

GC5: The Architecture of Brain and Mind

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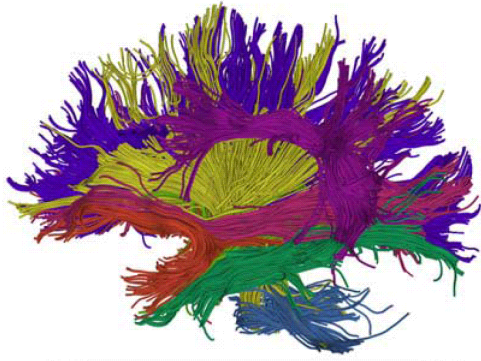
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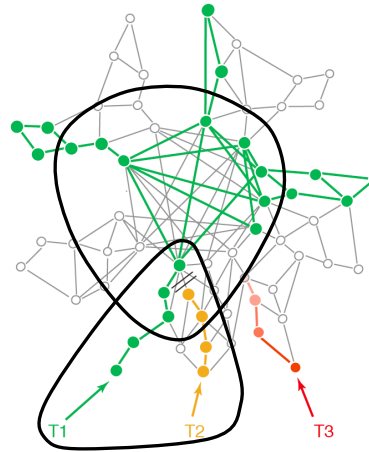
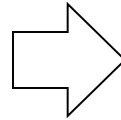
Grand Challenge 5

- To increase our understanding of the brain and mind
 - drawing on philosophy, neuroscience, developmental psychology, animal behaviour
 - exploiting CS concepts – architectures, virtual machines, parallel processing, and so on
- To test our understanding
 - by implementing computer and robot models
- To design and build ...
 - a robot capable of a range and sophistication of behaviour equivalent (in some sense) to that of an infant

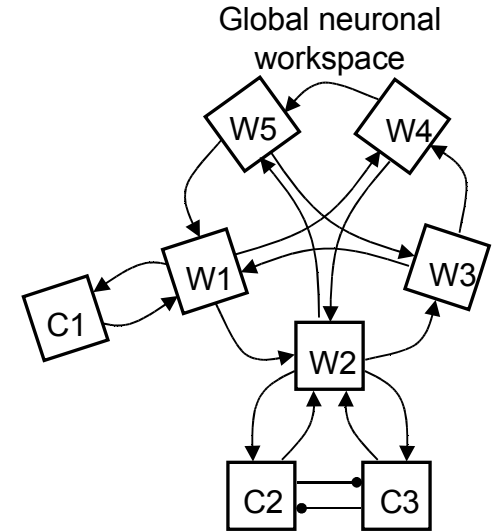
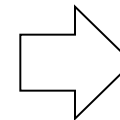
Cognitive Architecture



White matter pathways
(O'Donnell & Westin)



The global neuronal workspace
(Dehaene, Changeux, *et al.*)



A computer model of the
global workspace
(Shanahan)

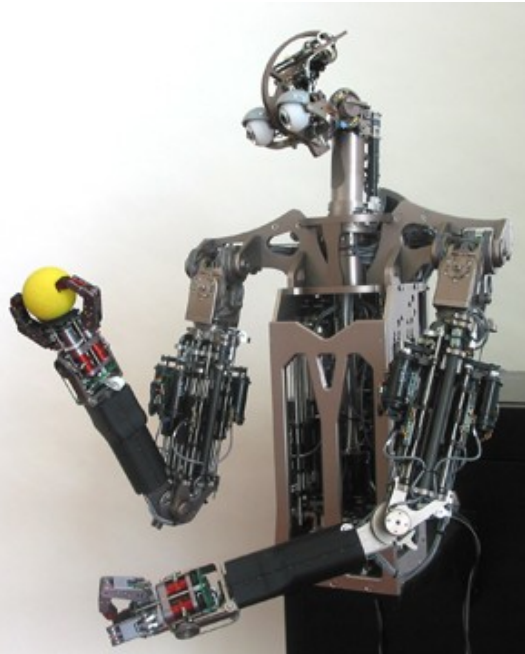
The challenge is to move from concrete neurological reality to abstract computer models

Humanoid Robotics

Various humanoid robot platforms are under development...



iCub

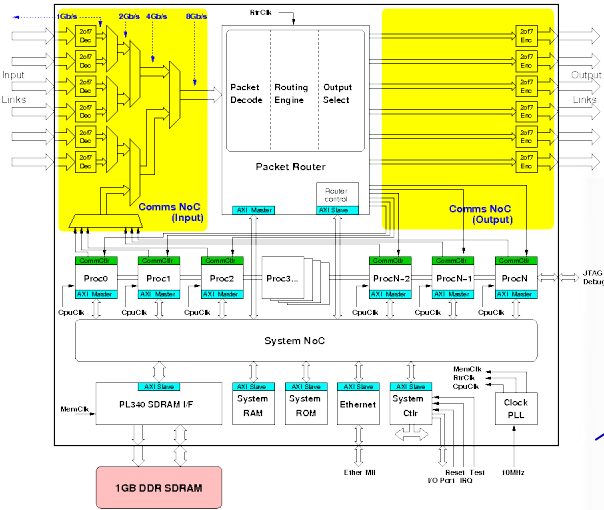


Domo



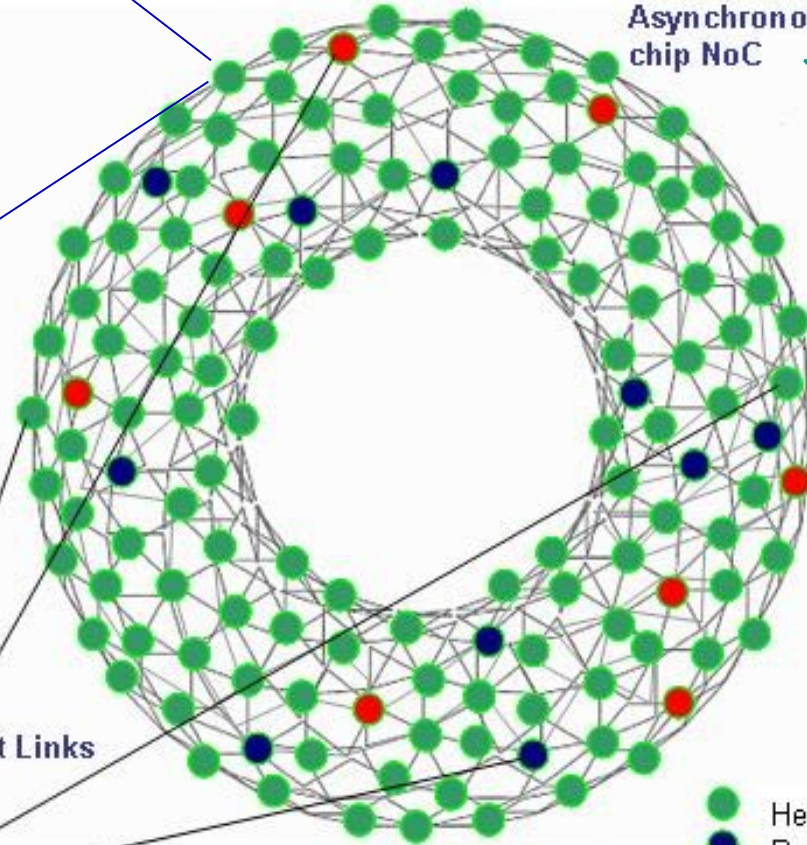
Cronos

SpiNNaker project



Asynchronous Inter-chip NoC

SpiNNaker
a universal
Spiking Neural Network
architecture



- Healthy chip
- Partially Healthy Chip
- Dead Chip



Success criteria

- a robot capable of a range and sophistication of behaviour equivalent to that of an infant
- an understanding of information processing mechanisms in the brain
 - leading to new therapeutic treatments
- a novel brain-inspired computer architecture
 - displaying biological levels of fault-resilience, power-efficiency, etc.