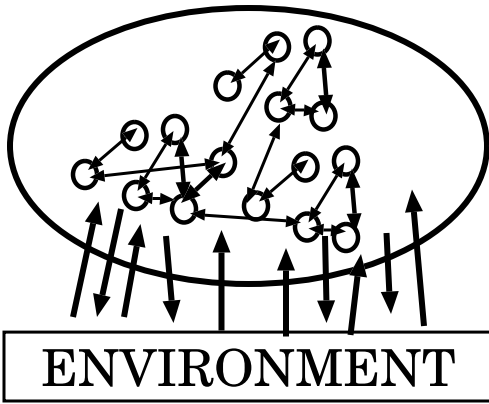


TWO KINDS OF DYNAMICAL SYSTEM



One kind, on the top left, is closely coupled with the environment through sensors and effectors.

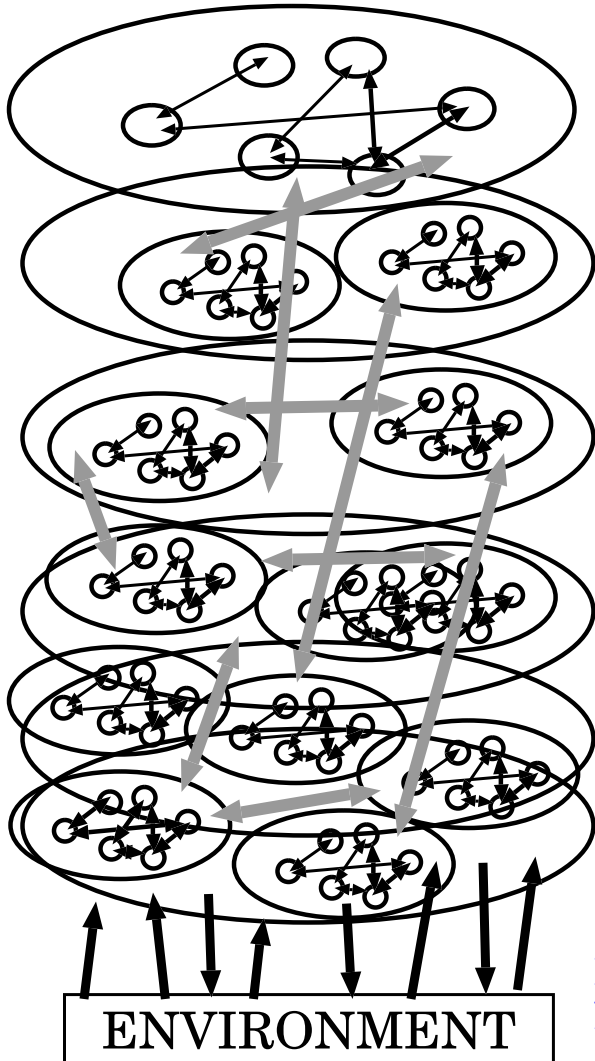
The other kind, below, has many sub-systems, with different levels of abstraction and decoupling from the environment, including subsystems concerned with theorising, reasoning, planning, remembering, predicting and explaining, or even free-wheeling daydreaming, wondering, etc.

Some subsystems change continuously, especially those closely coupled with the environment, while others change discretely.

At any time many subsystems are dormant, but able to be activated very rapidly by constraint-propagation mechanisms.

Evolution produced both kinds and many intermediate kinds.

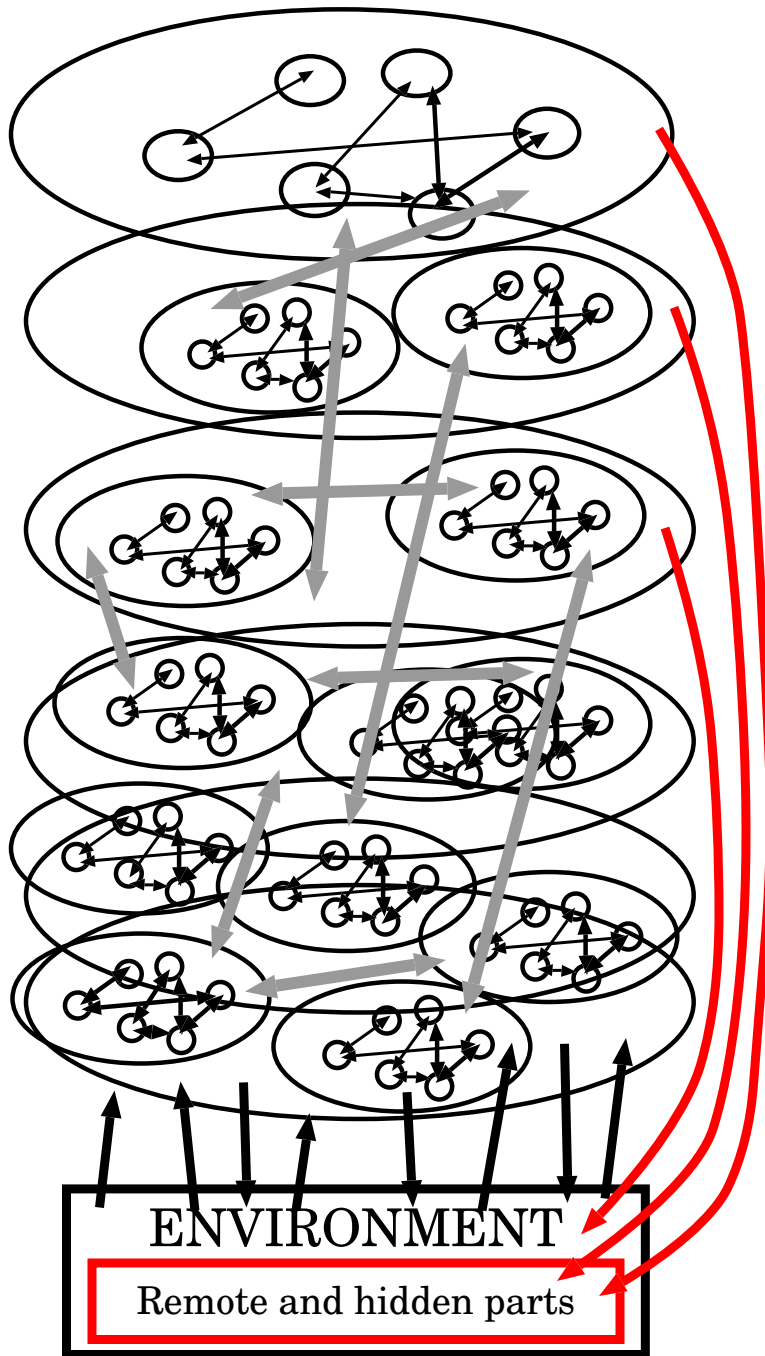
The more complex ones grow themselves after birth, under the influence of interactions with the environment (e.g. a human information-processing architecture).



For more on this see these talks
<http://www.cs.bham.ac.uk/~axs/talks.html>

TWO KINDS OF DYNAMICAL SYSTEM

(Part two)



In this kind of multi-layer system, some layers have states and processes that are closely coupled with the environment through sensors and effectors, so that all changes in those layers are closely related to physical changes at the interface.

All the semantic contents, in the interface layers are "somatic", referring to patterns, processes and invariants in the input and output signals.

Other subsystems, operating on different time-scales, with their own (often discrete) dynamics, can refer to more remote parts of the environment, e.g. internals of perceived objects, past and future events, and places, objects and processes existing beyond the current reach of sensors, or possibly undetectable using sensors alone.

These can use "exosomatic" semantic contents. The red lines indicate such reference to remote, unsensed reality.

Some of these sub-systems, using exosomatic ontologies, may be products of evolution: their main features and modes of operation are encoded in the genome ("preconfigured").

But for some (altricial) species and some future robots, the higher layers and their ontologies are constructed as a result of play and exploration, partly under the control of the environment, and partly the genome, and earlier developmental processes. We call these "meta-configured".

For more on this see these talks
<http://www.cs.bham.ac.uk/~axs/talks.html>
and papers by Chappell & Sloman in
<http://www.cs.bham.ac.uk/research/projects/cosy/papers/>

Besides factual information referring to entities beyond "the skin", some of the higher level subsystems can include questions, motives, preferences, policies, plans, and other control information, also referring (amodally) to more or less remote, or past or future entities.