Information Exchange and Coordination in Robot Swarms

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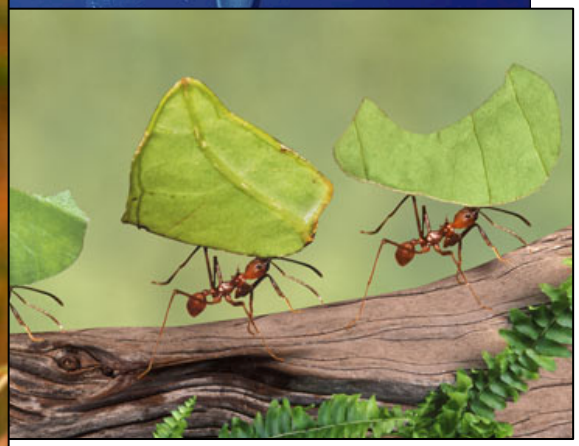
Swarm Engineering

- Design patterns?
- Biologically inspired – good reasons, but how?

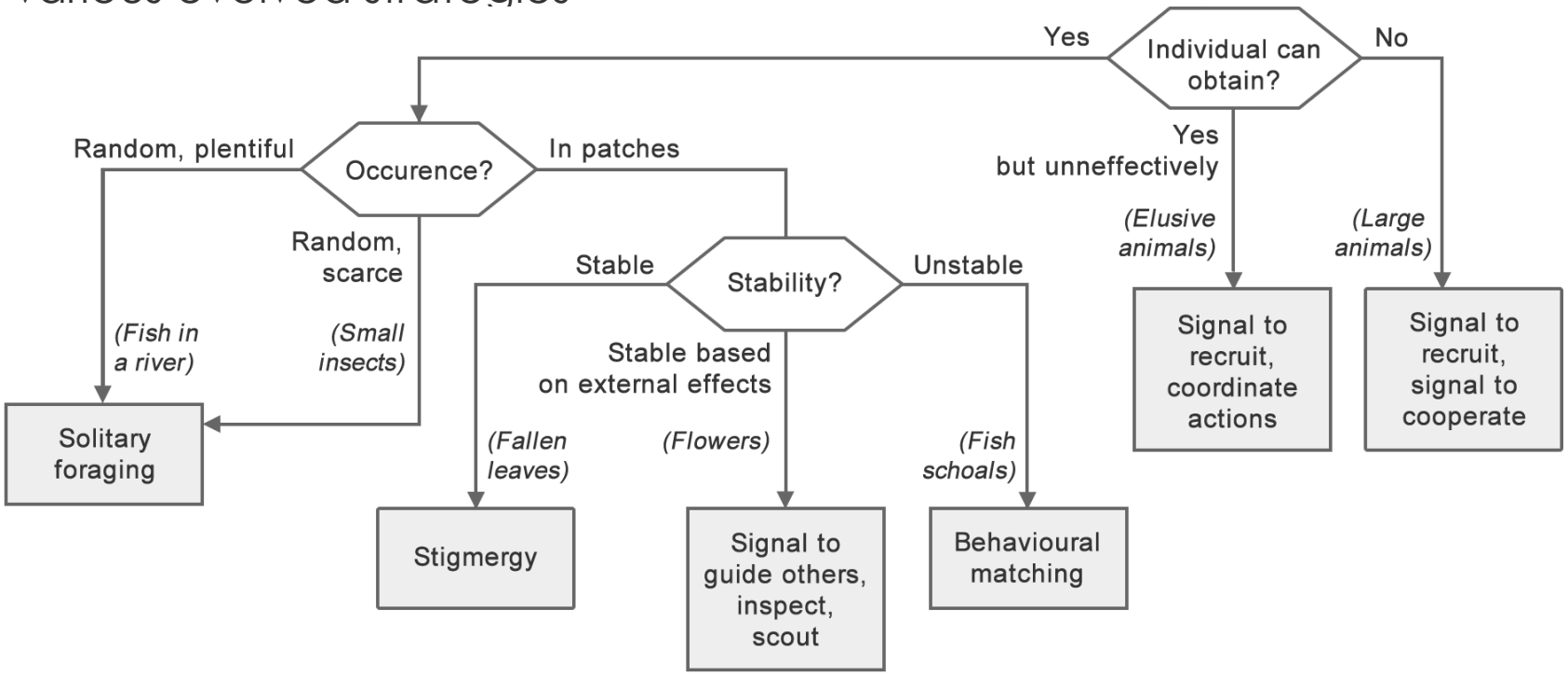
Animal-like behaviour

- What can we achieve?
  - Foraging
  - Construction
- How can we achieve it?
  - Communication
  - Recruitment
  - Labour division
  - Interaction with us



Foraging

- In nature:
  - Various resource types
  - Various evolved strategies



Foraging

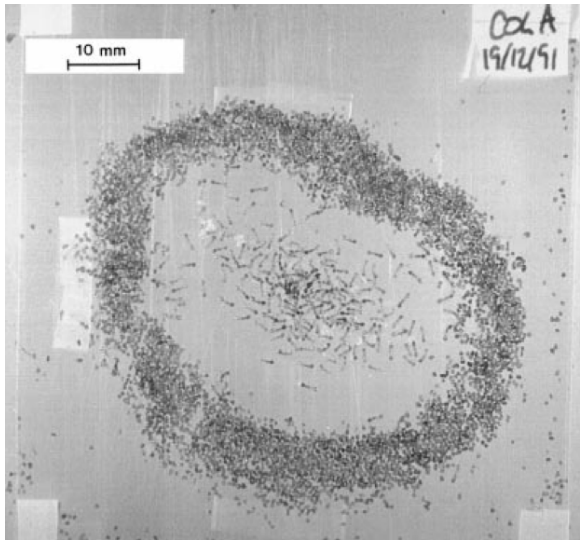
- In engineering
  - Various resource types
  - No ‘guide’ on strategies
- Good strategy = saving
  - Robot cost
  - Time spent building / coding
- Strategic knowledge = adaptation

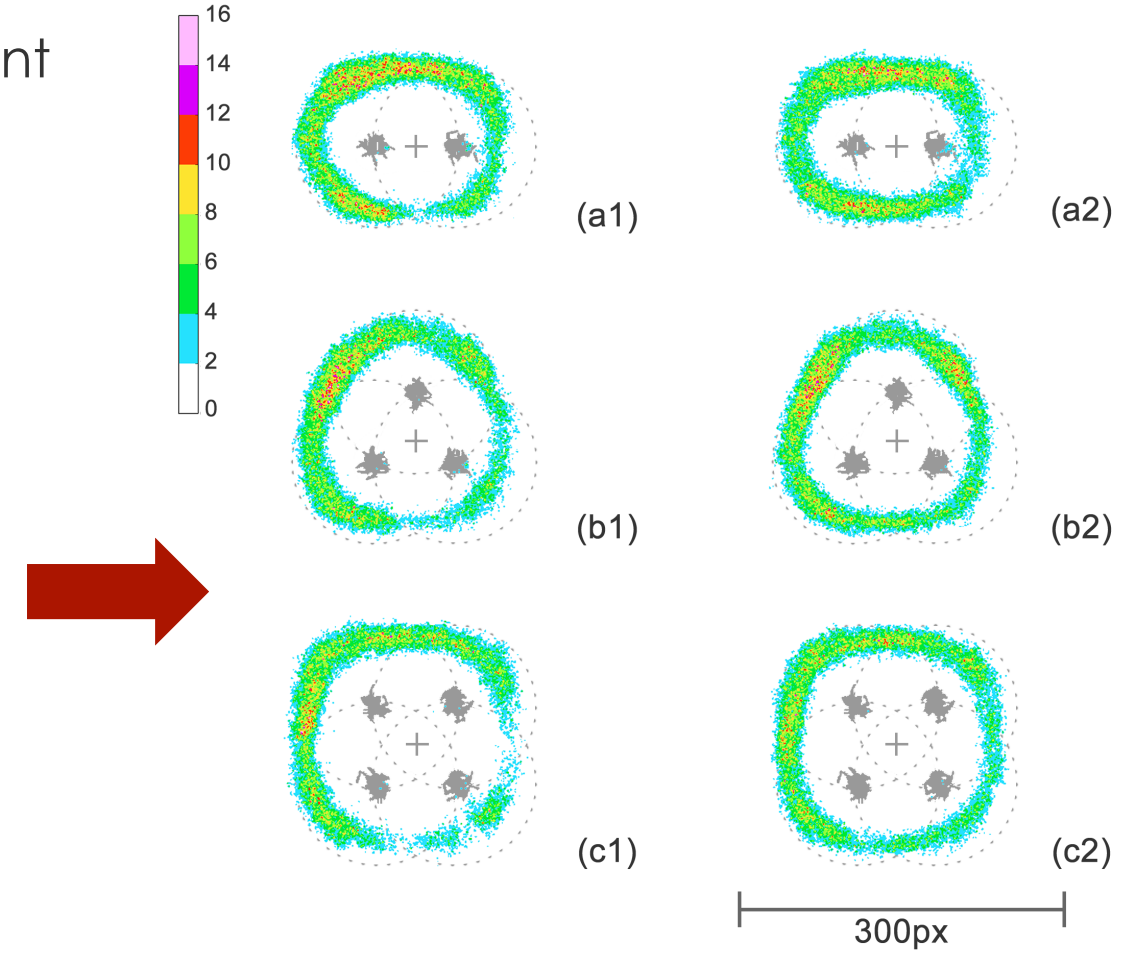
Construction

- In nature
  - Stigmergy
  - Pheromone concentration
- What can we do?
  - Structure complexity
  - Providing a blueprint (in language of the swarm)

Construction

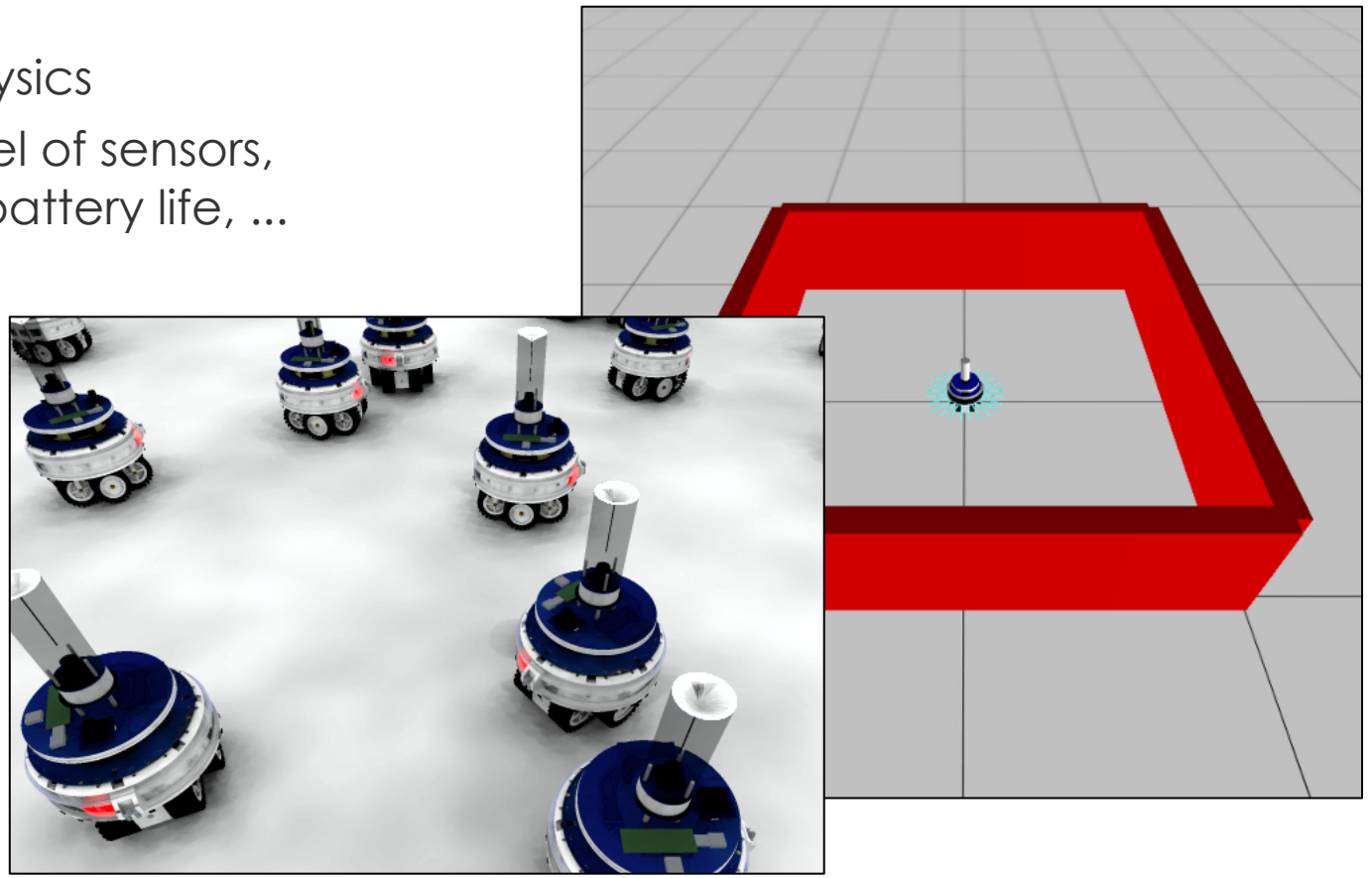
- Example: controlling ant construction





Platform

- Simulation
  - Realistic physics
  - Good model of sensors, actuators, battery life, ...
- ARGoS?
- Robots?



In summary...

- Applicability of biologically inspired swarm algorithms for robots
- How to
  - Design them
  - Make them coordinate
  - Tell them what we want
- Supervisors
  - Prof Seth Bullock
  - Dr Richard Crowder