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**Complessità**

**E**

**Psicoanalisi**

**Complessità: Psicoanalisi,  
Neuroscienze e Antropologia**

**1°  
Giugno  
2011**

**I SEMINARI APERTI del  
CENTRO MILANESE DI PSICOANALISI**

# Bios &... Pensiero



in quanto scienze dei sistemi viventi hanno  
il loro comun denominatore  
nelle teorie dei sistemi dinamici adattativi  
Complessi e Non-lineari





# Complessità è interazione/integrazione

La Psicoanalisi è un'esperienza integrata

basata su *4 dimensioni interattive*: 3 spaziali + 1 temporale.

1. Symbolic Representation: the interaction within ● *psicoanalisi*

2. Transference & Counter-Transference:  
the interaction between ● *neuroscienze*

3. Complex Adaptive System: the interaction across ● *antropologia*

+1. Setting: the interaction over time > *natura-fisica*.

Gerald M. Edelman: *Più grande del cielo*, Einaudi, 2004, pg. 57:

“...siamo in grado di specificare in modo più preciso le caratteristiche di un sistema complesso e di applicarle al sistema nervoso. Nelle reti cerebrali che interagiscono fra di loro si rivela questa proprietà: sono reti che presentano separazione funzionale, ma grazie ai collegamenti, diventano integrate ovvero manifestano proprietà più unitarie quando sono collegate”.



# Psicoanalisi

Within

1

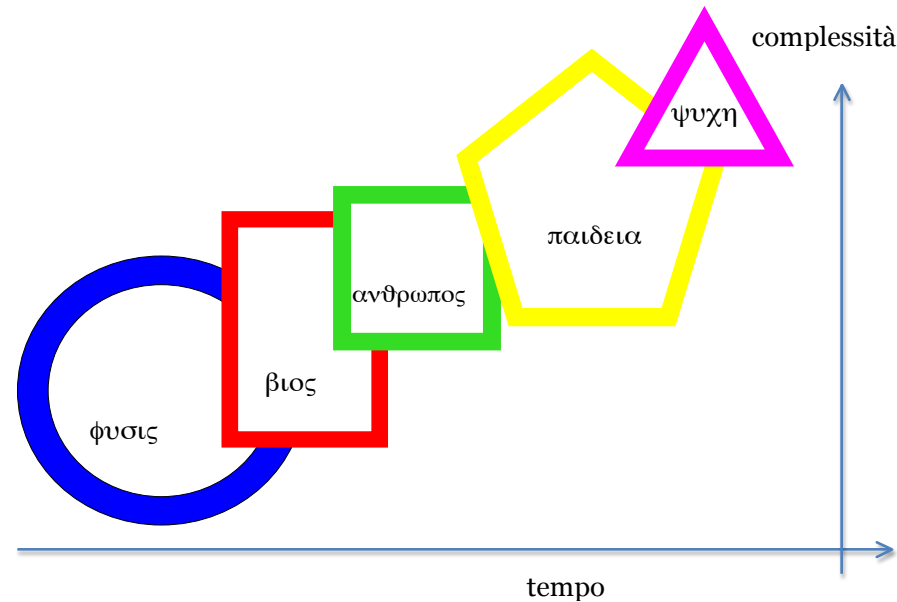
LA DOTTRINA DEL DETERMINISMO SOSTIENE CHE IN OGNI CASO IL RISULTATO È DETERMINATO DALLE CONDIZIONI PRECEDENTI DELL'INDIVIDUO, SIA FISICHE CHE MENTALI ...  
TUTTAVIA... GLI STESSI ANTECEDENTI NON SI RIPRESENTANO MAI UNA SECONDA VOLTA... L'ESISTENZA DI CONDIZIONI INSTABILI RENDE IMPOSSIBILE LA PREVISIONE DEGLI EVENTI FUTURI. ESISTONO CLASSI DI FENOMENI PIÙ COMPLICATI IN CUI L'INSTABILITÀ AUMENTA COL CRESCERE DEL NUMERO DELLE VARIABILI.

James Clerk Maxwell

*Essay on determinism and free will*

Cambridge 1873

# Il Cervello è la dimensione più complessa in natura

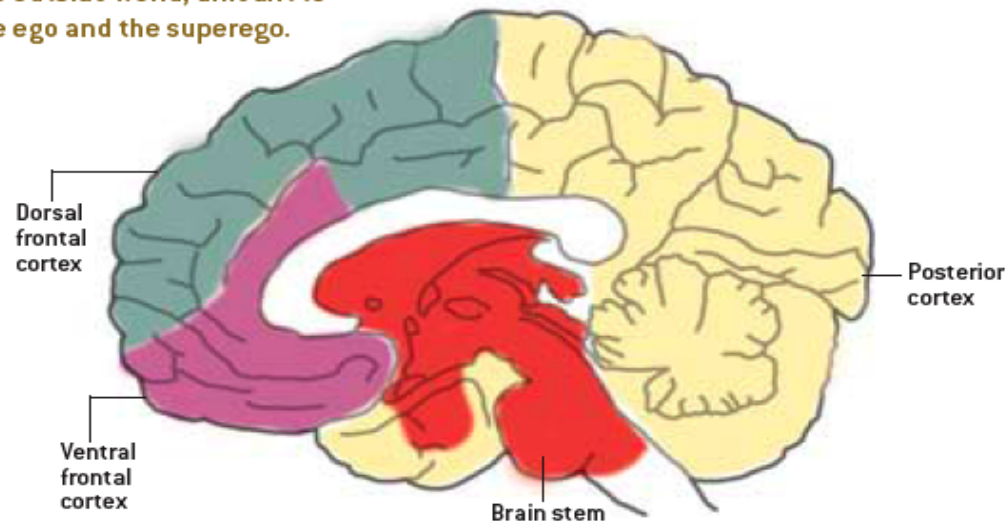


## W. Freeman: How brains make up their minds

Weidenfeld & Nicolson, London, 1999, pg. 99

*The most complex level of emotions involves social evolution and assignment of responsibility for actions taken. The biological basis for that difference lies in the self-organizing properties of the brain, through which the chaos that engenders actions is constrained and the actions are deferred by cooperation among the diverse parts of the brain. We experience that process as consciousness.*

the outside world, amount to  
the ego and the superego.

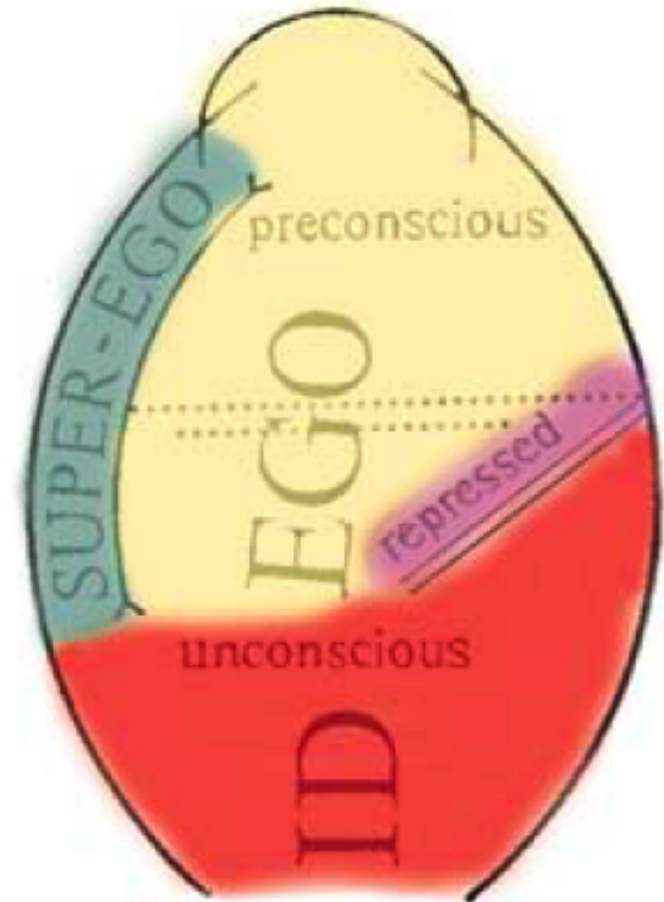


### The Mind, the Brain and Complex Adaptive Systems

Edited by H.J. Morowitz & J.I. Singer, 1995, at  
Santa Fe Institute, Studies in the Sciences of Complexity:

“Unconscious processes play a major role in  
mental life... Unconscious processes are automatic  
and effortless... (pag. 136)

Our experience, thought and action is influenced  
by mental structures and processes of which we  
are not aware. The unconscious is an empirical  
factor of mind, and can be studied by the  
conventional techniques of psychological science  
(pag. 138)”.



Freud 1933

It is becoming increasingly  
clear that a good deal of  
our mental activity is  
unconsciously motivated.



# Complex Systems (Giorgio Mantica)

	phase-space topology	
dynamics	lattice/regular	non-lattice/ irregular
does not modify phase space topology	pattern formation, synchronization, self-organized criticality...	epidemic spreading, forest fires
does modify phase space topology	n.a.	evolution, learning, ...

Lattice = a regular repeated three-dimensional arrangement of...

# N e u r o s c i e n z e

Between

2

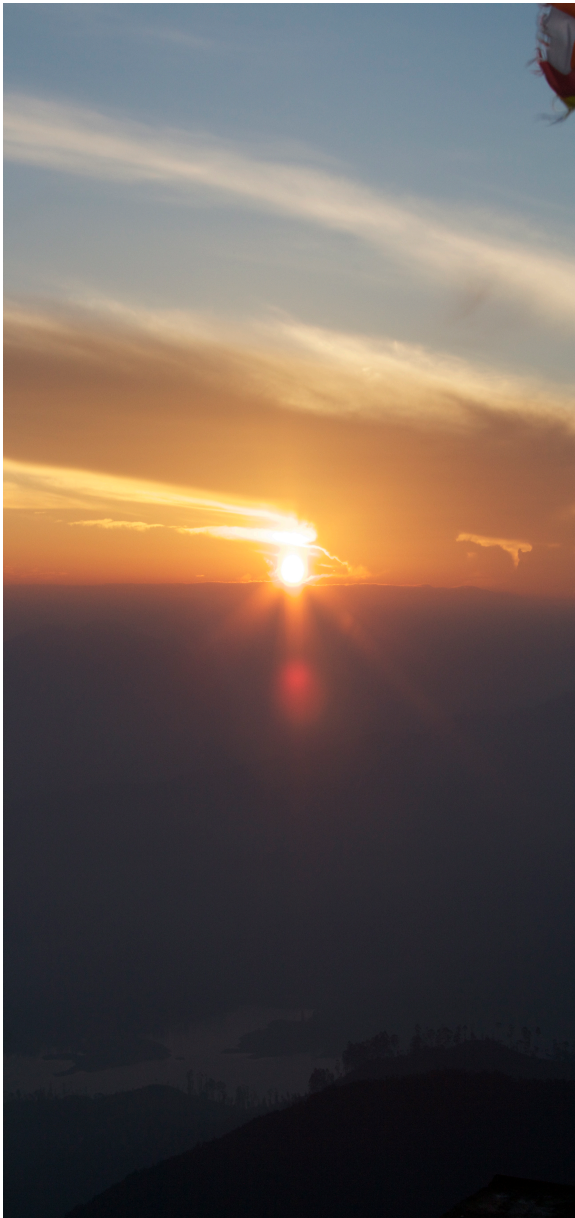
In *Psyche and Brain* (2003) I argued that integrating mind and brain is deeply relevant to both psychoanalysis and neuroscience. ...

The modern psychoanalyst is expected to be a scientist of both psychoanalysis and a number of related disciplines, including neuroscience.

*Emotion and the Psychodynamics of the cerebellum by Fred M. Levin, Karnac, London , 2009, pg. Xiii e 190*

Neurons are dynamical systems...

Nonlinear dynamical system theory is a core of neuroscience research.  
The model is especially suitable for simulations of large-scale models of the brain.  
*Dynamical Systems in Neuroscience by Eugene M. Izhikevich, The MIT Press, 2010*

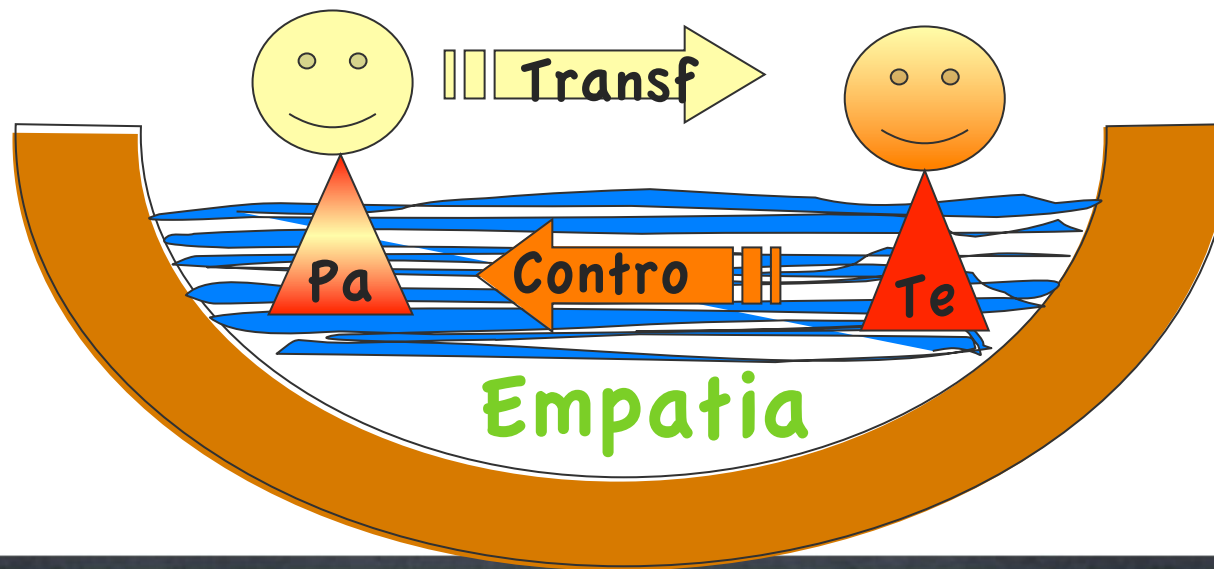


Partendo dall'esperienza di Freud,  
scienziato clinico ed umanista,  
e da quanto da lui sostenuto che  
la realtà psichica è prima di tutto  
una realtà naturale, e quindi  
da studiare seguendo le leggi della natura,  
in ottemperanza alle moderne teorie  
dei sistemi dinamici complessi ed adattativi,  
per cui le strutture complesse emergono  
da elementi più semplici,  
cercherò di mostrare come  
fenomeni vitali del lavoro psicoanalitico  
possano essere capiti ed espletati  
seguendo i principi delle leggi naturali.

Il m i o I n t e n t o

# La tinozza

## la transcendance du transfert



Modello psicoanalitico o realtà quotidiana?

*J. Laplanche: le baquet, PUF, Paris, 1987 - C.G. Jung: die wassel*



# Although the human brain is enormously complex, ...

*By Dale Purves, Brains: how they seem to work, FT Press, 2010, pg 219 ss*

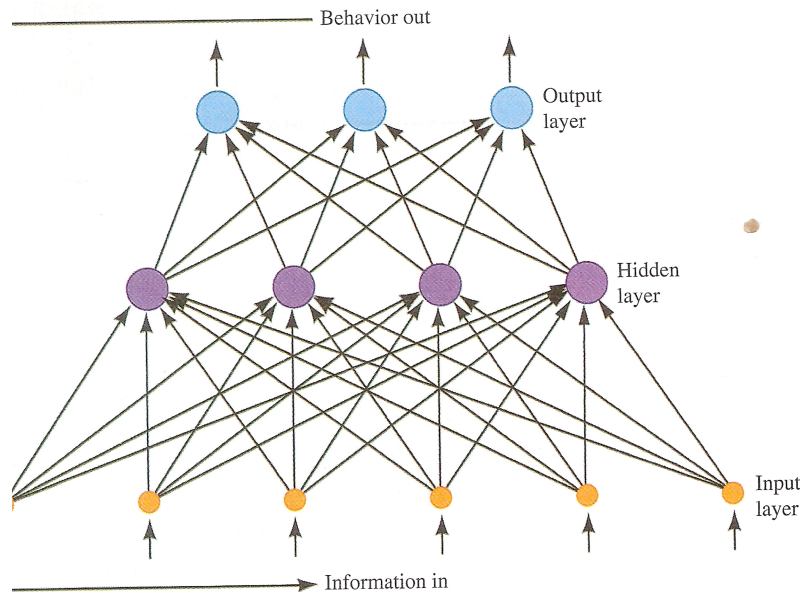
*... the brain is doing just one basic thing: linking sensory information to successful behavior by means of synaptic connectivity that has been entirely determined by trial and error.*

*... neural nets reach solutions by trial and error, gradually generating more useful responses by retaining the connectivity that led to improved behavior.*

The brain extracts features from sensory stimuli and combines them in representations of the world in higher-order cortical areas that we then perceive and use to inform behavior and cognition.

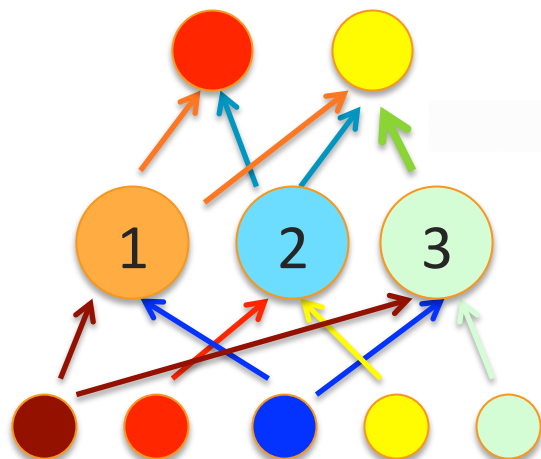
*... Sensory information is processed by online neural computations that represent the "real world " somewhere in the brain as a basis for half the higher-order functions that brain performs ...*

# NEURAL MODEL OF COMPLEX INTERACTIONS



Neural network is a richly interconnected system of nodes or neurons. ... The common denominator is the association of input from the external and internal environment with empirically successful behavior output.

*Dale Purves, pg. 226, idem.*



*... assessments of complex psychological constructs are foundational. Psychological constructs need to be decomposed into component structures (2), representations (1), and processes (3) that could plausibly be implemented by the brain. These, in turn, can be decomposed into the computations...*

**J. Cacioppo - J. Decet: Social neuroscience: challenges and opportunities in the study of complex behavior.**  
*Annals of the NY Academy of Sciences, April 2011, vol. 1224, pg. 162 -173.*

## Networks are examples of complex systems, with:

- highly structured connectivity patterns,
- multiscale organization
- nonlinear dynamics,
- resilient responses to external challenges,
- and the capacity for self-organization that
- gives rise to collective or group phenomena.

*The human brain is a complex network.*

*An important first step toward understanding the function of such a network is to map its elements and connections, to create a comprehensive structural description of the network architecture.*

*...provide new insights into the organization of the brain's structural connections and their role in shaping functional dynamics.*

*Structural and functional networks share some of the same characteristics, although their relationship is complex and nonlinear.*

*The human connectome: a complex network  
by Olaf Sporns,  
Annals of the N. Y. Academy of Sciences  
[V. 1224](#), pg. 109-125, April 2011*

# Structural and functional connectivity

## *Structure:*

the extensive but finite set of physical links between neural elements.

## *Functional:*

a statistical dependence between remote neural elements or regions

*Functional connectivity*, which unfolds within the structural network, is significantly more variable across time, reflecting changes in internal state or neural responses to stimuli or task demand.

Network is a mathematical object that naturally fits within a larger theoretical framework and thus links neuroscience to modern developments in network science and complex systems.



# Some properties of the “biological” networks by Sporns

1) fundamental structural **data sets** that inform us about the possible “functions” (actions and interactions) of a biological system.

2) involve structural elements at **different levels** of scale ...

3) exhibit **variability** across organisms of the same, as well as different, species.

## Psychoanalysis is:

- 1) An **information system**,
- 2) A **deep understanding**,
- 3) A **degree of variety**,
- 4) The **fertility of similarity**,
- 5) An **evolving knowledge**,
- 6) The **simplicity of insight**.

4) give rise to **complex system dynamics** ...

5) can be modified by environmental interactions. It is well known that brain connectivity is altered through various forms of neuronal **plasticity**

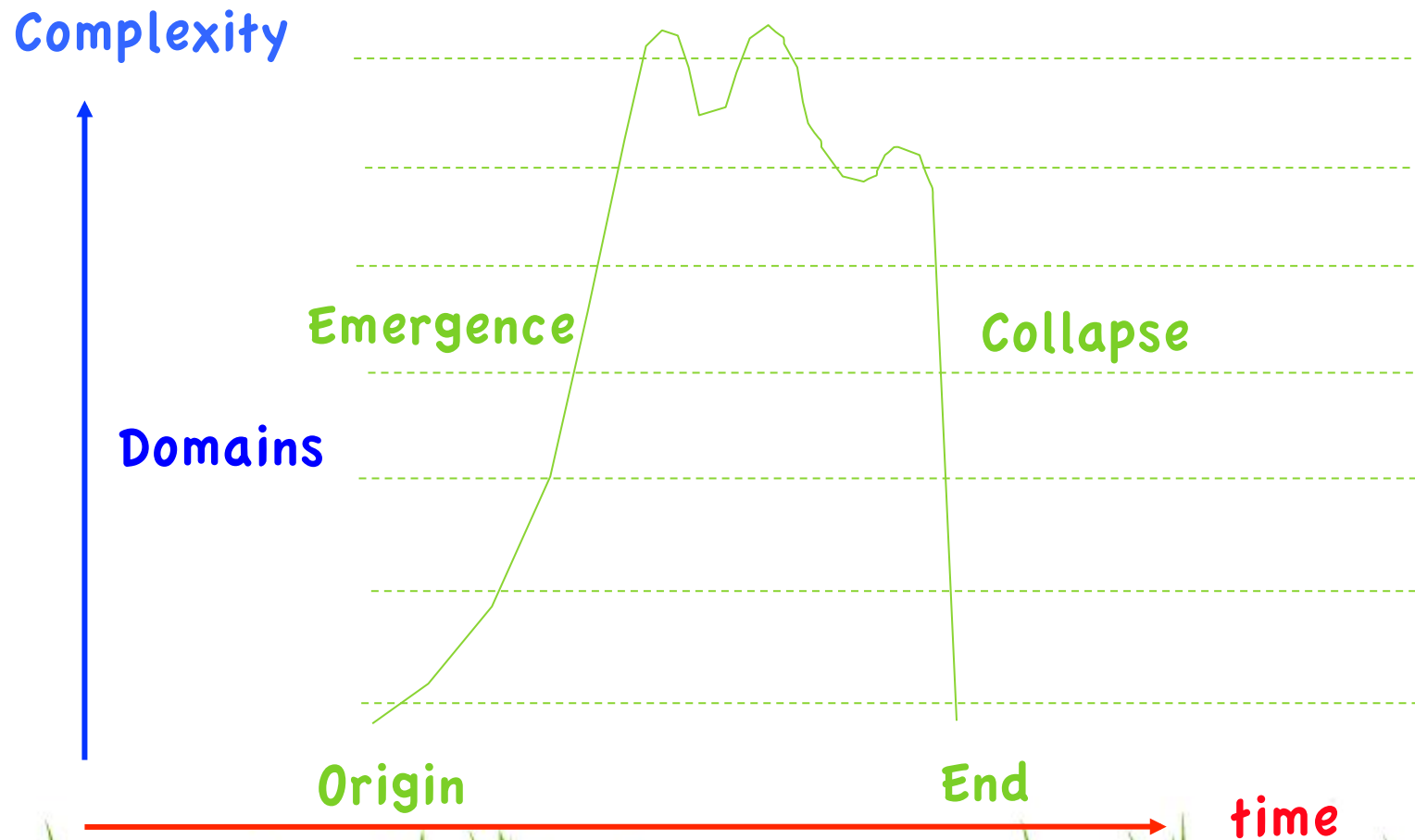
6) embedded in three-dimensional space, and the spatial **proximity** of their elements influences their functional dynamics

# Fisica della complessità e Livelli

by Marcello Costa, Neuroscienziato, Adelaide, SA

- The biosphere (and beyond) emerged over time as multiple superimposed levels of reality (domains)
- Each domain emerging from the one below and being dependent on all the ones below
- Within each domains phenomena occur in the 4 physical dimensions
- Transitions between domains require time
  - > emergence of properties (origin)
  - > collapse of properties (end, termination)
- Every 4D structure is composed of superimposed domains
- The number of domains gives a measure of complexity to the structure
- Living organism, including humans and their mental states, are 5 dimensional structures

# The multilayered structure of organisms



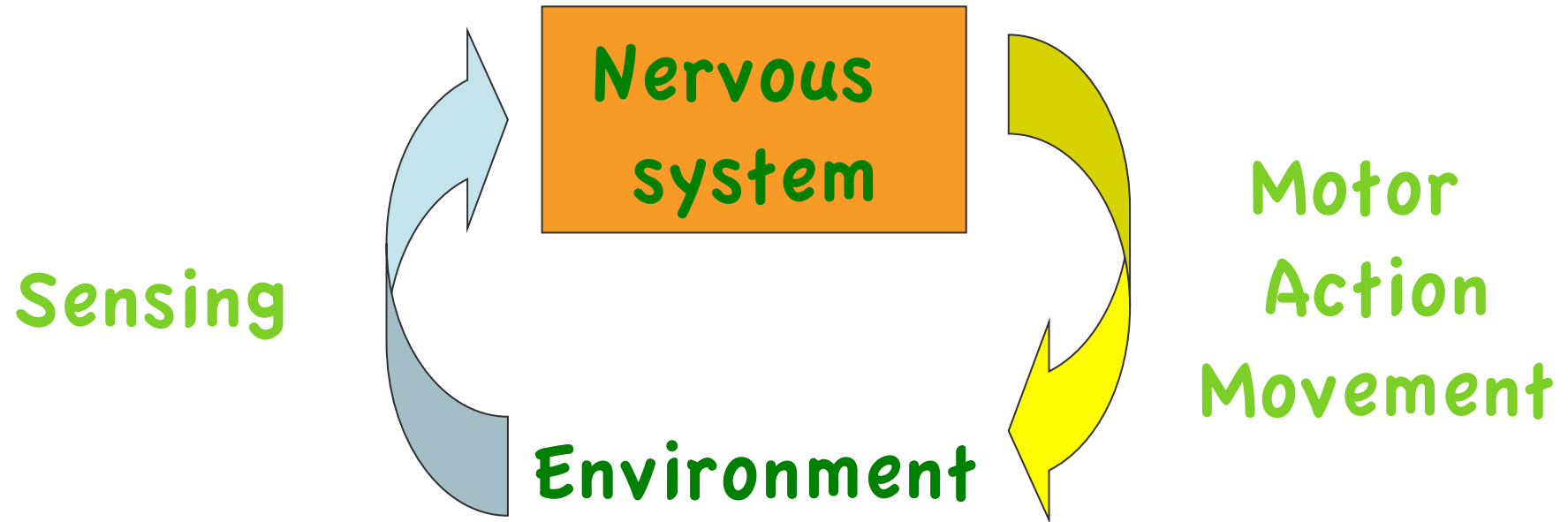
# L' emergere della vita

L'emergenza del dominio “vivente” consiste:

- In evolution organisms with a nervous system developed the ability to “have experiences”;
- Experience is always individual, subjective; it requires an “experiencer” organism;
- The appearance of ability to experiencing has been associated with increasing distinction between a “self” and and external “world”;



# The primordial experiential loop



The primordial interaction with the environment involved locomotion and escape behaviors.

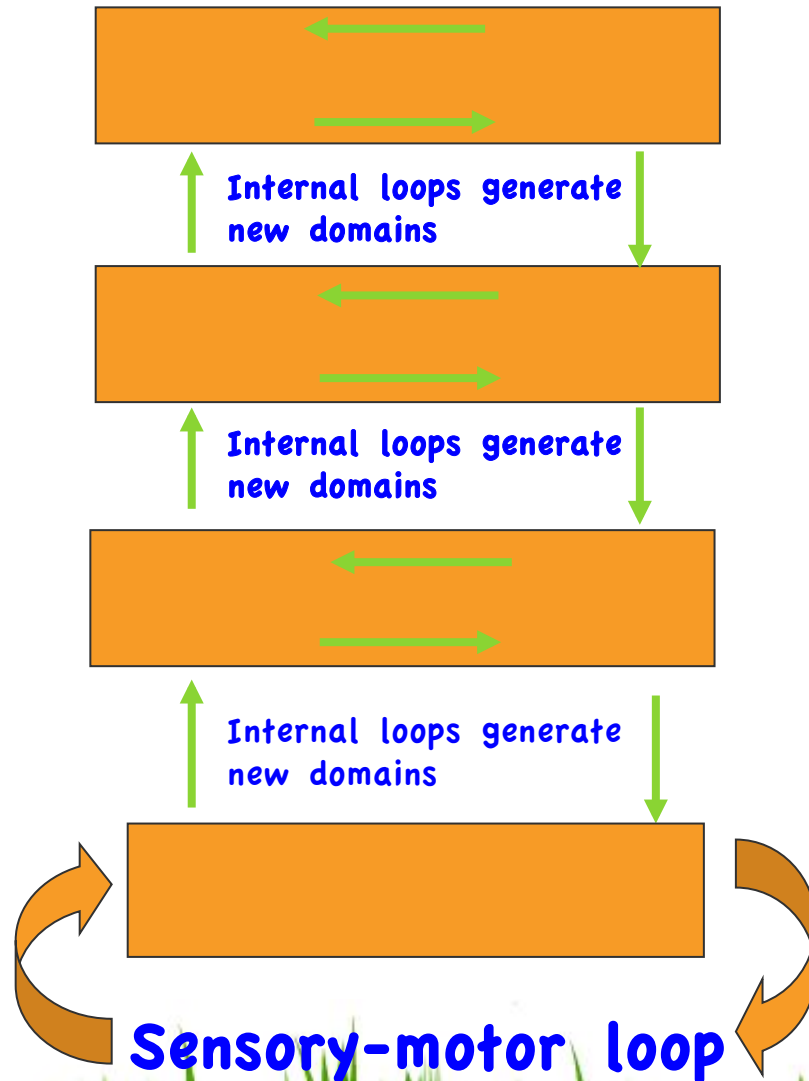
This interaction between organism and environment was mediated by neural nets in the segmental architecture of the nervous system.

This interaction represents the primordial “experiential loop”.

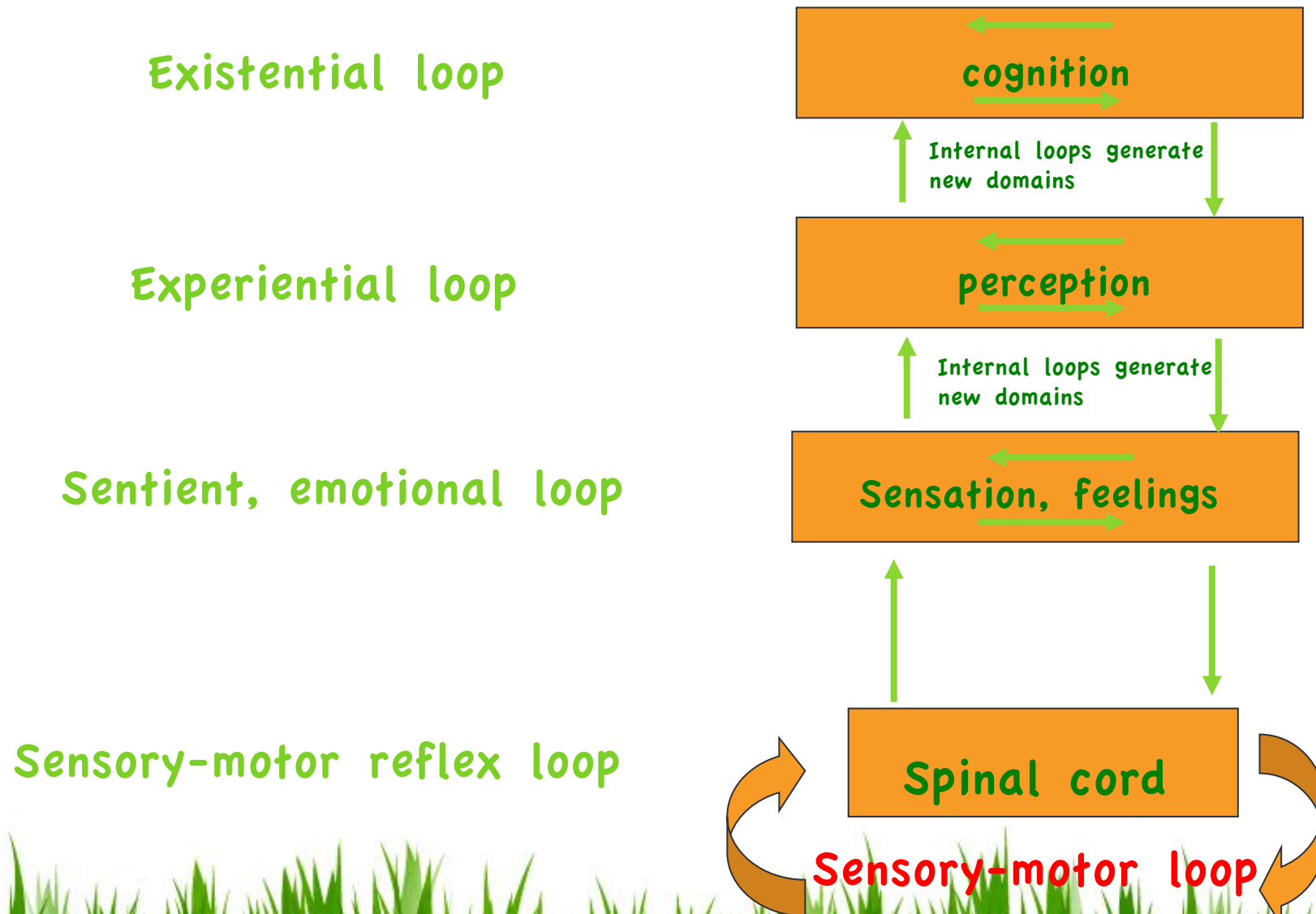
# The brain as superimposed neural loops

The nervous system evolved  
into superimposed loops  
of neural circuits

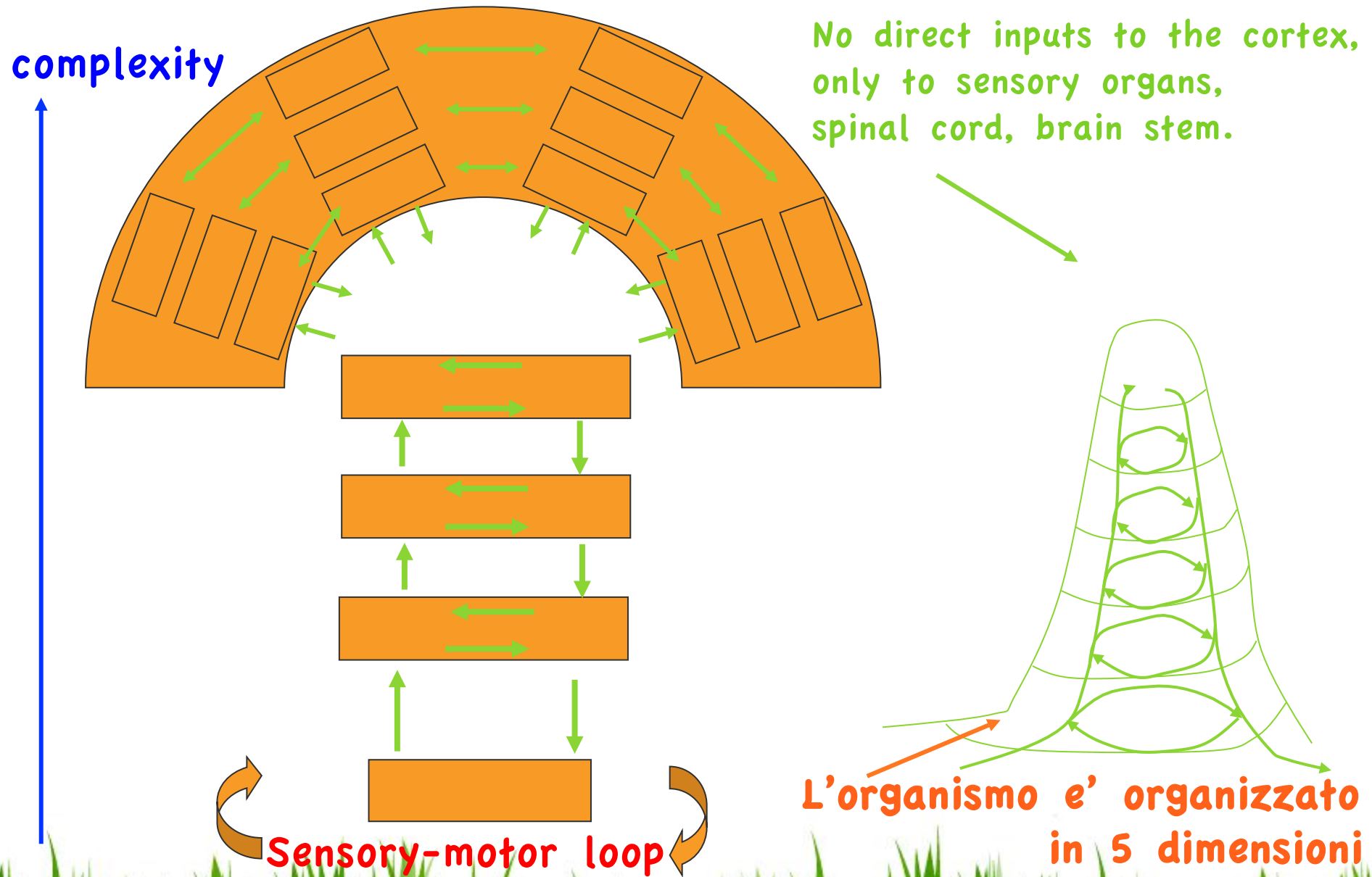
With superimposed loops  
new domains emerge  
i.e. new properties emerge



# Superimposed loops and associated higher neural states



# Hierarchical-parallel organization of the embodied brain

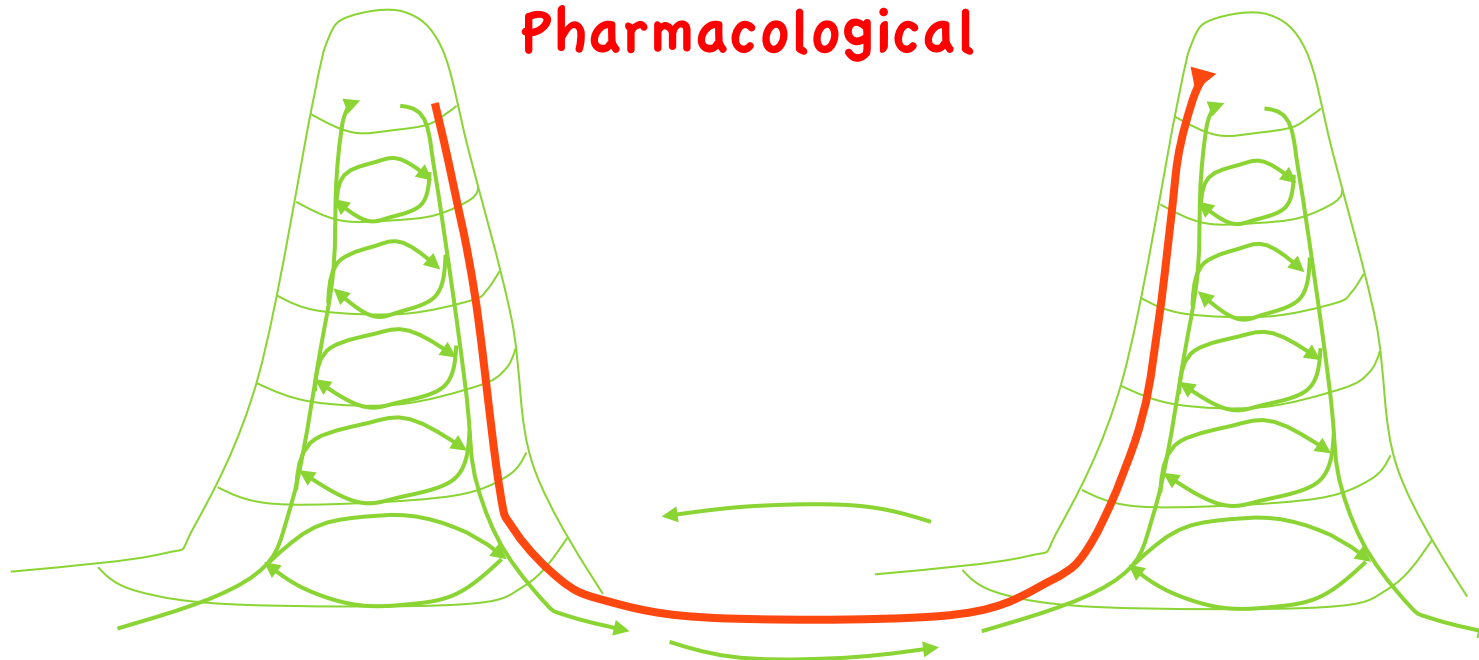




# Therapeutic interaction with other similar beings via real coupling

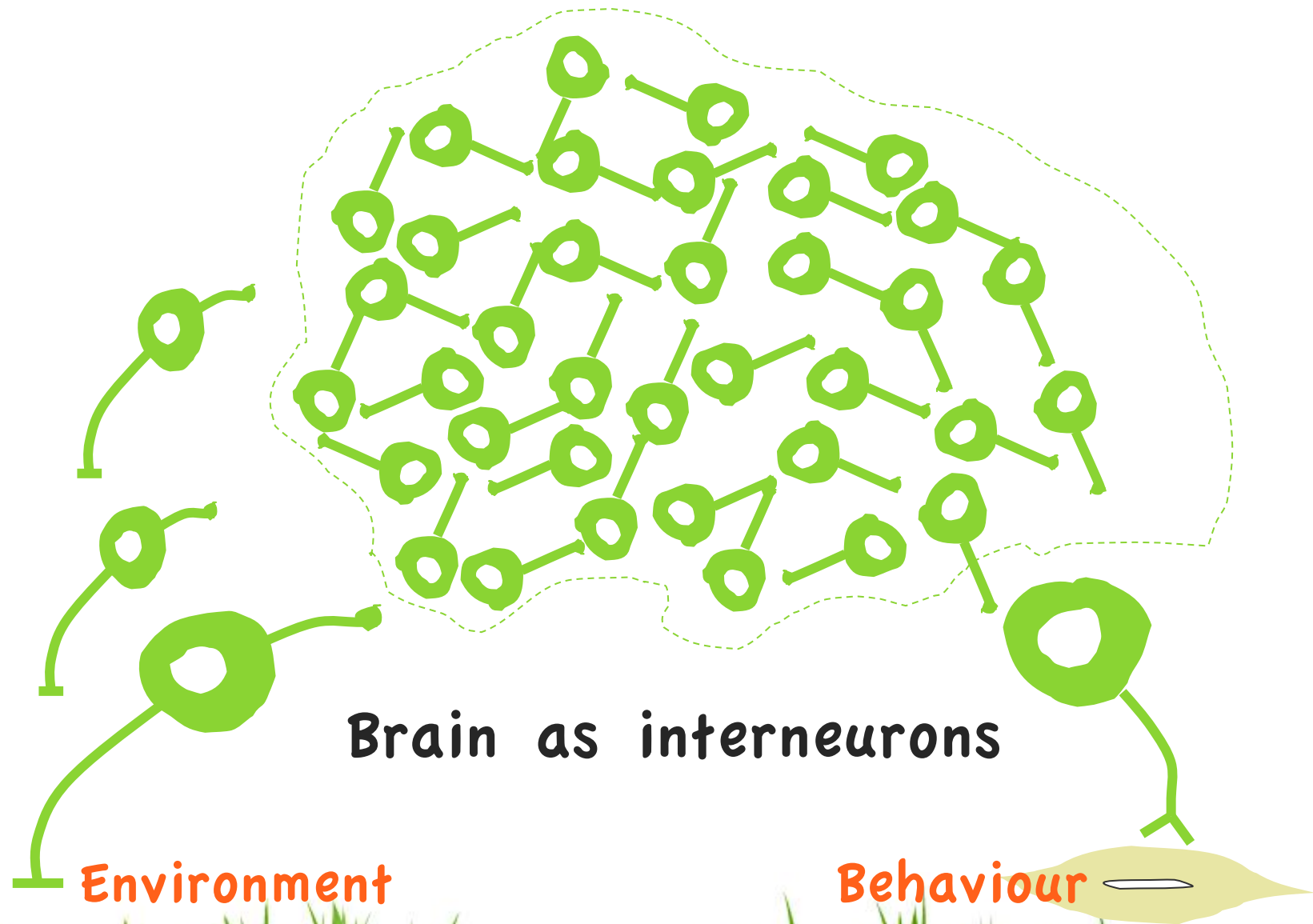
complexity

Cognitive; verbal  
Emotional; non verbal  
Behavioral; imitative  
Pharmacological



**Coupling between organisms  
is still at the lowest domains**

# The interneurons become “the brain”



# A n t r o p o l o g i a

ONE PROBLEM WITH THE NATURE/NURTURE DEBATE IS THAT  
OCCAM'S RAZOR DOES NOT WORK

Across

3

This revolution has taken place even ...  
resulting in a burst of publications in ...  
anthropology that explored the possibilities  
that the new science offered.

Continuing the Revolution by C Beekman & W. Baden  
in Nonlinear Models for Archeology and Anthropology,  
Athenaeum Press, 2005

Science is the production of convincing knowledge in modern society.

by J. Marks; Why I am not a scientist: anthropology and modern knowledge  
Berkeley, 2009, California Un. Press

In J of the Royal Anthropological Institute, June 2011, pg. 342

# Similarità o Coincidenza?

**1. GLI ANTROPOLOGI HANNO SCOPERTO  
MODELLI IDENTICI  
PRESENTI IN DOMINI DELLA NATURA  
CHE SEMBRAVANO SEPARATI E INDIPENDENTI.**

**2. LE SIMILARITÀ SONO UTILI  
NELL'INDAGARE EFFICACEMENTE  
CONNESSIONI E IDEE  
TRA ASPETTI DEI SISTEMI SOCIOCULTURALI  
E ASPETTI INVESTIGATI  
DALLA TEORIA DEI SISTEMI COMPLESSI.**



**On the Order of Chaos: Social anthropology and the science of Chaos  
By Mark Mosko & Frederick Damon - Berghahn Books NY 2005, pg 36/37**





## Convergenze tra Psicoanalisi e Antropologia

3. Le conoscenze scientifiche, sociali e antropologiche possono efficacemente essere aggiunte e correlate alle più importanti correnti del pensiero scientifico attuale.
4. Il riconoscimento di similarità, come di metafore e analogie nel campo della ricerca semantica, è stato una pratica standard nella maggior parte delle analisi e delle comparazioni antropologiche e sociali.
5. L'antropologia ha una lunga storia di coinvolgimento con gli elementi culturali che sono entrati a far parte delle teorie della complessità; molti concetti emersi nelle scienze naturali erano già espliciti, più che impliciti, nelle scienze sociali.

The task of converting observations into numbers is the last task rather than the first thing to be done, and it can be done only when you have learned, beforehand, a great deal about the observations themselves. You can achieve a very deep understanding of nature by quantitative measurement, but you must know what you are talking about before you can begin applying the numbers for making predictions.

pg. 38

Thus the quantification of qualitative phenomena may well prove to be the critical hurdle in social anthropology's rapprochement with chaos theory.

pg. 39



# Predictions from numbers





natura



uomo - cultura

universalità



psiche



vita





Una delle caratteristiche dello studio dei fenomeni caotici è l'enorme potenzialità di unificazione culturale in cui tutta la filosofia naturale e le discipline economiche umanistiche, politiche e sociali sono coinvolte. La natura stessa sembra usare il caos nel suo programma di evoluzione: ogni schema deterministico fallirebbe se utilizzato per la sopravvivenza delle forme di vita in condizioni ambientali in continua trasformazione.

Giulio Casati, *Il Caos : le leggi del disordine* ,  
Le Scienze Editore 1991, pg 9

**Universality:** qualitative similarity quantitative identity