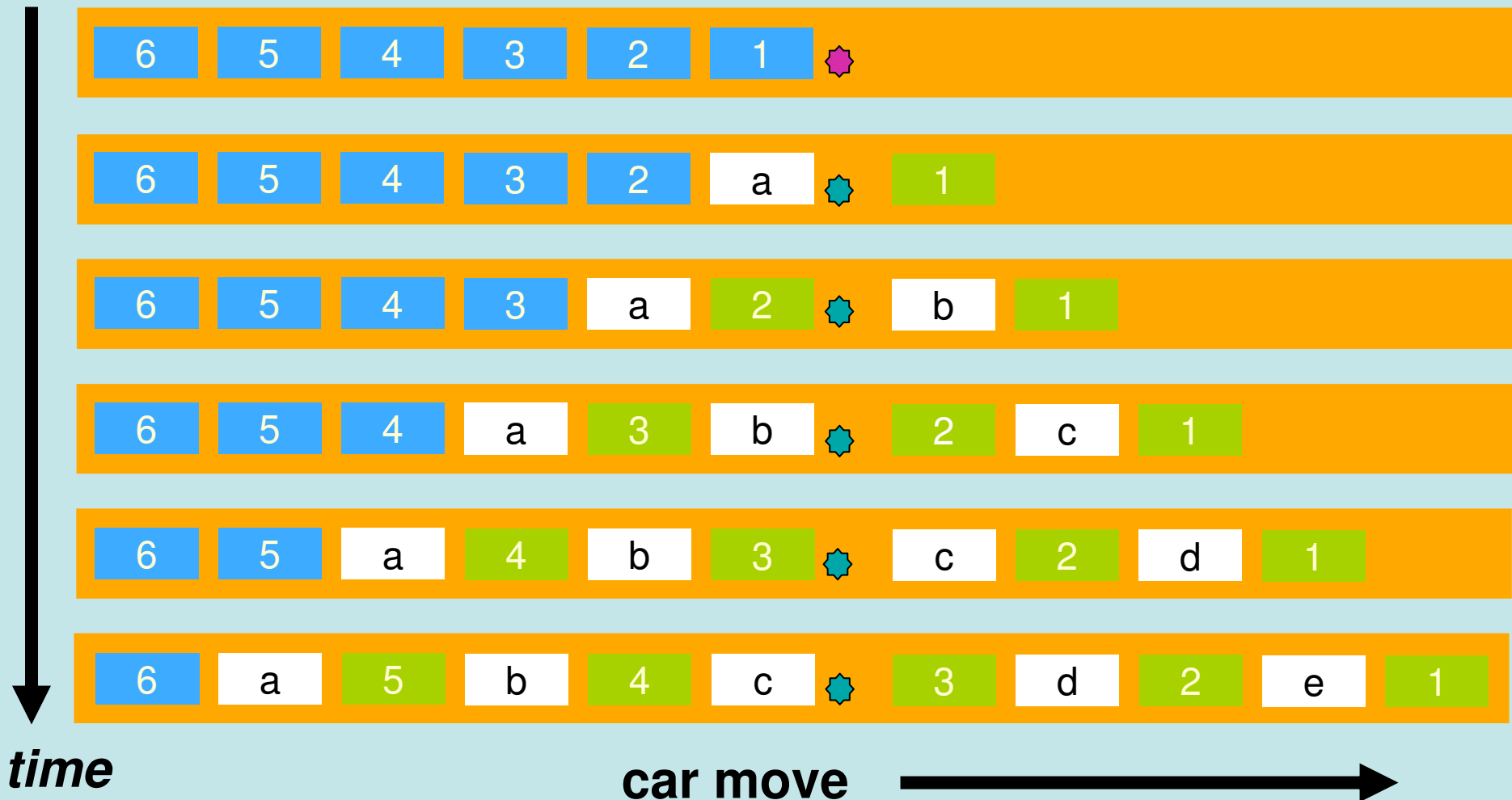
16. Intrinsic and Extrinsic Intentionality

Engineering systems:
designed with **fixed telonomy**
have **intrinsic hard intentionality**
in univariable systems
and multivariable systems

Humans:
created with **flexible telonomy**
have **intrinsic soft intentionality**
in strong personalities
and **extrinsic soft intentionality**
in weak personalities

17. Intentionality and Ethics

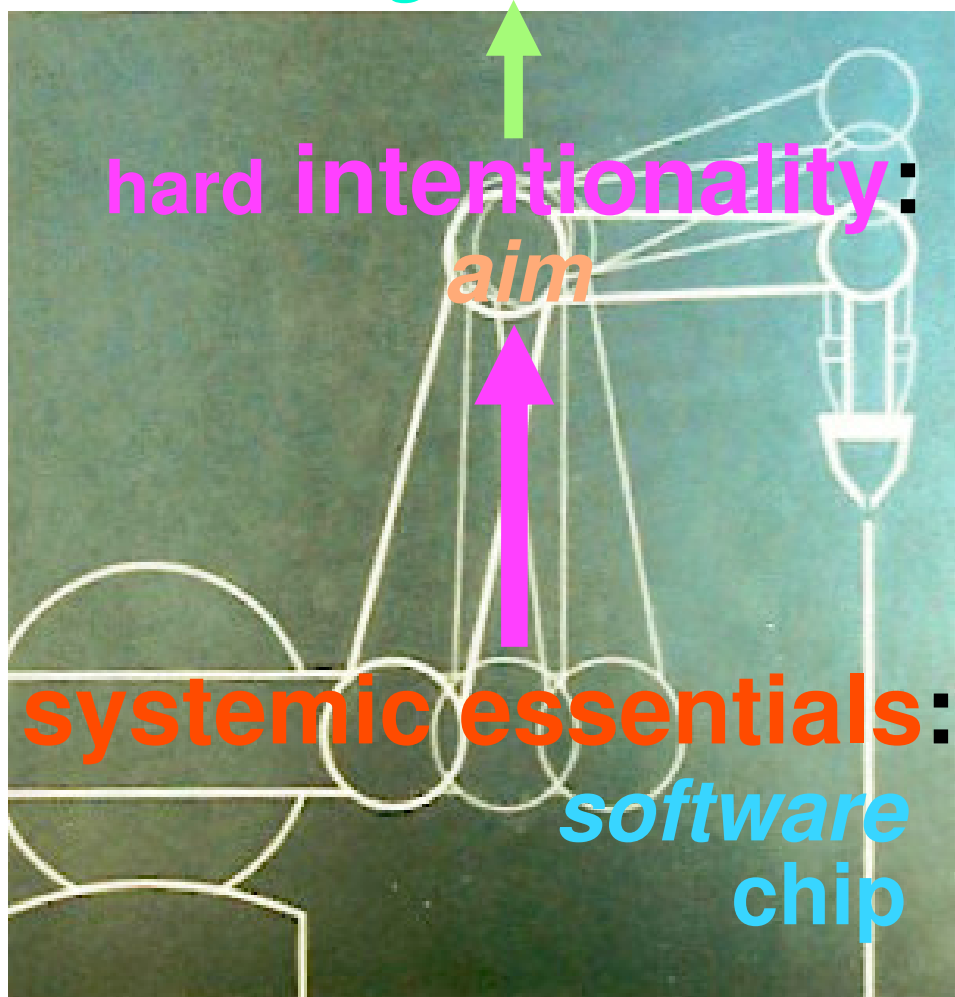| Machine manual (hard intentionality) | *performance guide rules* → |

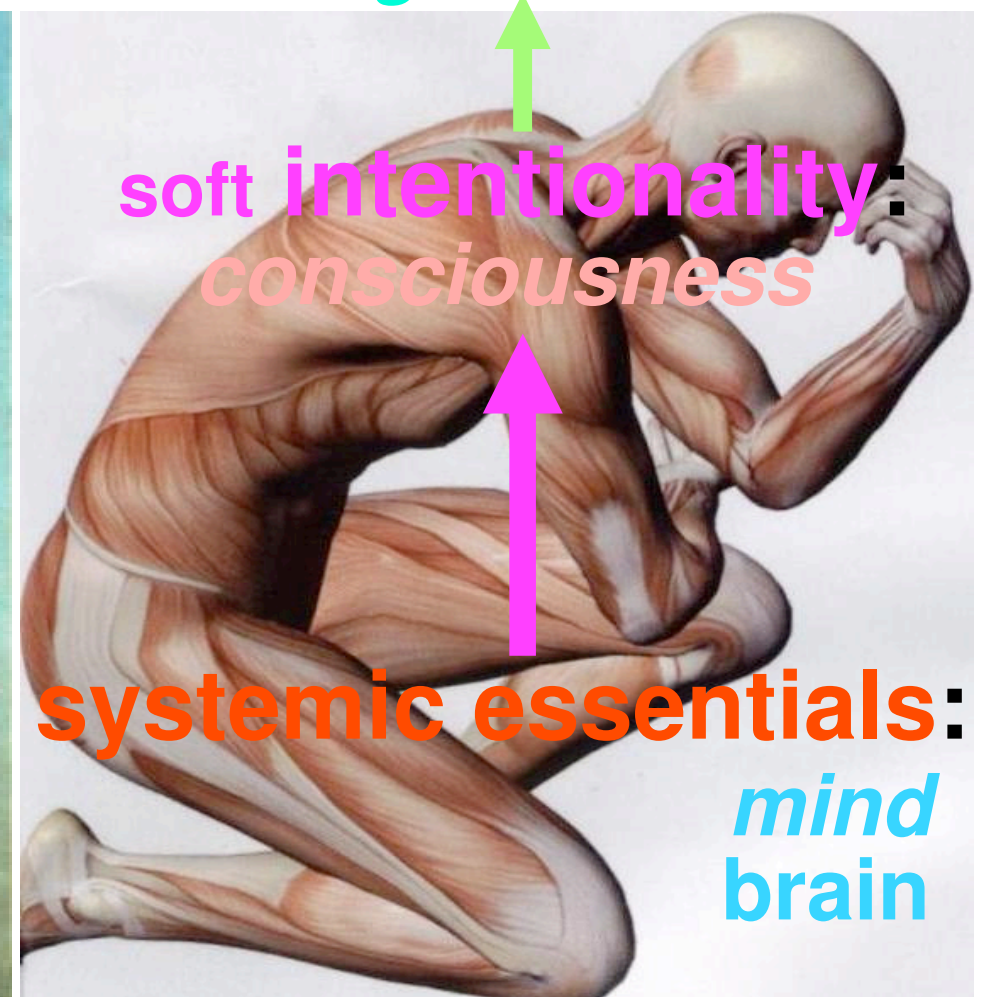| Human ethics (soft intentionality) | *behavioral guide norms* → |

| Human-Machine (inteligence-intelegence) | *guide rules to integrate* → |

18. Systemic Theory

fixed telonomy:
emergent action

flexible telonomy:
emergent action

hard intentionality:
aim

soft intentionality:
consciousness

systemic essentials:
software
chip

systemic essentials:
mind
brain

Hard and Soft System Intentionality

Hermínio Duarte-Ramos