

Scalable Complex Systems Simulation

Adam Sampson – CoSMoS, CRISP, White Space Research



UNIVERSITY
of
ABERTAY DUNDEE

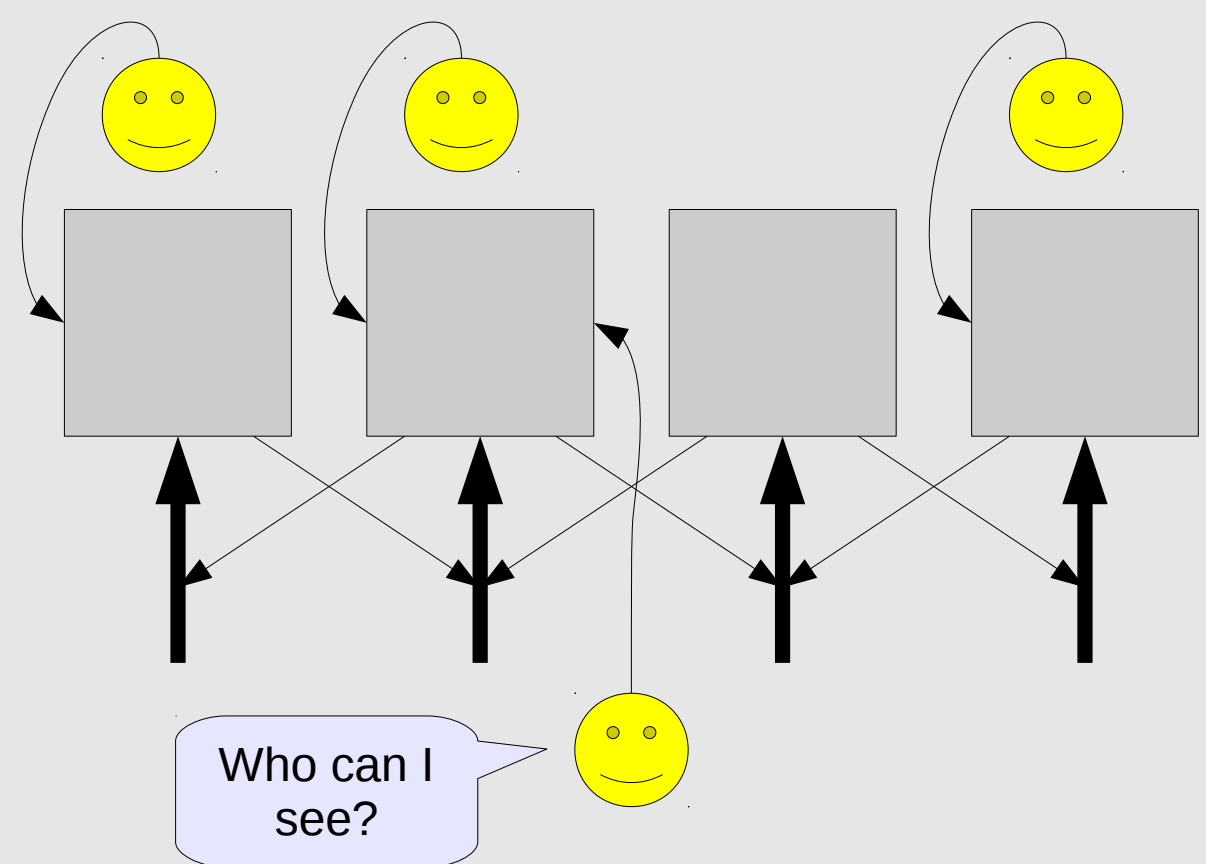
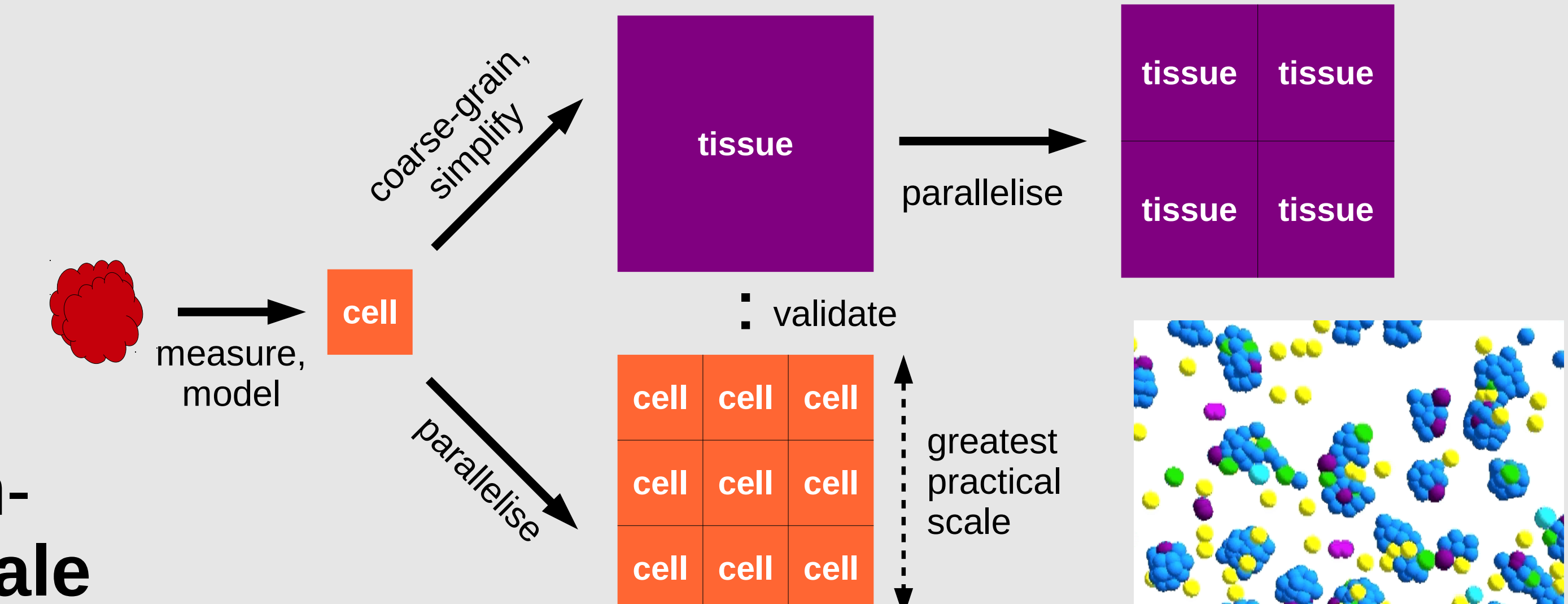
High-level parallel programming for simulation

Simulation at a realistic scale means harnessing **parallel** computing resources: multicore, cluster, cloud...

- Exploit **natural concurrency** of complex systems for **parallel execution** – preserve from modelling through to simulation
- Apply **concurrent** programming techniques: describe agents and their interactions, and **schedule intelligently** at runtime
- Use **scalable** means of **spatial interaction** – games technology



Cancer modelling: building on **cell-scale** models to enable in-silico science at the **tissue scale**



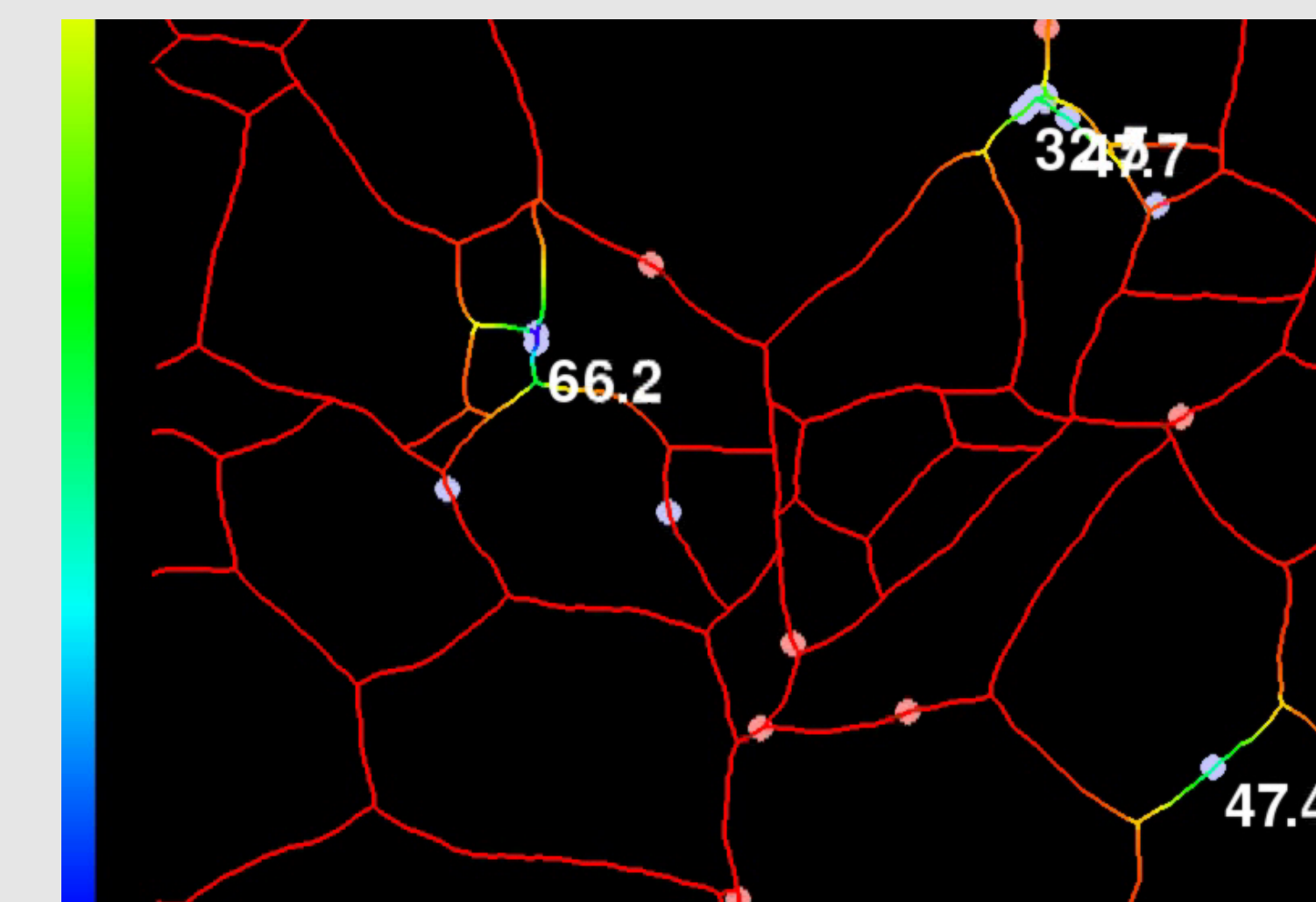
Process-oriented ABM of bird flocking: interactive, distributed simulation with distributed visualisation on Tromsø Display Wall



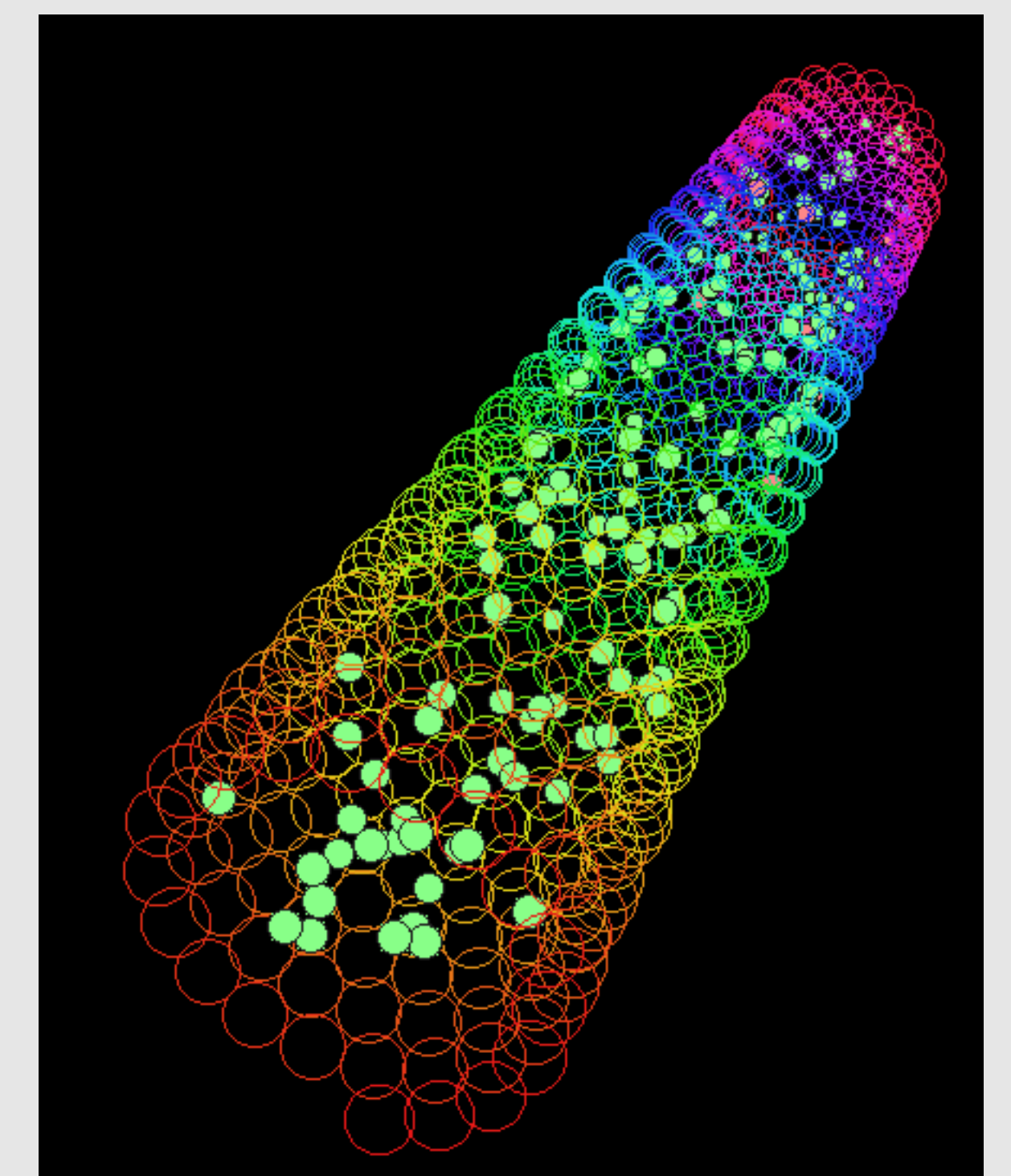
EPSRC 2008-present
Reusable engineering techniques for simulation as a scientific instrument – scalability, maintainability, trustworthiness

cosmos-research.org

Ongoing work using CoSMoS techniques:
Granuloma formation

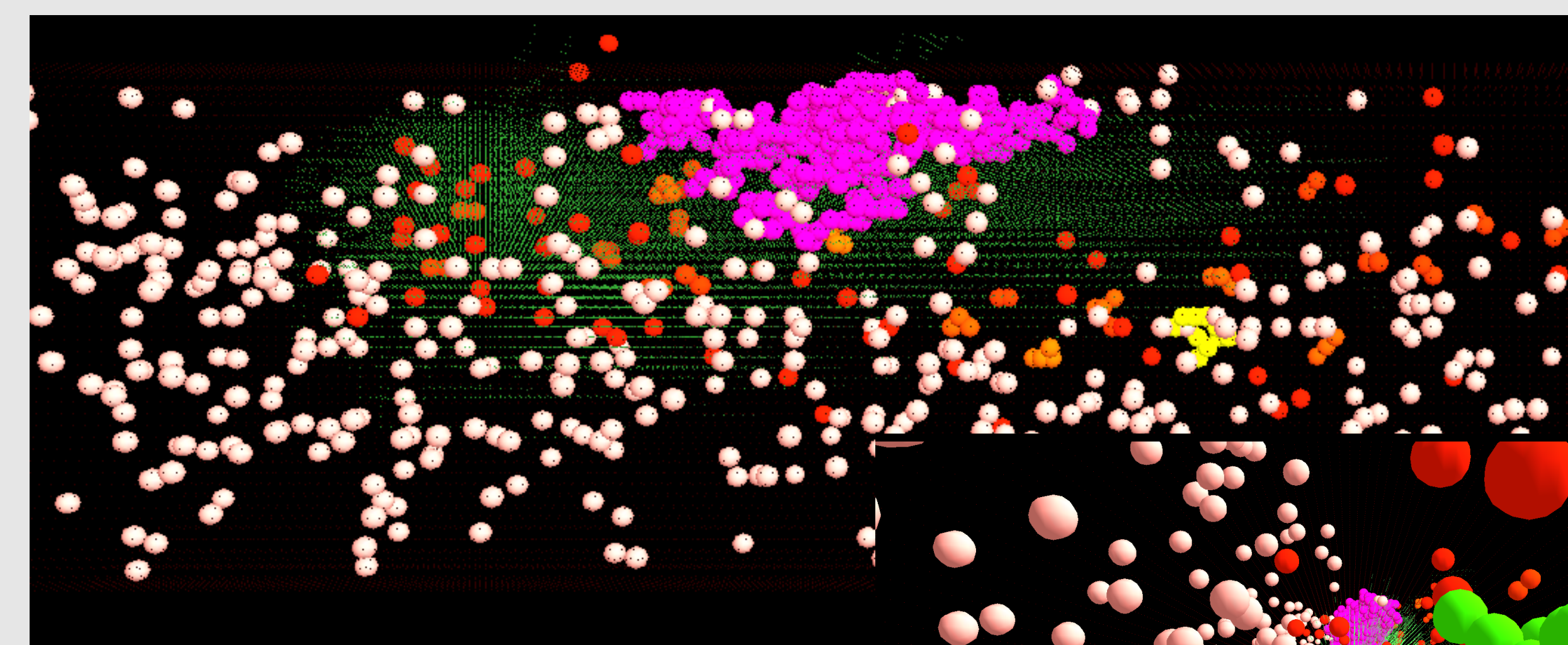
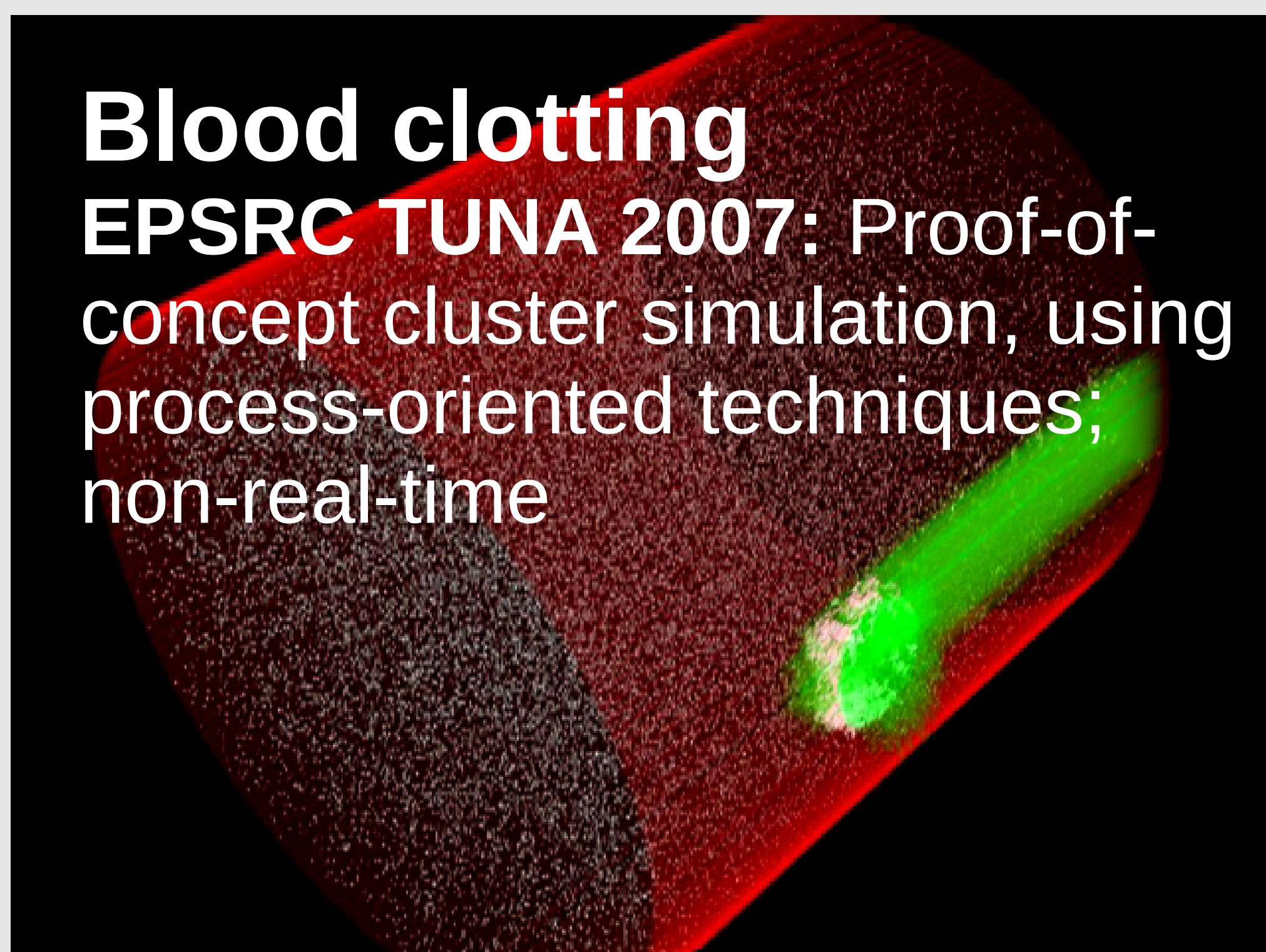


Lymphocyte migration

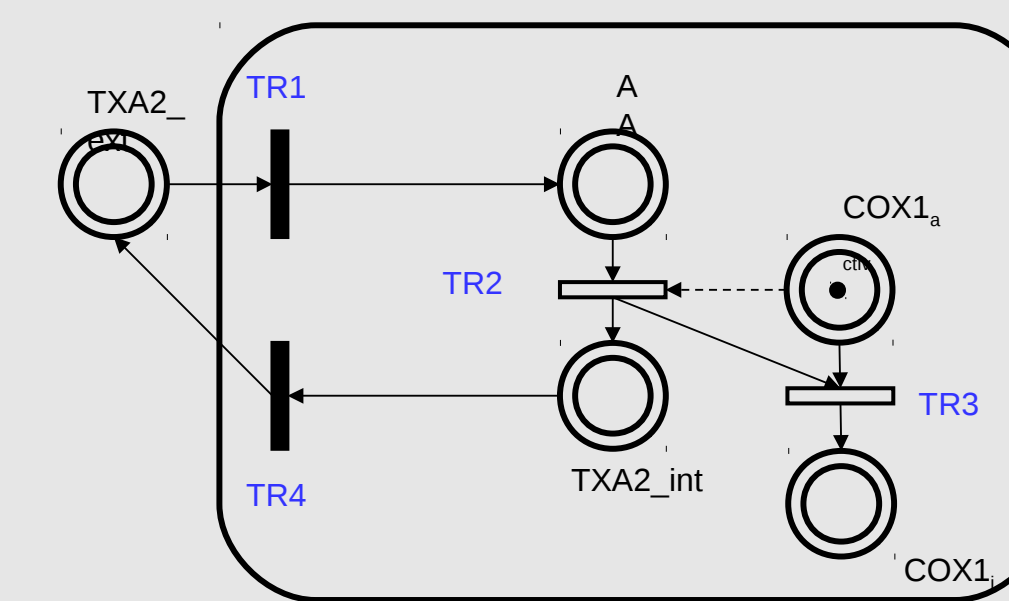
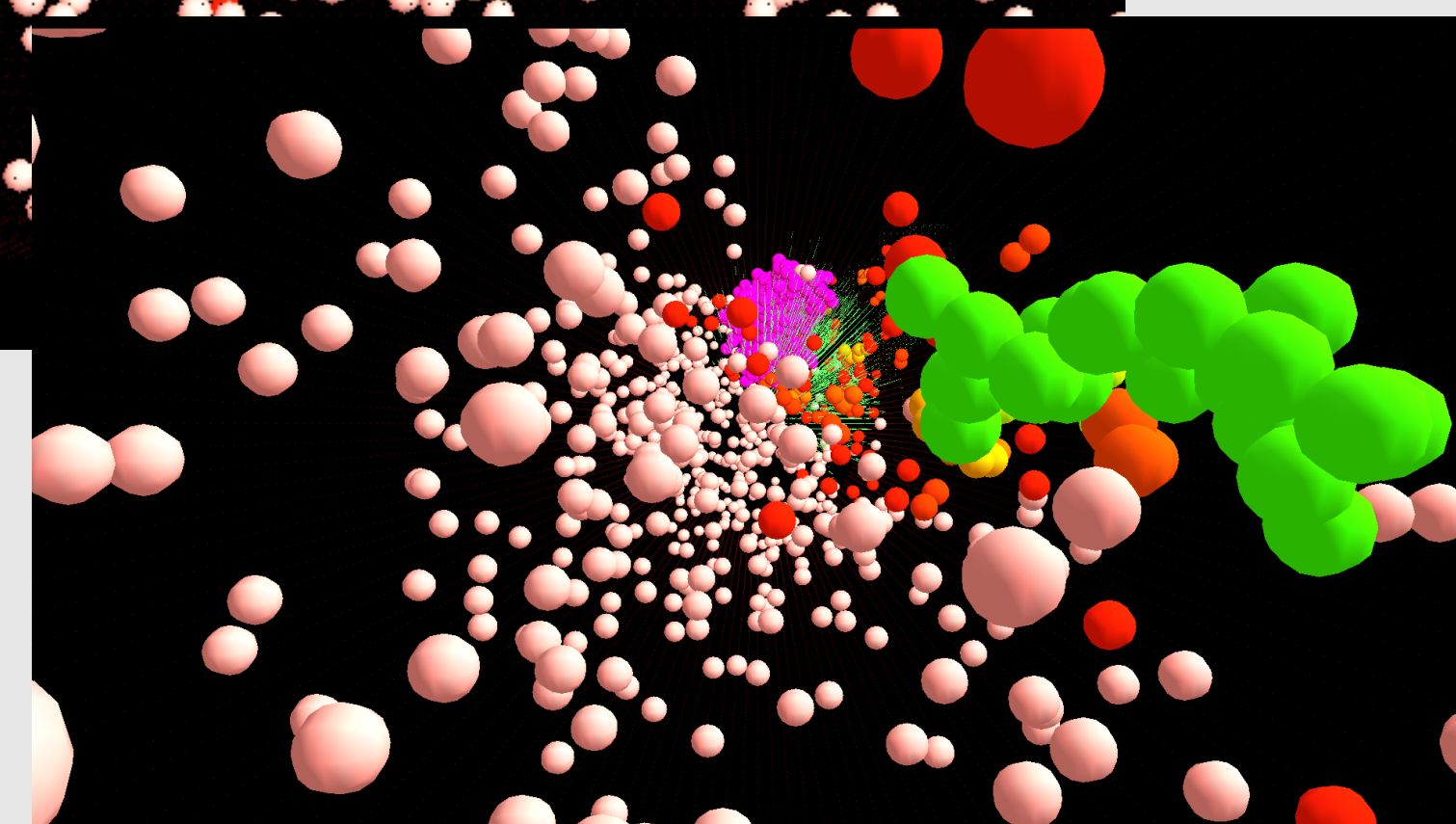


Blood clotting

EPSRC TUNA 2007: Proof-of-concept cluster simulation, using process-oriented techniques; non-real-time



2010: Interactive simulation on single multicore machine



Nuffield 2011:
Combine with existing equational models of platelet signalling to simulate effects of combinations of drugs

