

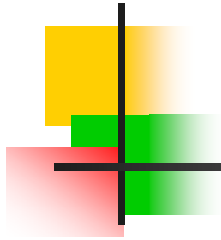
Workshop Complex System Science Action ONCE-CS, Vilnius 2006

ORGANIZED COMPLEX SYSTEM as Informational Closed-Loop Coding-Decoding Control System

Dobilas KIRVELIS

Vilnius University, Lithuania

Dept. Biochemistry and Biophysics



**Organizationally
closed**

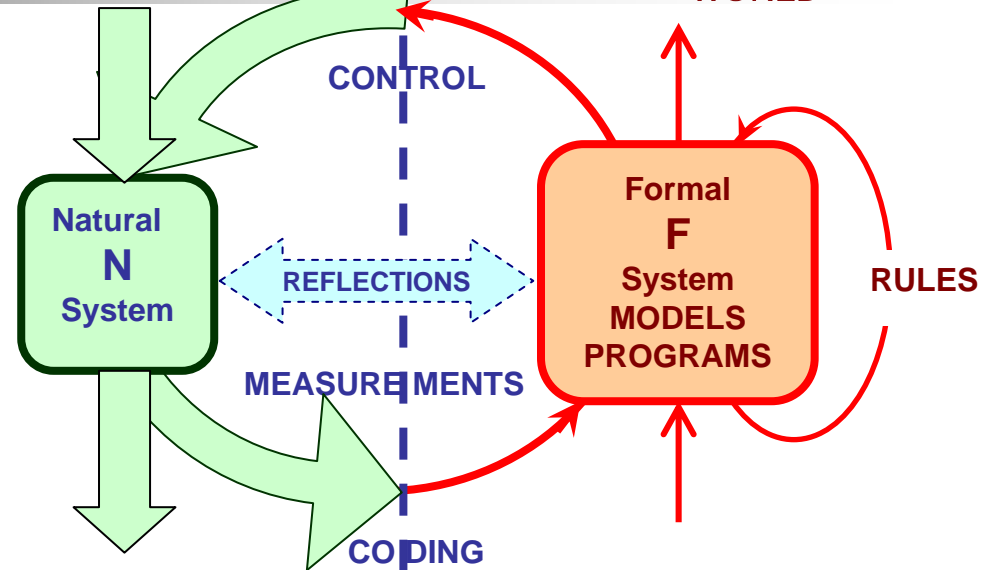
**Matter-energy-
information open**

**Closed-loop
coding-decoding
control**

**Paradigmatic
schematization**

REAL
MATTER & ENERGY
WORLD








ABSTRACT
MATHEMATICAL VIRTUAL
INFORMATION or
SYMBOLIC
WORLD



MATTER TRANSFORMATIONS
(CHEMISTRY)
ENERGY TRANSFORMATIONS
(PHYSICS)

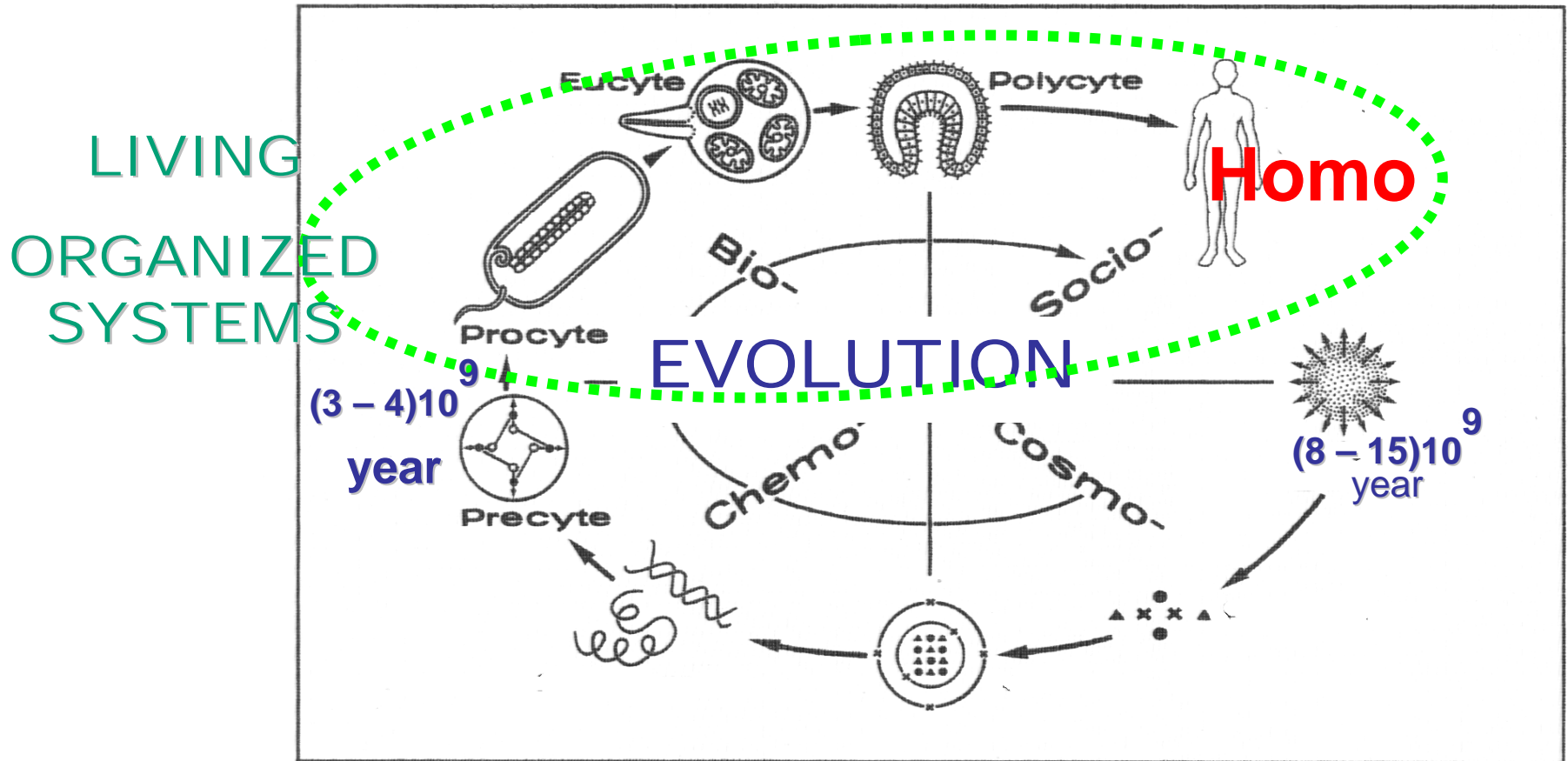
INFORMATIONAL
CONTROL
(CYBERNETICS)

SIGNALS  **INFORMATION**

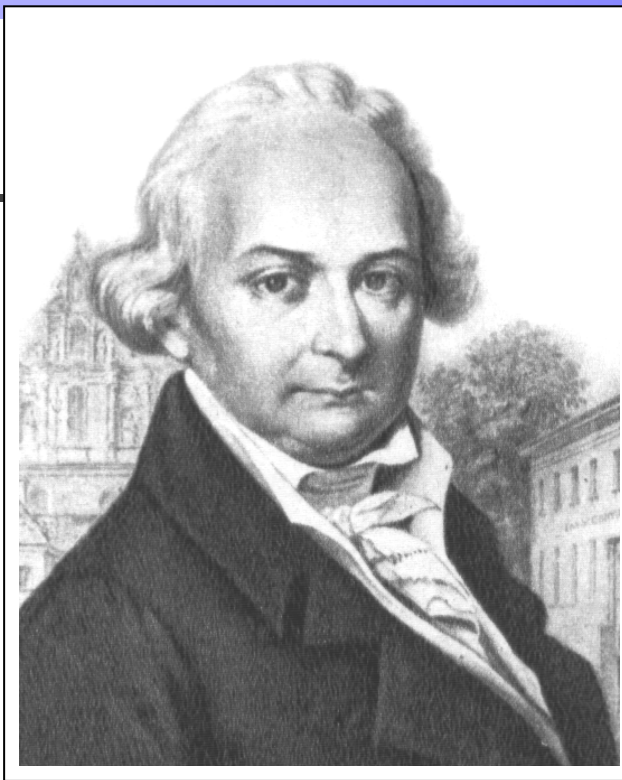
PHENOTYPE		GENOTYPE
BRAIN		CONSCIOUS
BODY		SOUL
BIOSPHERE		NOOSPHERE
ORGANIZATION		MENAGEMENT
STATE		GOVERNEMENT
HARDWARE		SOFTWARE

World evolution

(After W. Schwemmler)



Phenomenon of informational control and closed-loop coding-decoding appeared on the Earth 3-4 billion years ago, when the life or organized complex systems originated.



“...,” *“If the matter is organized and alive, a special force should be operating that connects, controls the matter and makes it alive. We shall name this force **organic** or **organizing force**.”*

A. Sniadecki, *“The theory of organic beings”*, Vilnius, 1804..”

JĘDRZEIA
SNIADOCKIEGO,
MEDYCYNY DOKTORA,
Teorya Jestestw Organicznych.

*Służmy pocziwey sławie, a iako kto może
Niech ku pożytku dobra spólnego pomoże.*

JAN KOCHANOWSKI.

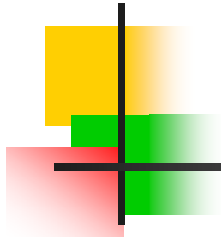
TOM I.

Na cześć do Szanownego

w WARSZAWIE,

w Drukarni N° 646. przy Nowolipiu.

1804.



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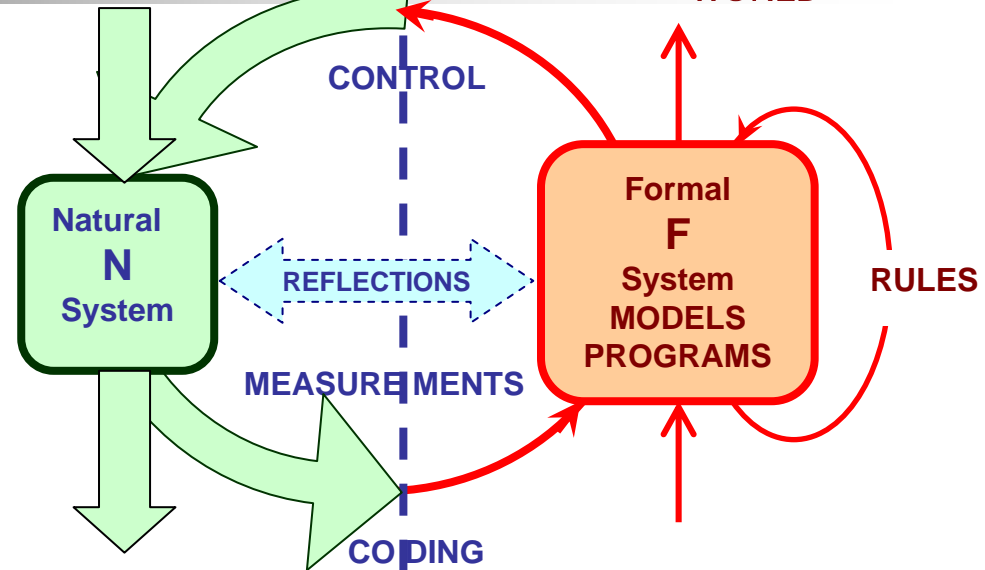
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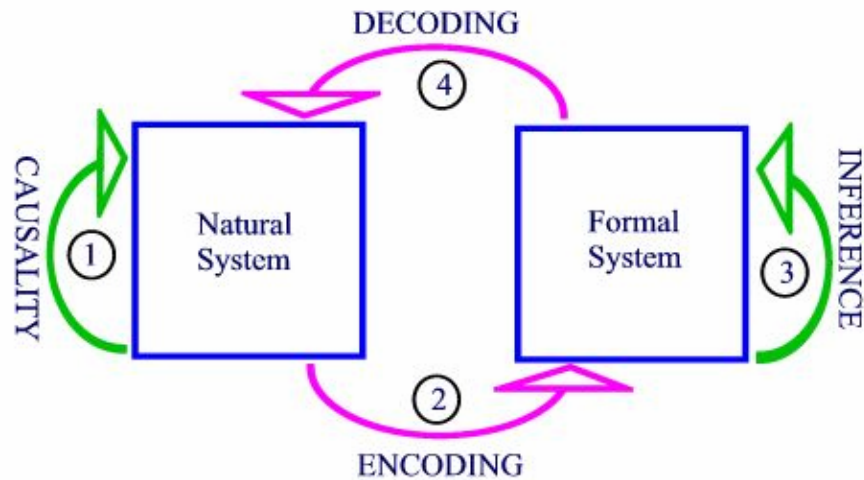
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MODELING RELATIONS after R. Rosen and J. Casti



**Modeling Relations
after J. Casti, 1989**

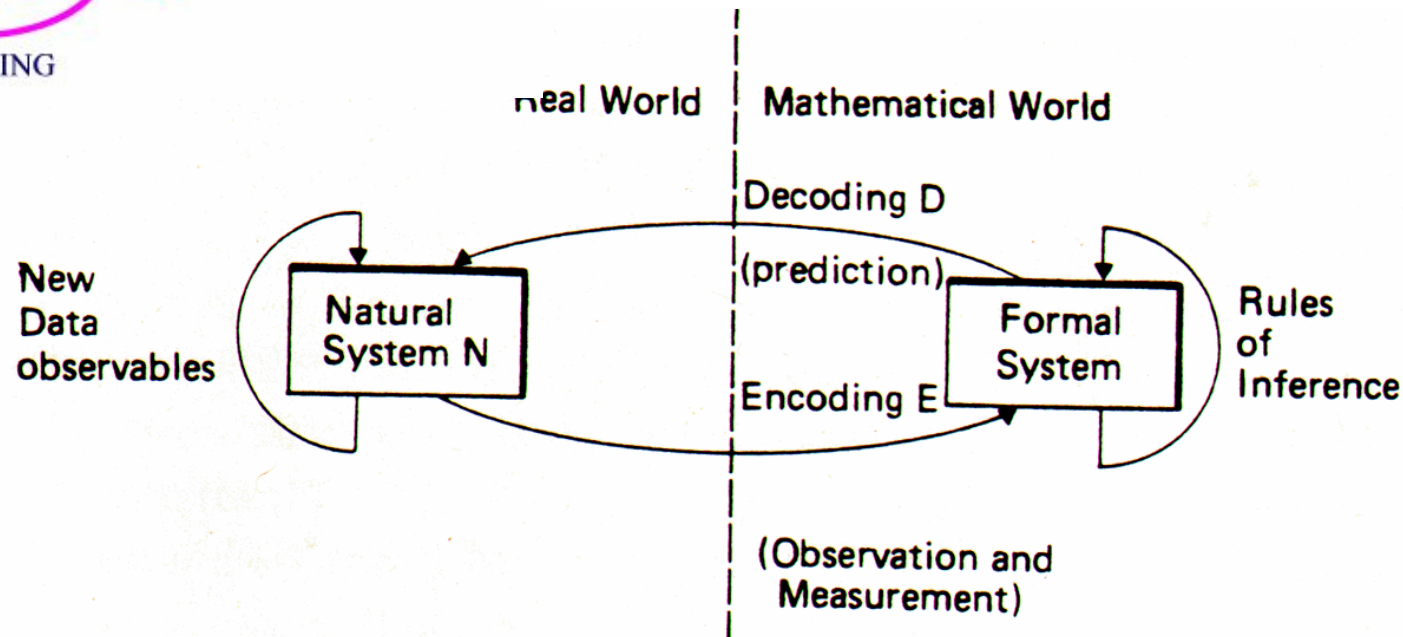
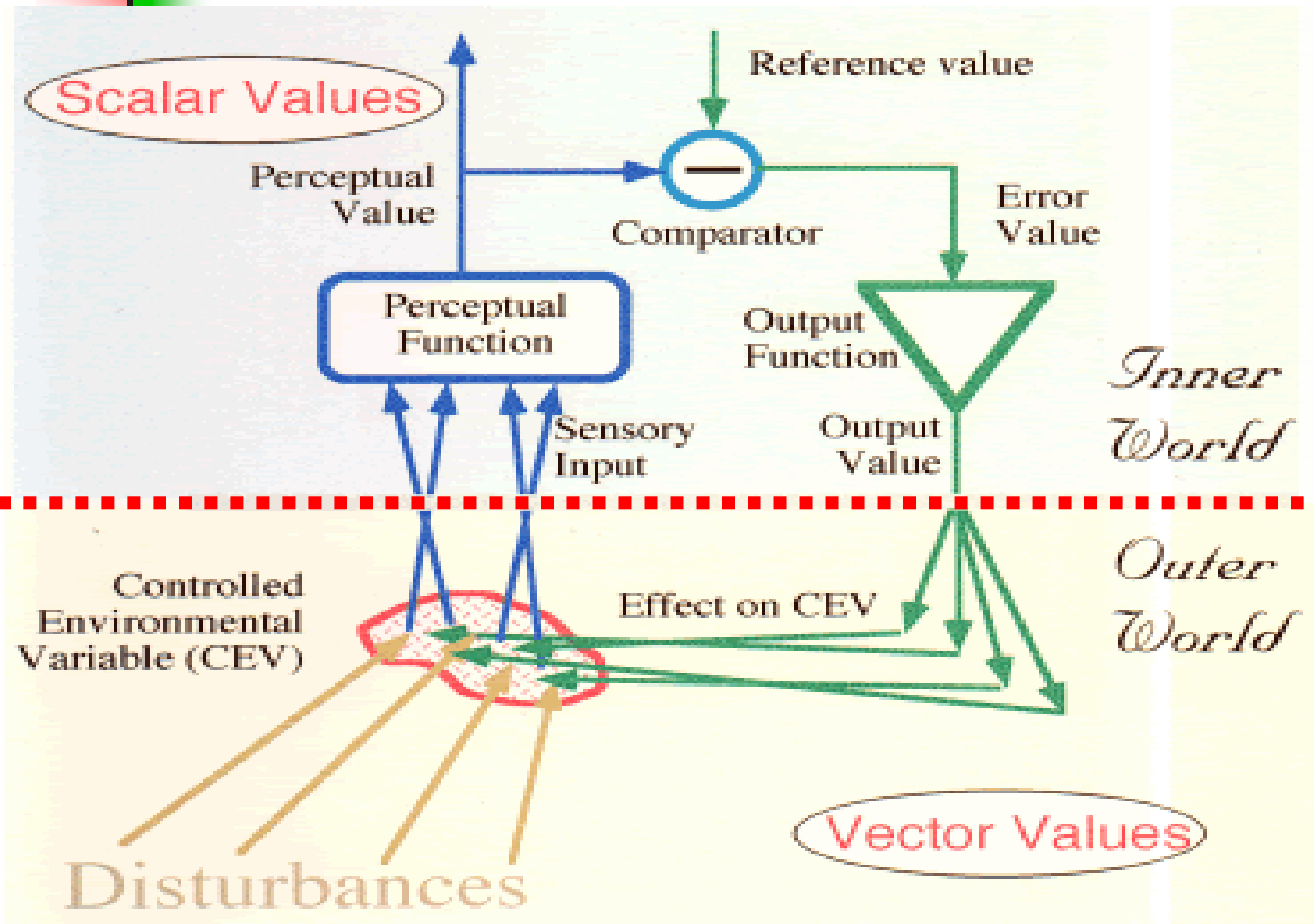
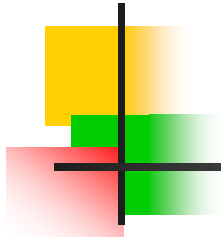


Figure 1.5 The Modeling Relation

Basics Perceptual Control Theory (PCT)

after W.T. Powers





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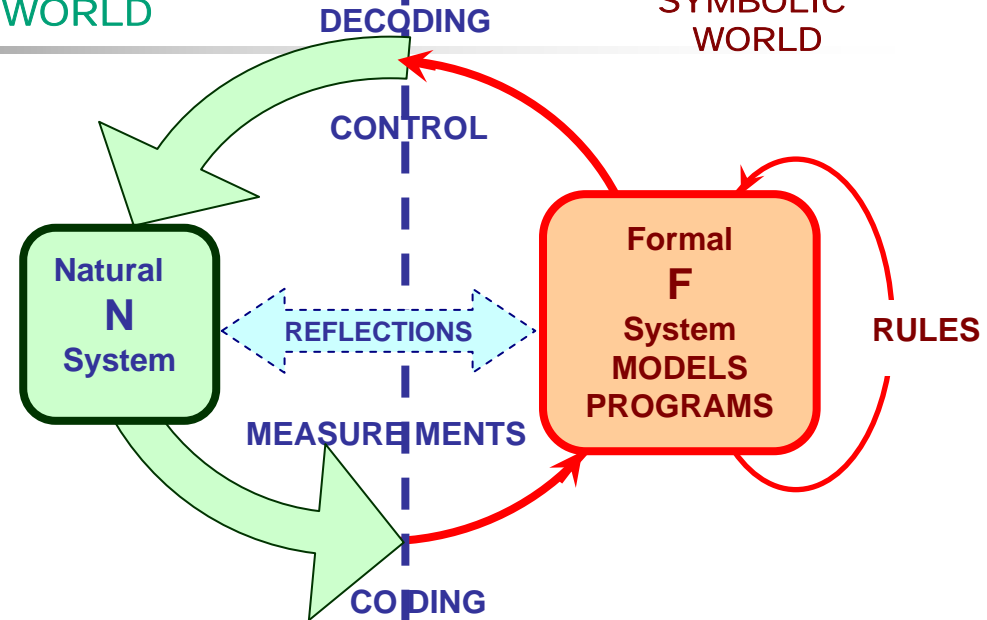
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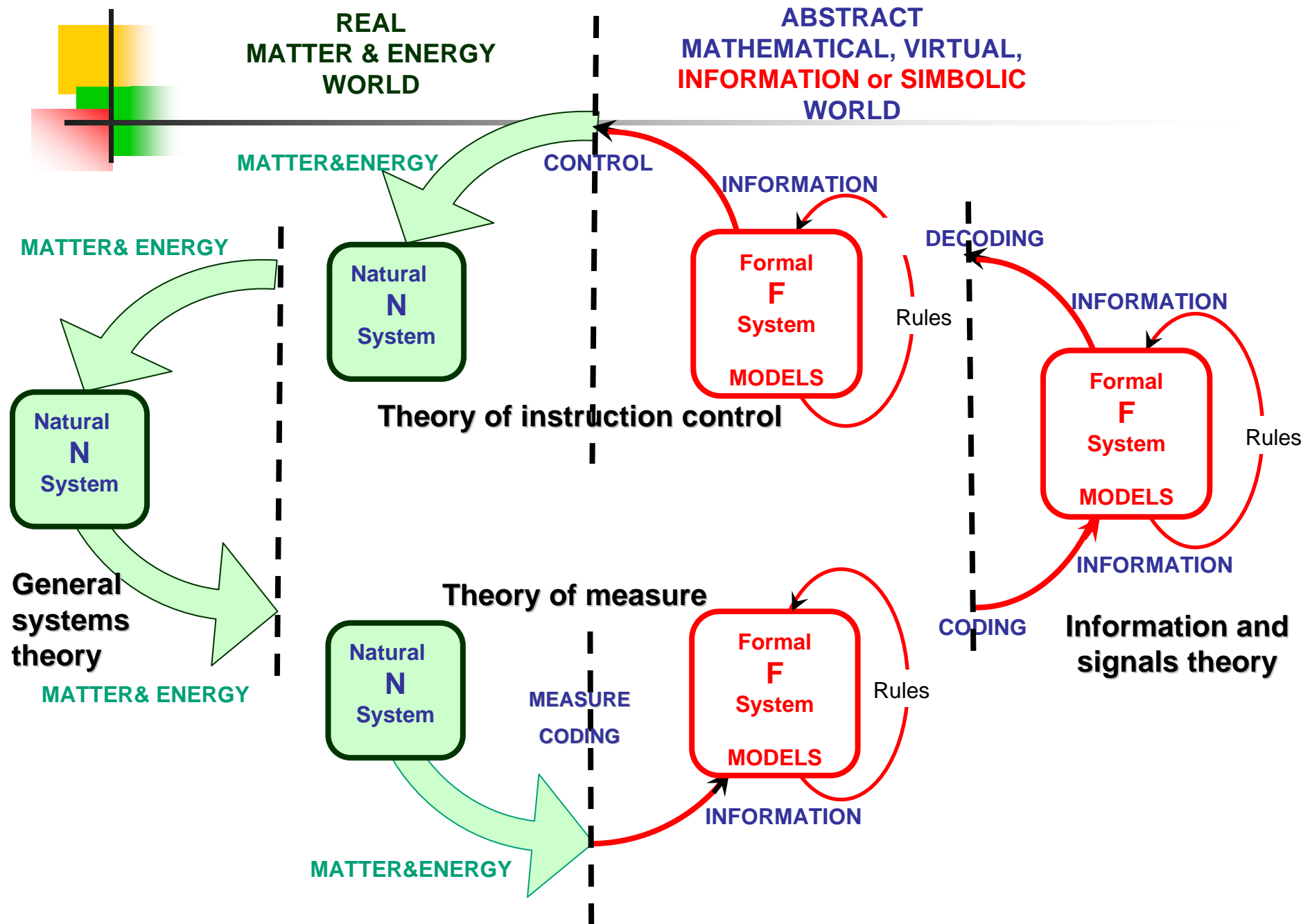


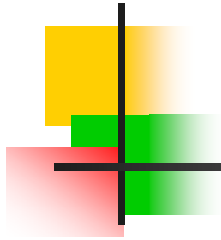
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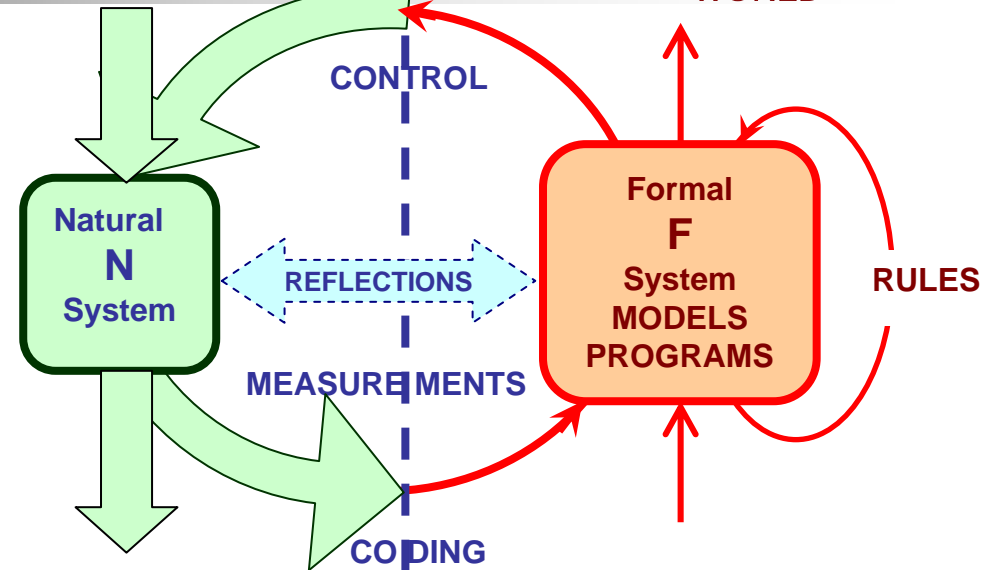
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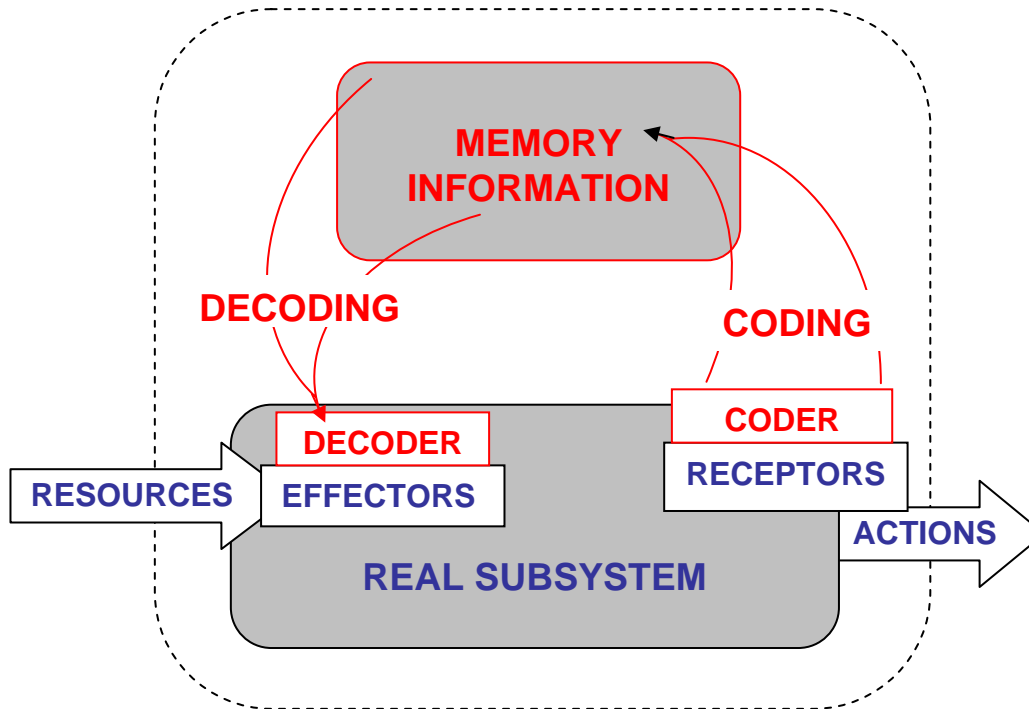
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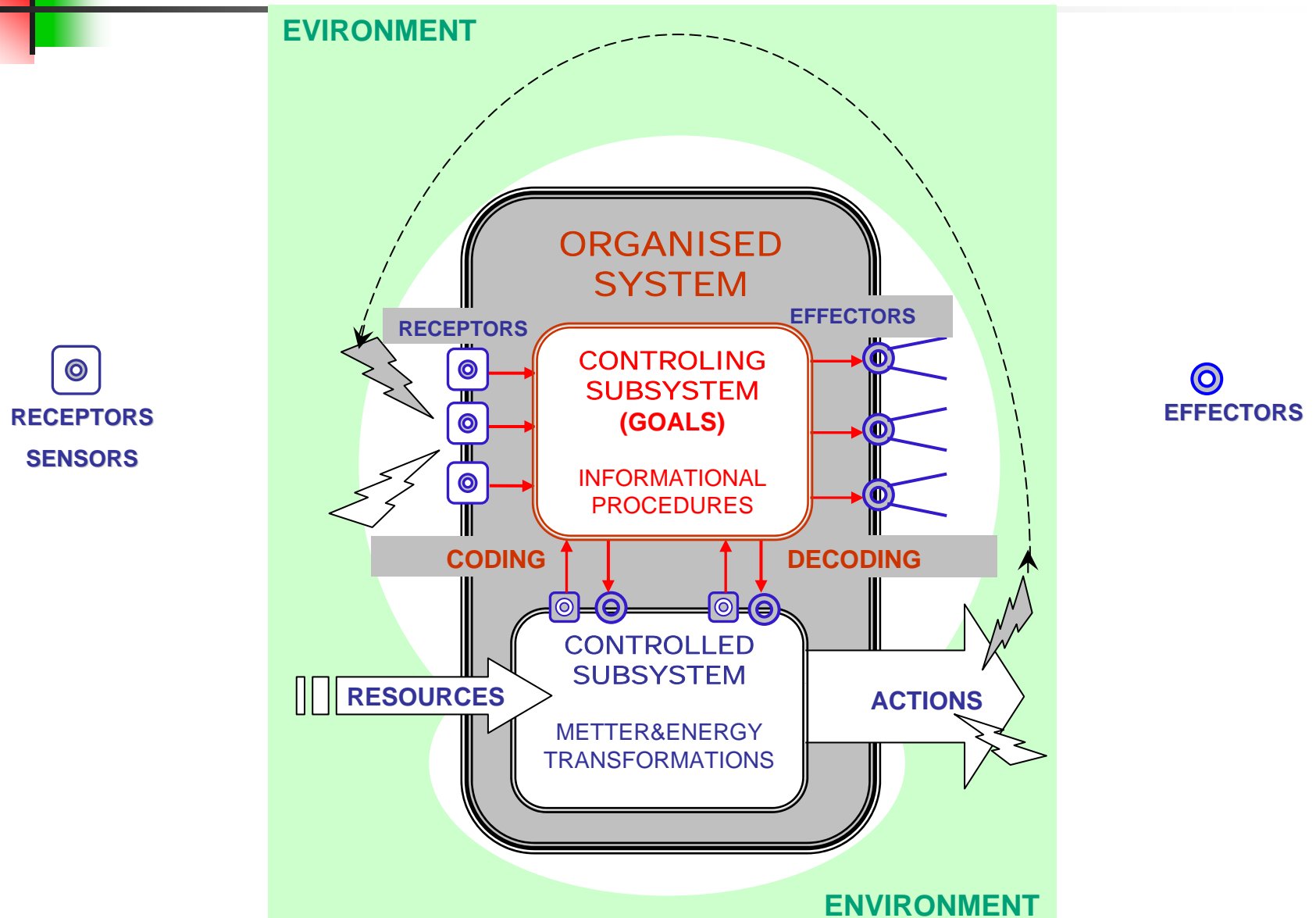
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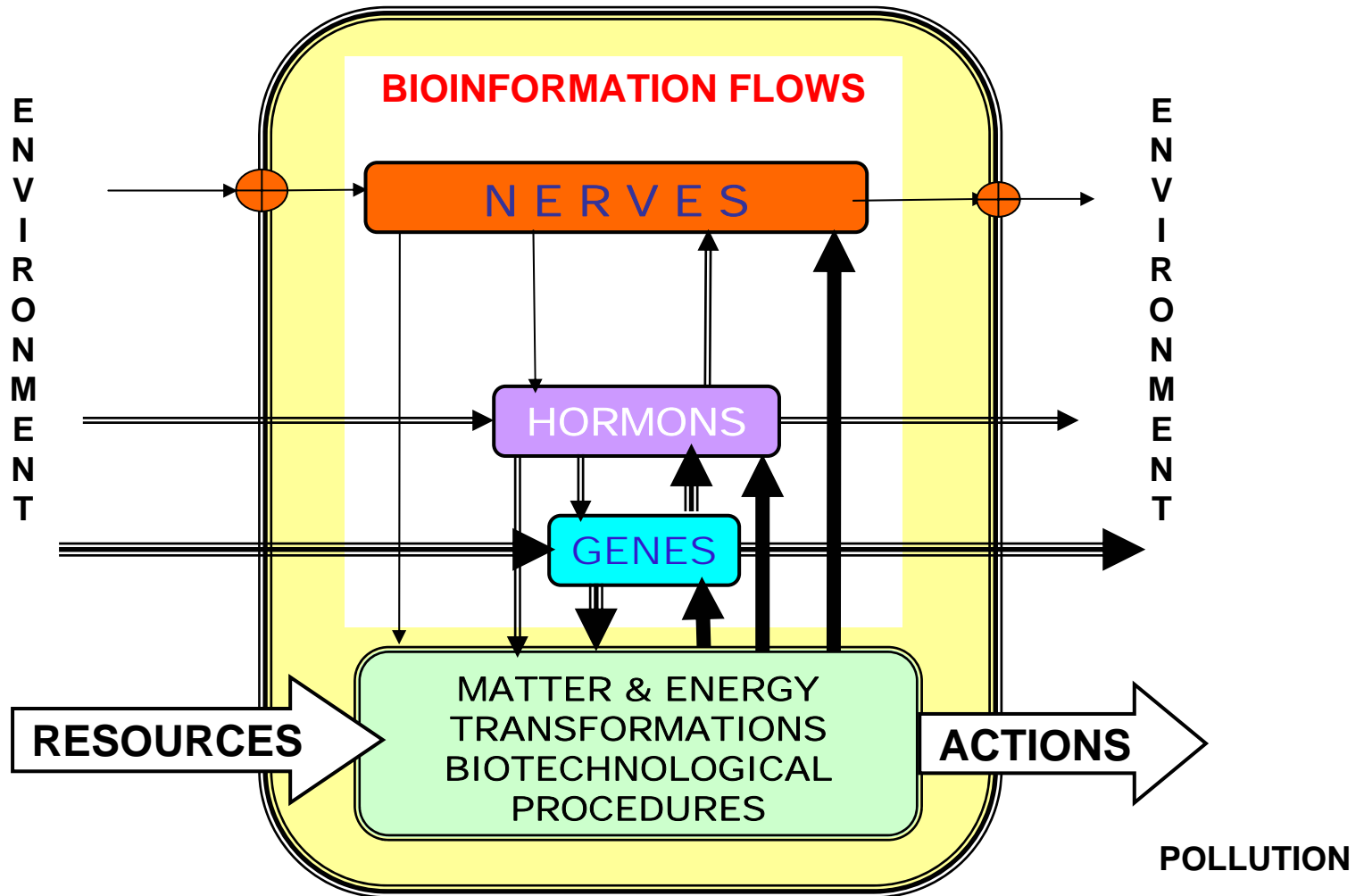
CLOSED-LOOP CODING-DECODING SYSTEM STRUCTURE



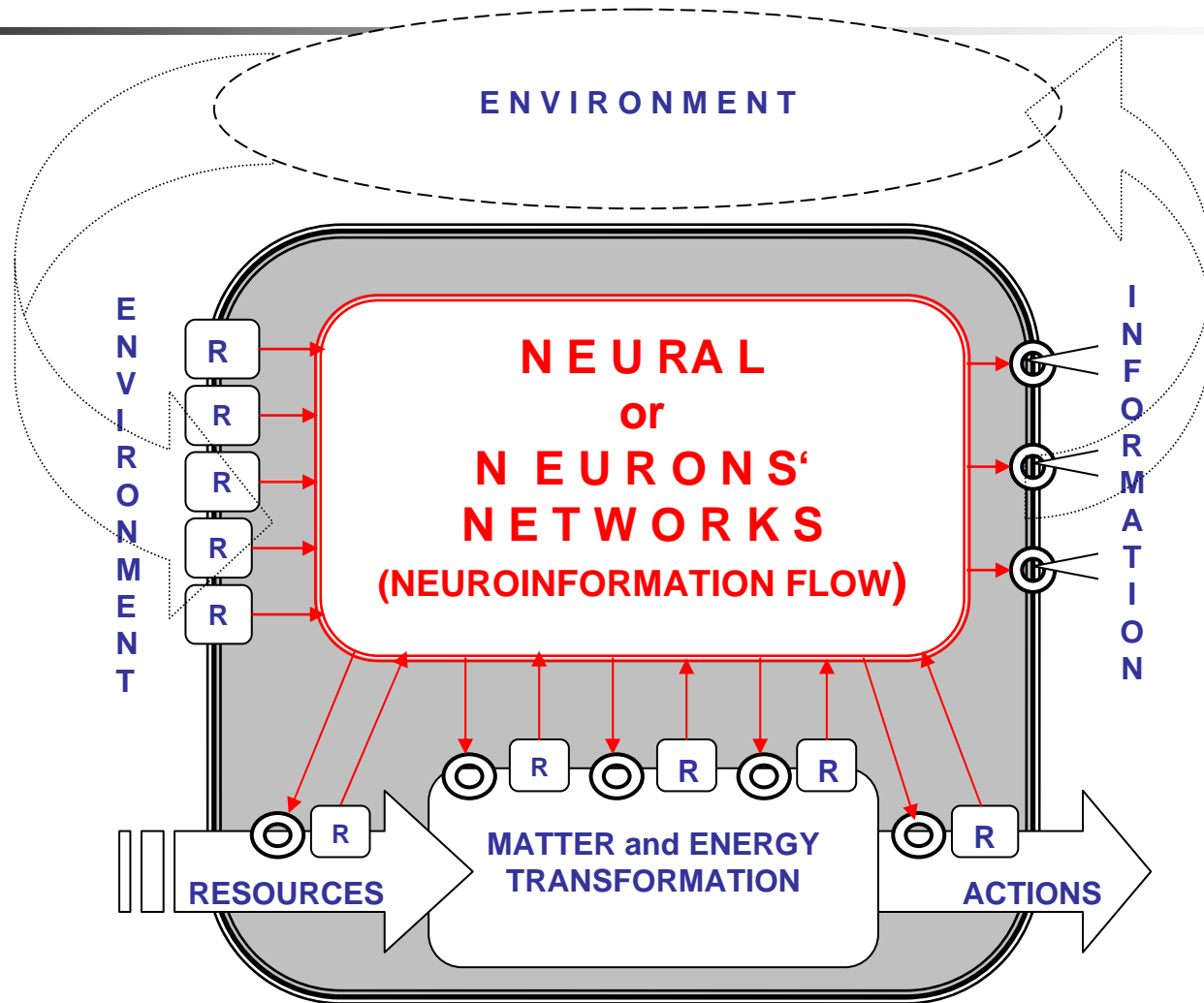
GENERAL FUNCTIONAL STRUCTURE of the ORGANIZED SYSTEMS



Hierarchical Closed-Loop Coding-Decoding procedures in human and animals



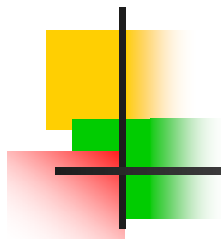
NEURAL SUBSYSTEM in the ORGANIZED SYSTEM



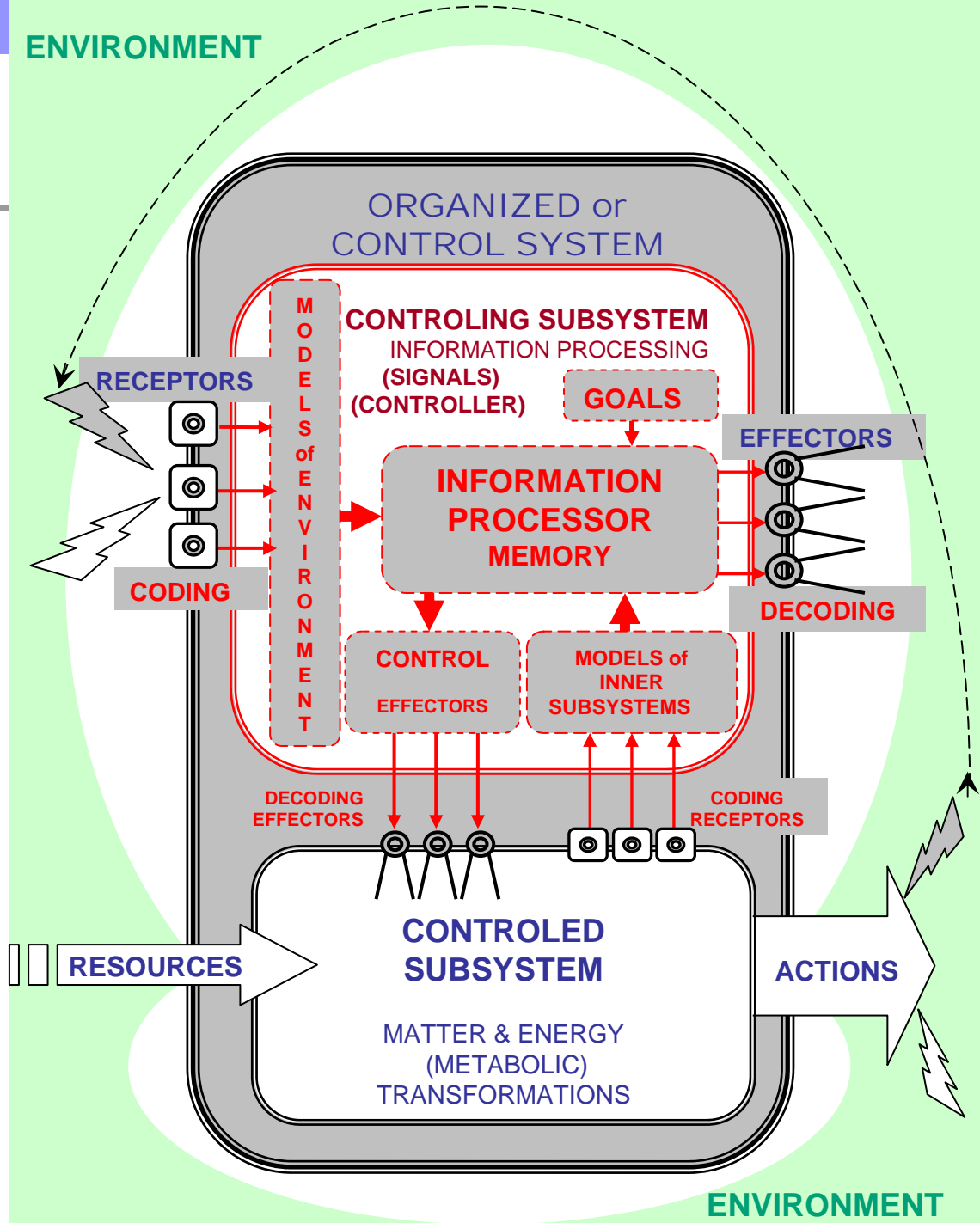
Neural networks in the organized system (organism)

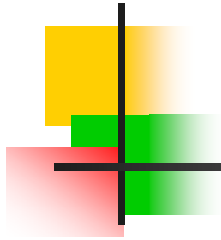
R - receptors or elementary coders,

G - effectors or elementary decoders



COMPLEX ORGANIZED SYSTEM with CONTROL STRUCTURES





**Organizationally
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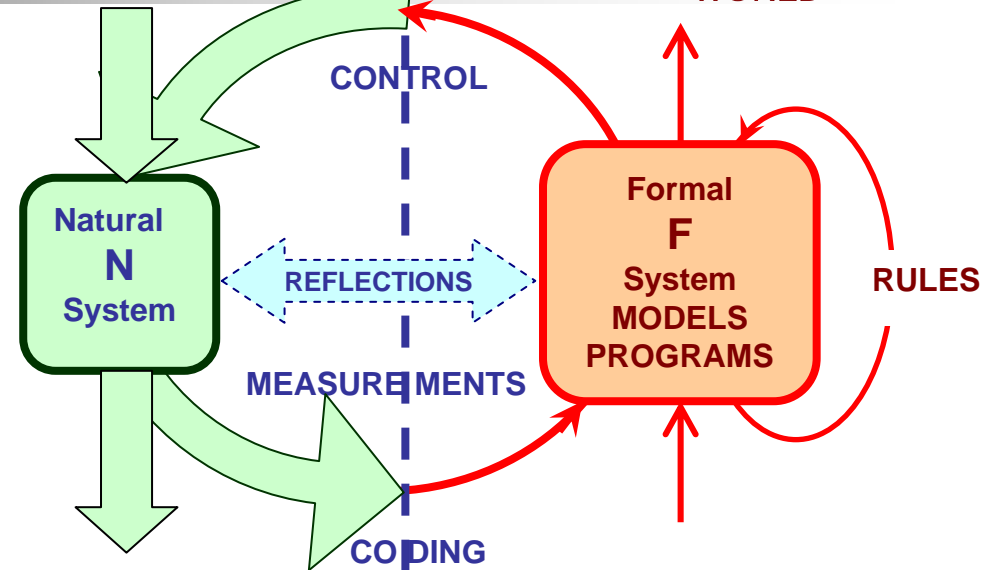
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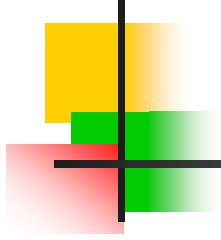
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CONCLUSIONS

- 1. The complex organized systems – living, linguistic, social and some engineering ones – could be regarded as the systems with Informational Closed-Loop Coding-Decoding Control (CL-CDC).*
- 2. In a organizationally closed system, Coding-Decoding adds the functional (semantic) meaning to the system.*
- 3. Informational openness gives the system the ability to receive the additional information about the environment.*
- 4. The matter-energy-information openness enables the system to synthesize more complex organized systems from CL-CDC elements.*



***Thank you
for your attention***