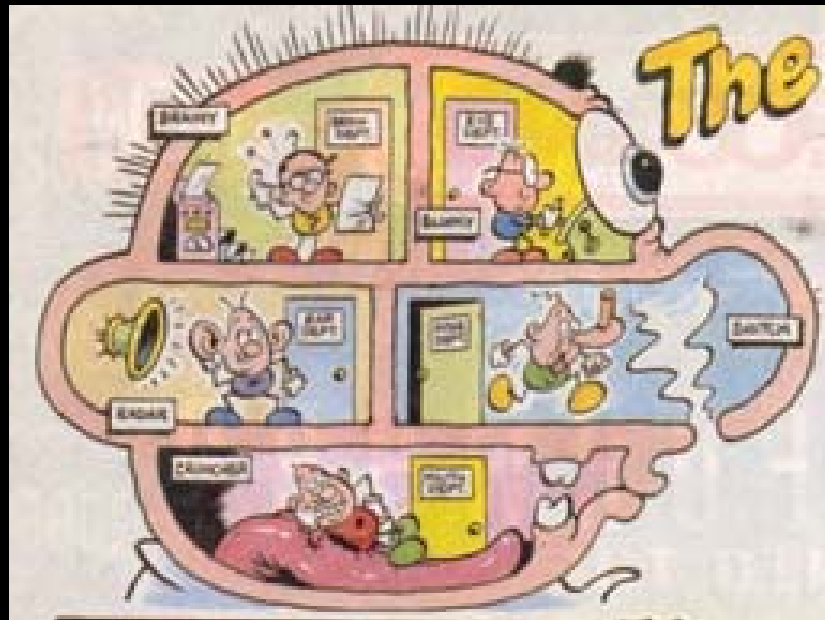


# euCognition

*The European Network for the Advancement of  
Artificial Cognitive Systems*

3<sup>rd</sup> Six-Monthly Meeting

Cognitive Architectures



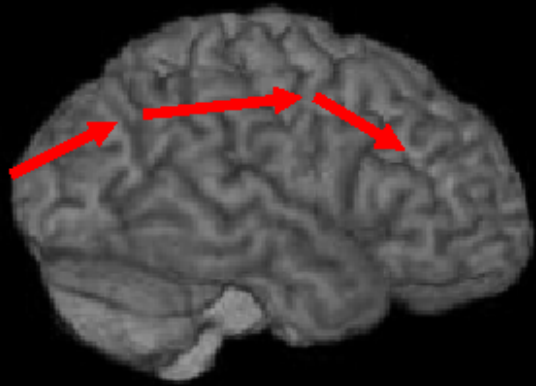
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## Programme

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### Friday 29th June 2007: Network Meeting on Cognitive Architectures

- 09:00 Registration
- 10:00 David Vernon, euCognition Network Coordinator: Welcome & Overview
- 10:15 Joanna Bryson, University of Bath
- 11:15 Coffee
- 11:30 Jeff Krichmar, The Neurosciences Institute, San Diego
- 12:30 Lunch
- 13:30 Peter Redgrave, University of Sheffield
- 14:30 Murray Shanahan, Imperial College London
- 15:30 Aaron Sloman and Jeremy Wyatt, University of Birmingham
- 16:00 Panel and Audience Discussion
- 17:30 Poster Session and Wine Reception
- 



50 Years



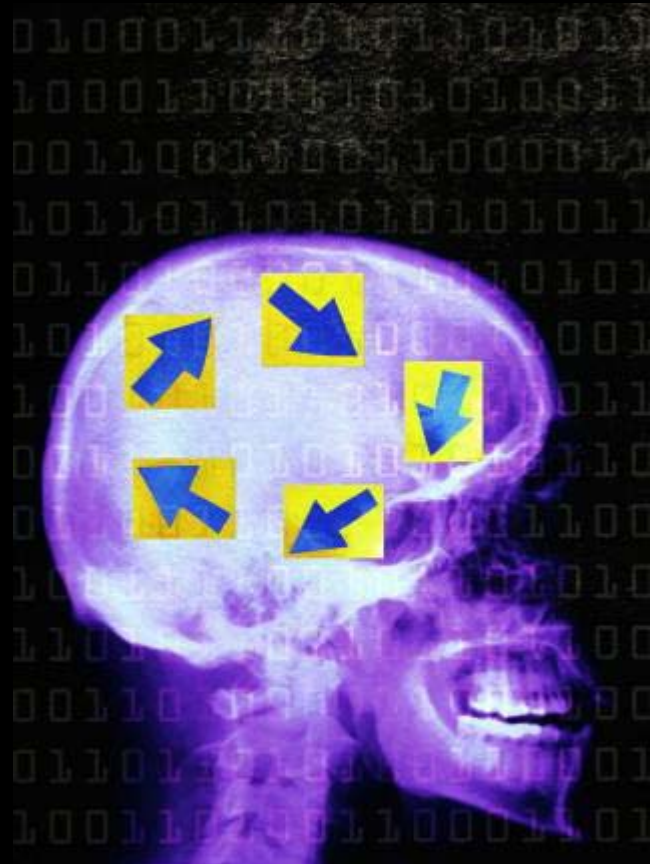
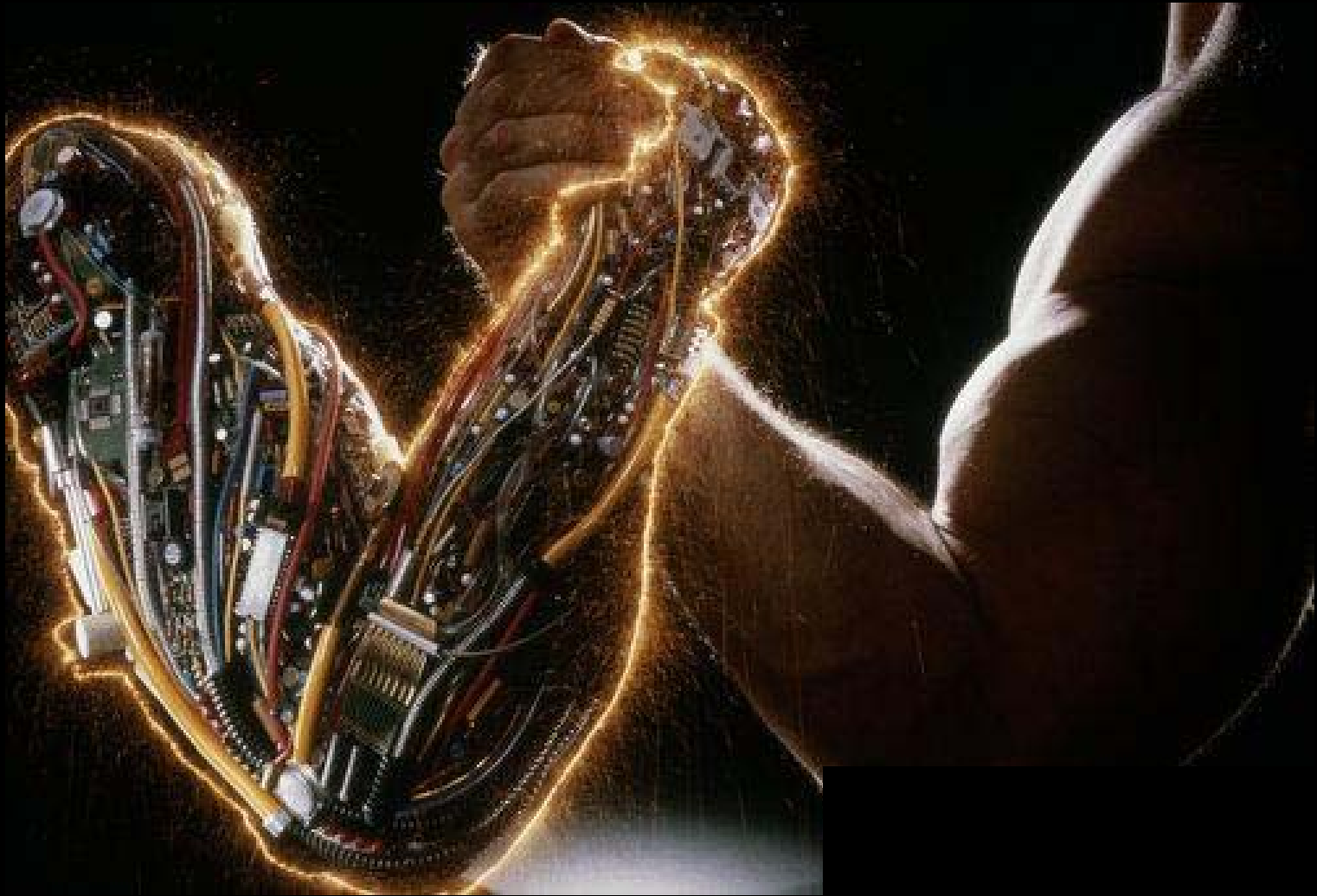


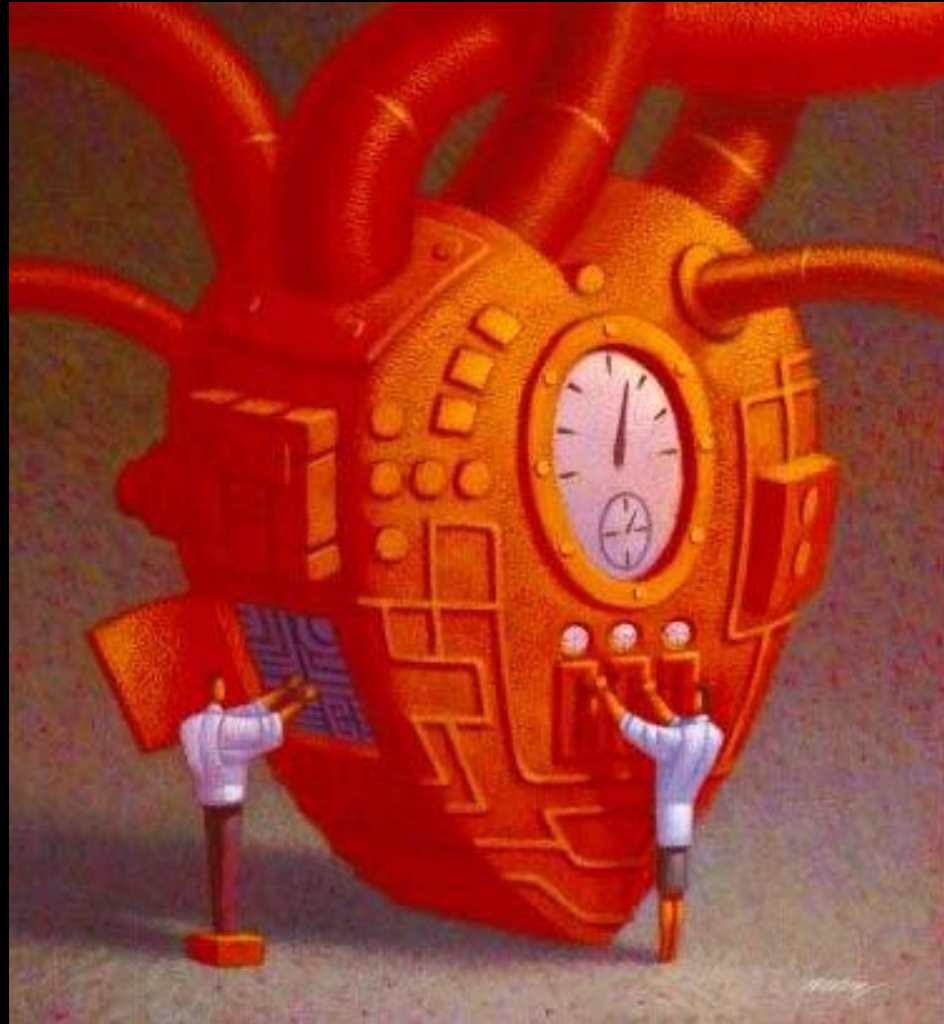


IMAGE BANK  
TWICE BANK

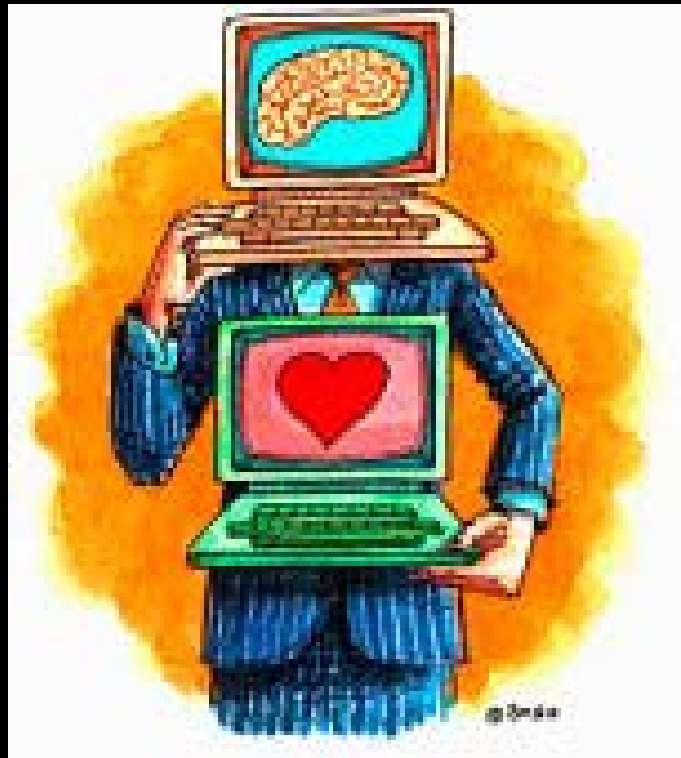


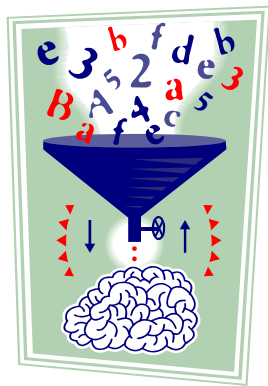
Mind as Motion, Port & Van Gelder



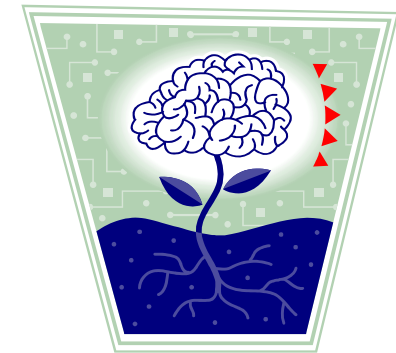








50 Years



## Functionalist & Dualist

Mechanisms are independent  
of the instantiation

## Emergent, Embodied, & Enactive

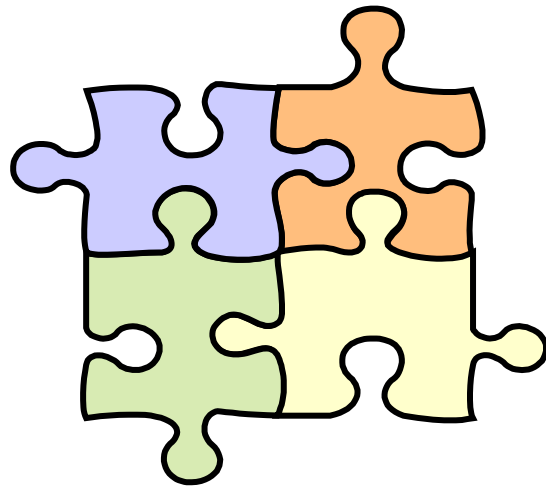
Embodiment plays a constitutive  
role in the process of cognition

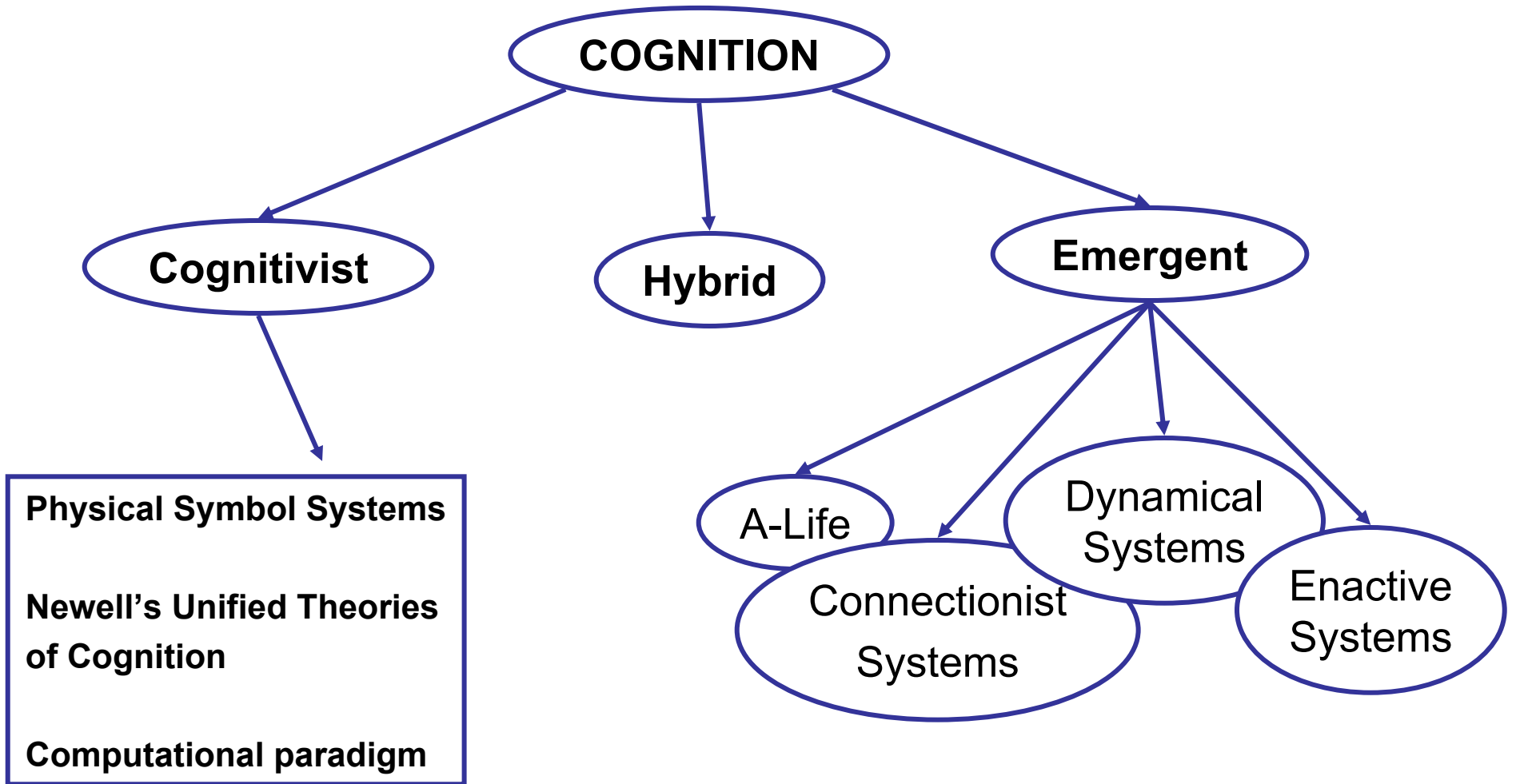


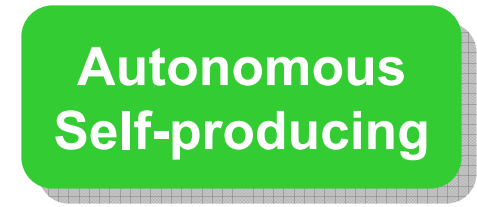
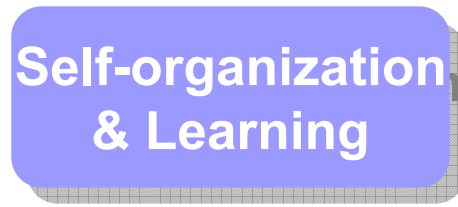
50 Years



# Cognitive Architectures







**Build systems that understand the world we see the way we see it**

**a priori syntax  
a priori semantics**

**Build systems that see order: statistical regularity**

**discover syntax  
no/implied semantics**

**Build systems that construct reality**

**discover syntax  
construct semantics  
Meaning is negotiated**

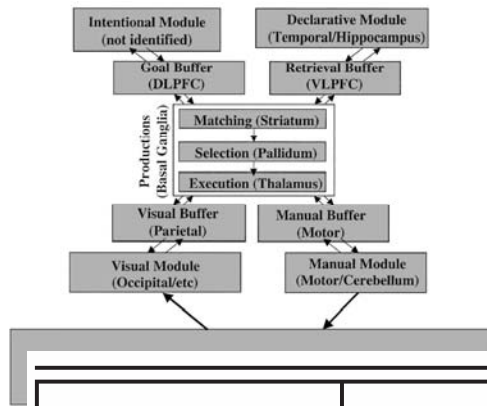
Cf. Luc Steels (AI50):

1. AI through design
2. AI through statistical machine learning
3. **Self-generated AI**  
(AI by orchestrating the processes that generate it)

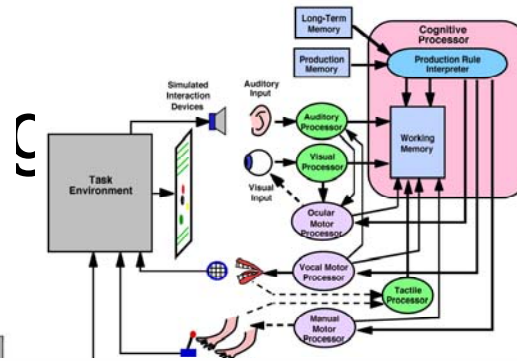
## The Cognitivist vs. Emergent Paradigms of Cognition

<b>Characteristic</b>	<b>Cognitivist</b>	<b>Emergent</b>
Computational Operation	Syntactic manipulation of symbols	Concurrent self-organization of a network
Representational Framework	Patterns of symbol tokens	Global system states
Semantic Grounding	Percept-symbol association	Skill construction
Temporal Constraints	Atemporal	Synchronous real-time entrainment
Inter-agent epistemology	Agent-independent	Agent-dependent
Embodiment	Not implied	Cognition implies embodiment
Perception	Abstract symbolic representations	Perturbation by the environment
Action	Causal consequence of symbol manipulation	Perturbation by the system
Anticipation	Procedural or probabilistic reasoning	Self-effected traverse of perception-action state space
Adaptation	Learn new knowledge	Develop new dynamics
Motivation	Resolve impasse	Increase space of interaction
Relevance of Autonomy	Not implied	Cognition implies autonomy

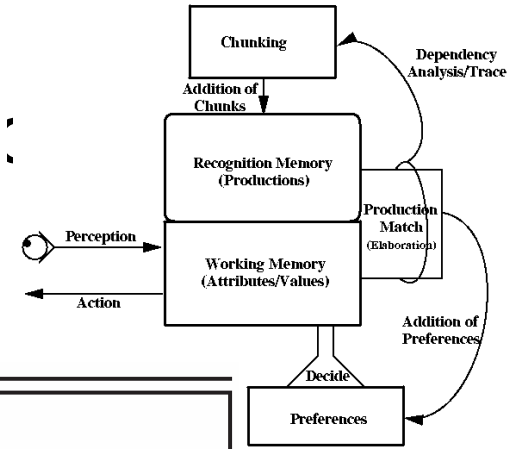
**ACT-R 5.0** [Anderson et al. 04]



**EPIC** [Kieras & Meyer 97]



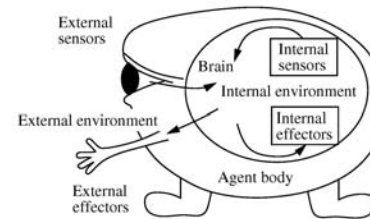
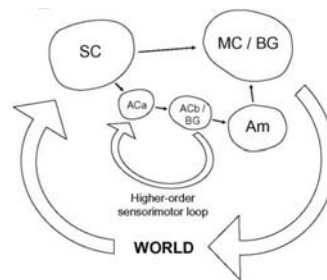
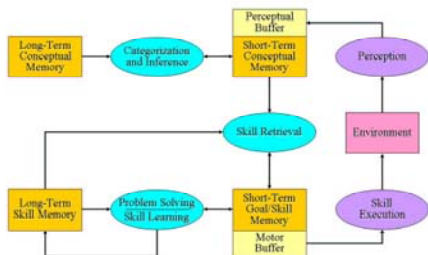
**Soar** [Newell 96]



Cognitivist	Emergent	Hybrid
Soar	AAR	HUMANOID
EPIC	Global Workspace	Cerebus
ACT-R	I-C SDAL	Cog: Theory of Mind
ICARUS	SASE	Kismet
ADAPT	DARWIN	

0, The Soar's User Manual, Version 6)

[Vernon, Metta, Sandini 06]



**ICARUS** [Langley 05, Langley 06] **GWT** [Shanahan06] **SASE** [Weng 04a, Weng 04b]

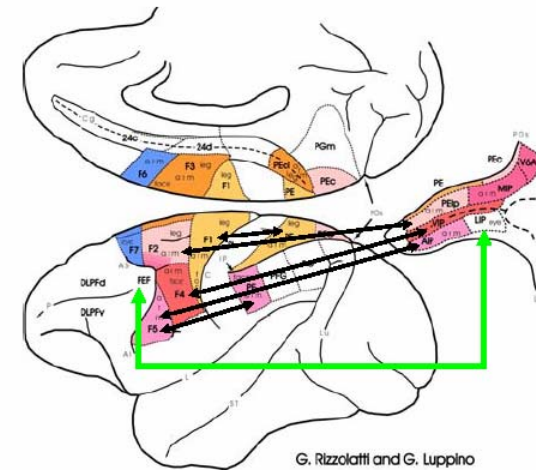


## Two views of cognitive architecture

### Functional / Structural

- Basal ganglia
- Hippocampus
- Thalamus
- Cerebellum
- Cortex
- ...

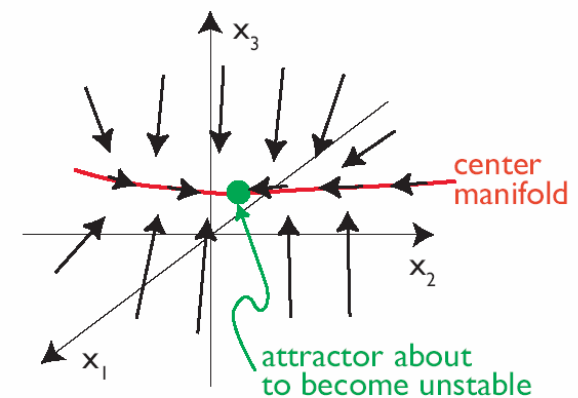
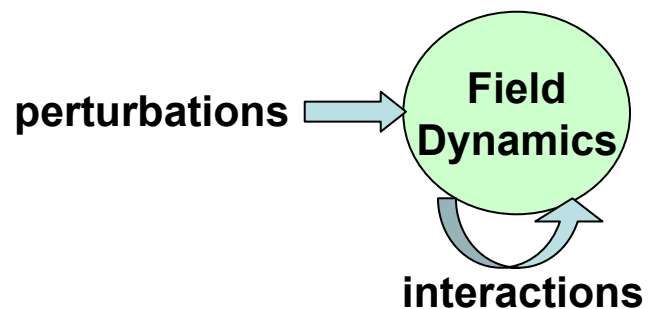
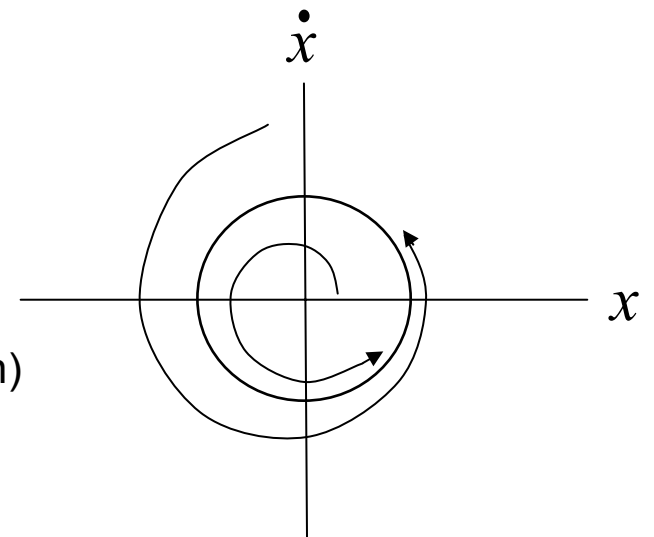
The LIP-FEF circuit



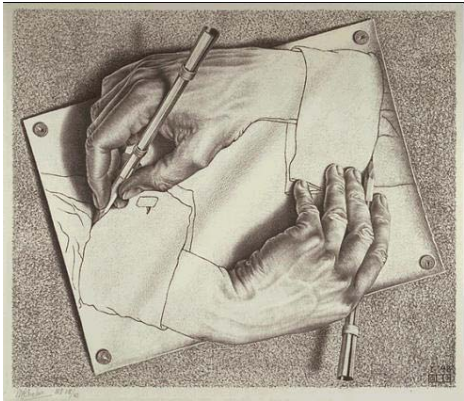
## Two views of cognitive architecture

### Process

- Highly-complex re-entrant structures
- Model their dynamics
- Several scales
  - Re-entrant nets (Hopfield, Elman, Jordan)
  - Re-entrant devices (cf. Krichmar BBD)
- Dynamic neural field theory



# Process Modelling



# Structural Modelling

## **Third Six-Monthly Meeting and Project Review**

29 & 30 June 2007

Room K13

[Municon - Munich Airport Conference Centre](#)

### **Cognitive Architectures**

There is a printable version of the meeting agenda [here](#) (pdf - 0.10 Mb)

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