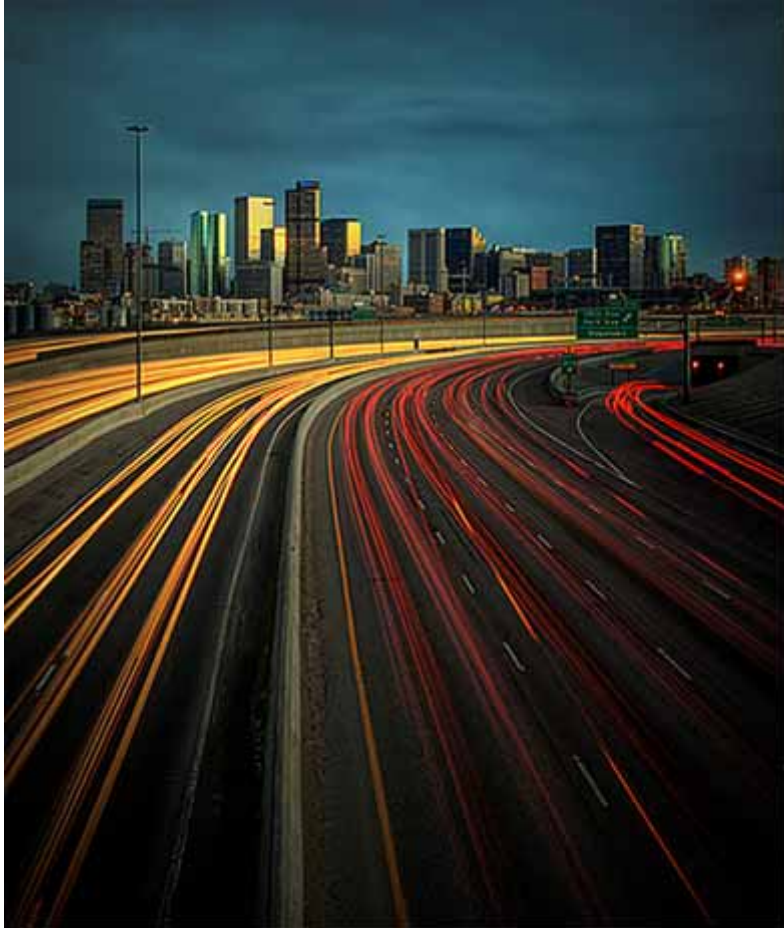


Emerging Intelligence

Geir Horn

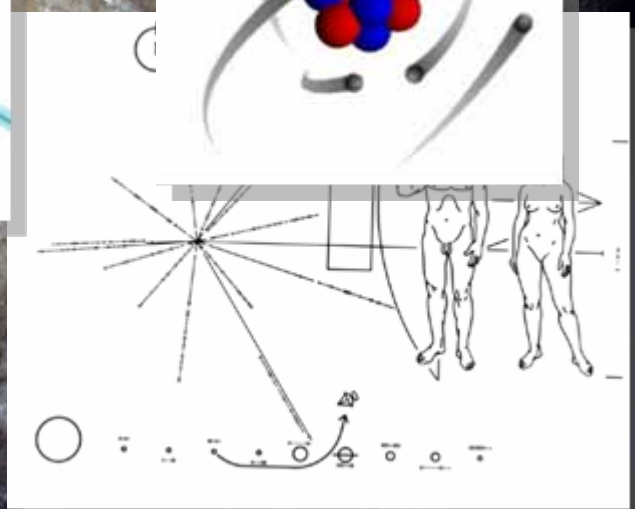
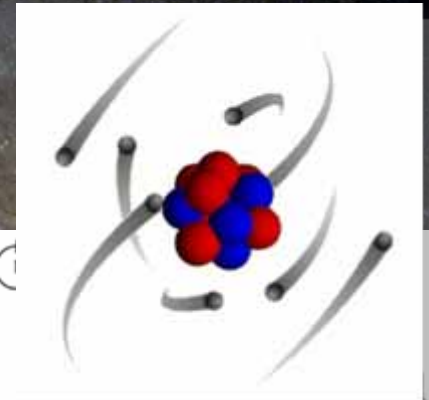
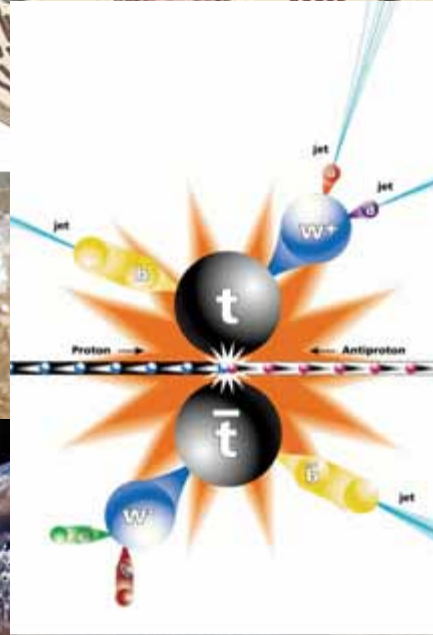
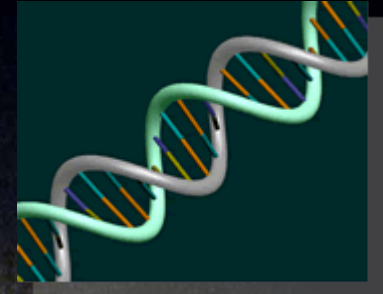
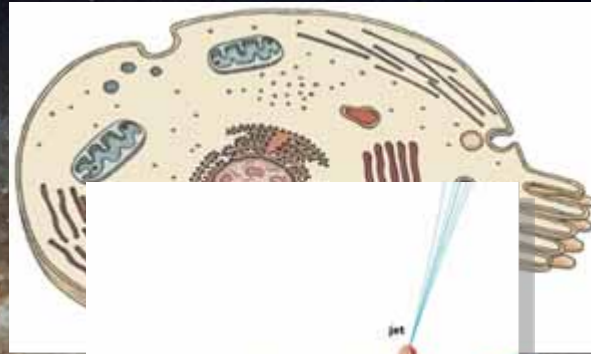
Future and Emerging Technologies
Flagship Workshop
Brussels
10 June 2010

Goal



To understand emergent structures in massive self-aware complex systems and use this for prediction and control

Emerging structures



Salient Features

■ System

- Interconnected and interdependent elements and dimensions
- Feedback processes
- Emergence
- Nonlinear
- Sensitive to initial conditions

■ Adaptive agents

- Reactive
- Self-organisation
- Co-evolution

Ben Ramalingam and Harry Jones (2008): *Exploring the science of complexity: Ideas and implications for development and humanitarian efforts*, Overseas Development Institute, Working Paper 285, ISBN 978 0 85003 864 4

Complexity in ICT

*The number of different configurations grows exponentially
with the number of alternative services
and the number of services*

- State enumeration impossible
- No global optimum
- No direct feasibility
 - No indirect feasibility
 - Local feasibility – global mess?
- Continuous change
- Self-* systems
 - Reasoning
 - Adaptation
 - Reconfigurations
 - Dependable
 - State preservation
- Partial information
 - Approximate matching
 - Learning

Challenges

- To develop a theory for converging autonomous decisions
- To develop algorithms capturing distributed learning and adaptation
- Verify results with massive large scale multi agent simulations

