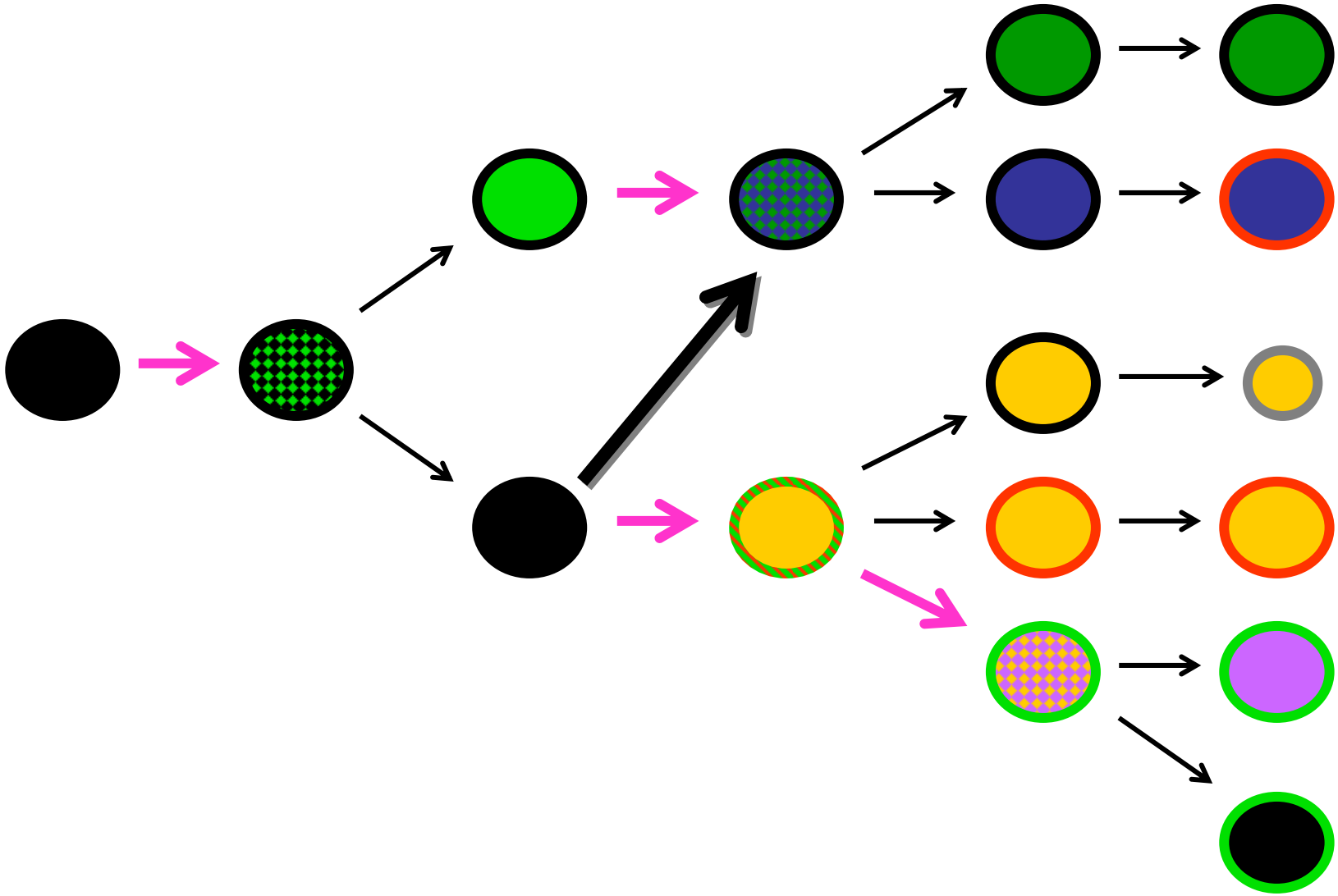
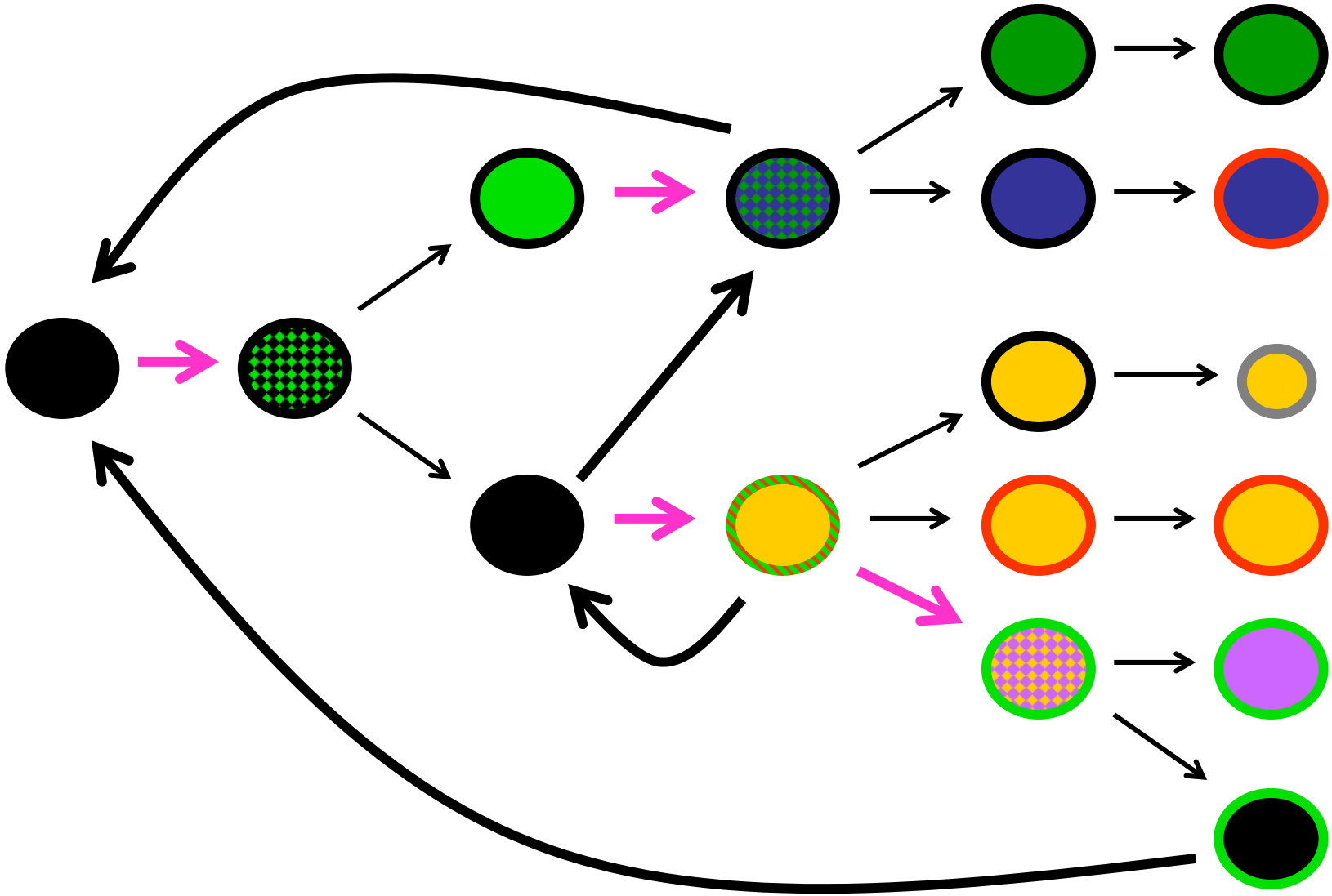
CELL team

- Mark d’Inverno, agent-based systems, formal modelling
- Jane Prophet, visual artist
- Neil These, liver pathologist, stem cell research
- Pete Ride, curator
- Rob Saunders, A-life programmer

background

- interdisciplinary project
- Investigate new experimental findings
- stem cell organisation and determination
- traditional view of cell determination
- Theise’s (and others) paradigm shift
- process-based research
  - no goals; money to exchange ideas
  - all come together first and then …





different outputs

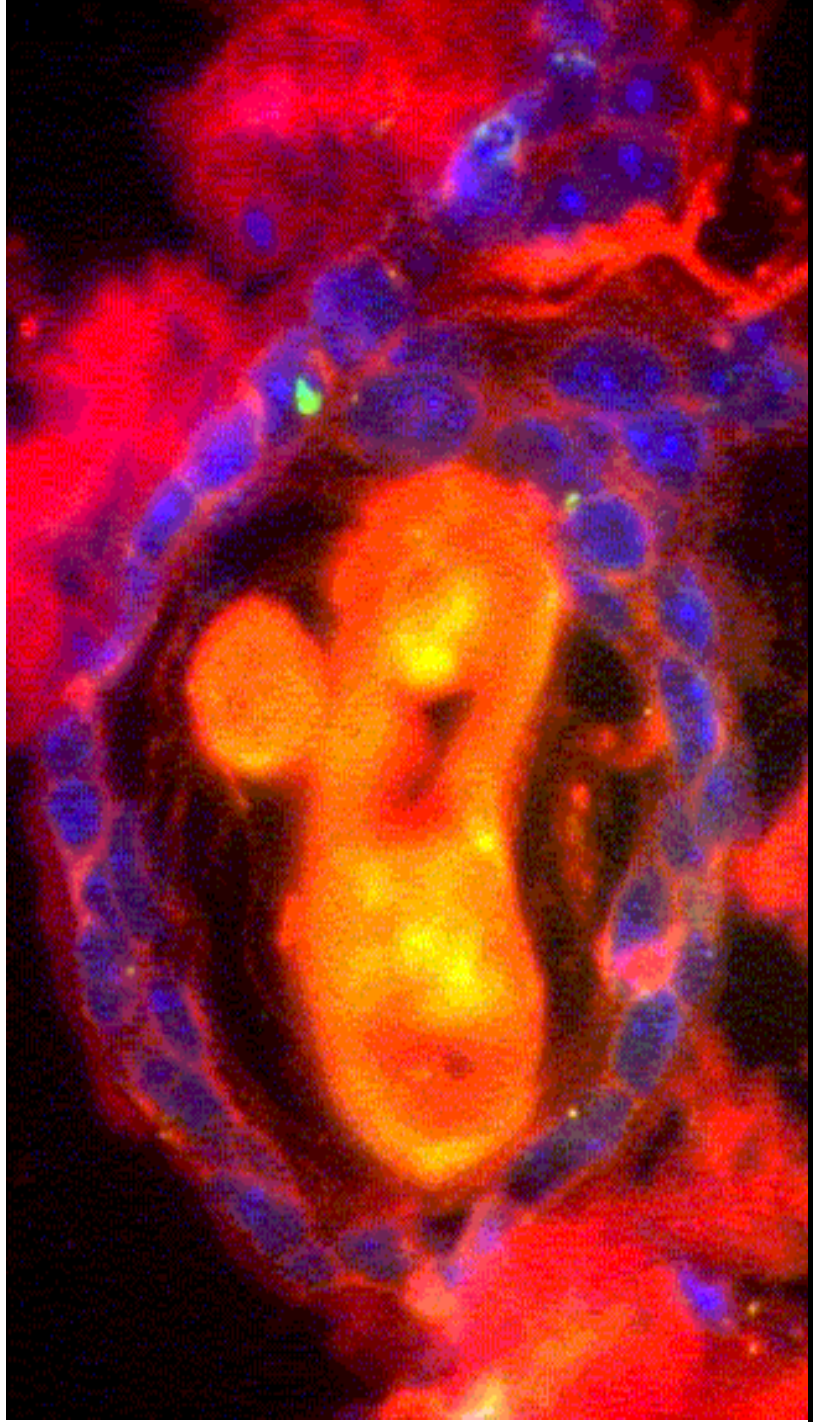
- art outputs and exhibitions
- research papers
  - medical, cs, mathematical biology, cross-disc
- mathematical model
  - express current and new theories
- agent-based simulation that’s strongly linked to model
  - functional programming language (erlang)
- new project to build a software tool
  - researchers, students, general public

- Funders include
  - Wellcome, SciArt, University of Westminster, SRIF

what would biologists like to get from informaticians?

- which biologists?
- how do they normally work with data?
- images as data

CELL
2004



“useful to compare data” Cristina Miceli

- Different representations?
  - Images
  - Write Things Down! Formal model: plain english
  - Mathematical: mathematical model
    - (Z, CSP)
  - Computational - erlang – concurrent functional programming language
    - “highly concurrent analyzable formal languages”
  - visualisations
  - dynamical (emergent)

Abstraction

Phototrealism

“we need to understand biological processes as processes” Luca Cardelli

- Do not just look at single components (in our case cells) in isolation
- Nor as snapshots (eg still images)
- Nor in 2-dimensions
- Need to understand how the sum of their interactions leads to system behaviour

“dynamic systems” Pierpaolo Degano

- Much wet laboratory work by its very nature makes it possible to monitor an entire dynamic system
- Need to understand how global properties of systems can be maintained in dynamical systems
- How can a system recover after massive perturbation (eg Parkinson’s Disease)
- Need to understand how systems behaviour develops (emerges) over time as a result of the interactions between all the processes and environment

Interdisciplinary collaboration

- Being open to new ideas
- Involved in order to gain new insights: necessary to be open to changing the way you think
- Building trust
- Common conceptual framework
- Agreed shared goals and outputs and individual goals and outputs
- Peer review in every discipline

pubs

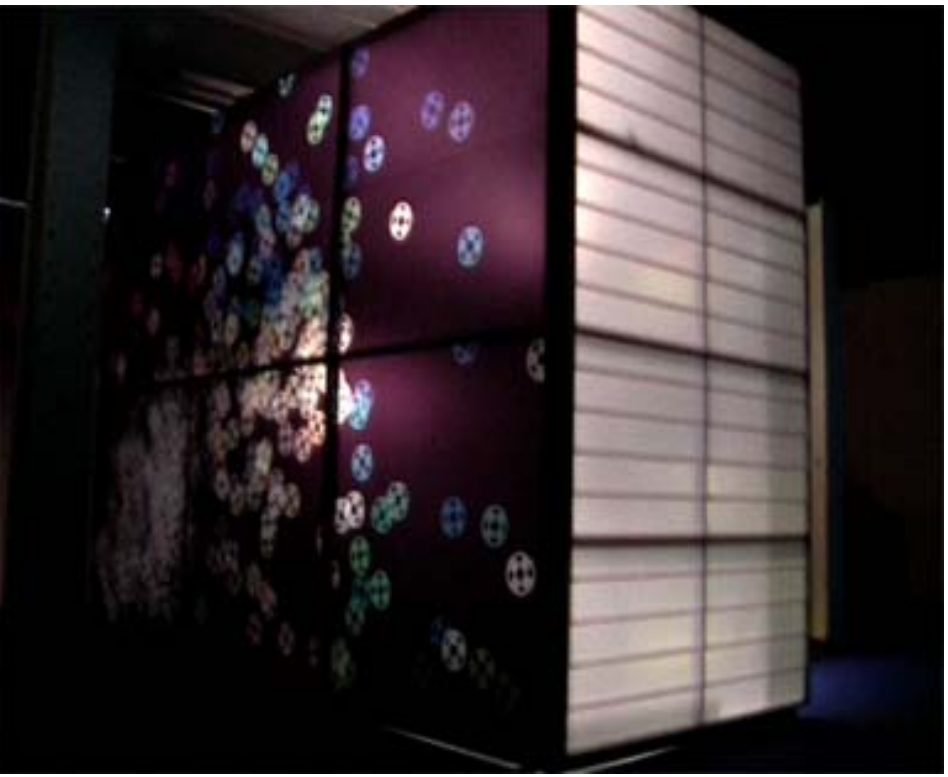
Prophet and d'Inverno, Transdisciplinary research, in Aesthetic Computing (Fishwick ed), MIT Press.

d'Inverno and Theise, A complexity primer for the stem cell biologist, Tissue Stem Cells, Biology and Applications, (Loeffer ed) Marcel Dekker.

Theise and d'Inverno, Understanding Stem Cell Lineages as Complex Adaptive Systems, Blood, Cells an Molecules, 13(2), 2004.

d'Inverno and Luck, Understanding Agent Systems, 2nd edition, Springer, 2004.

Staining Space



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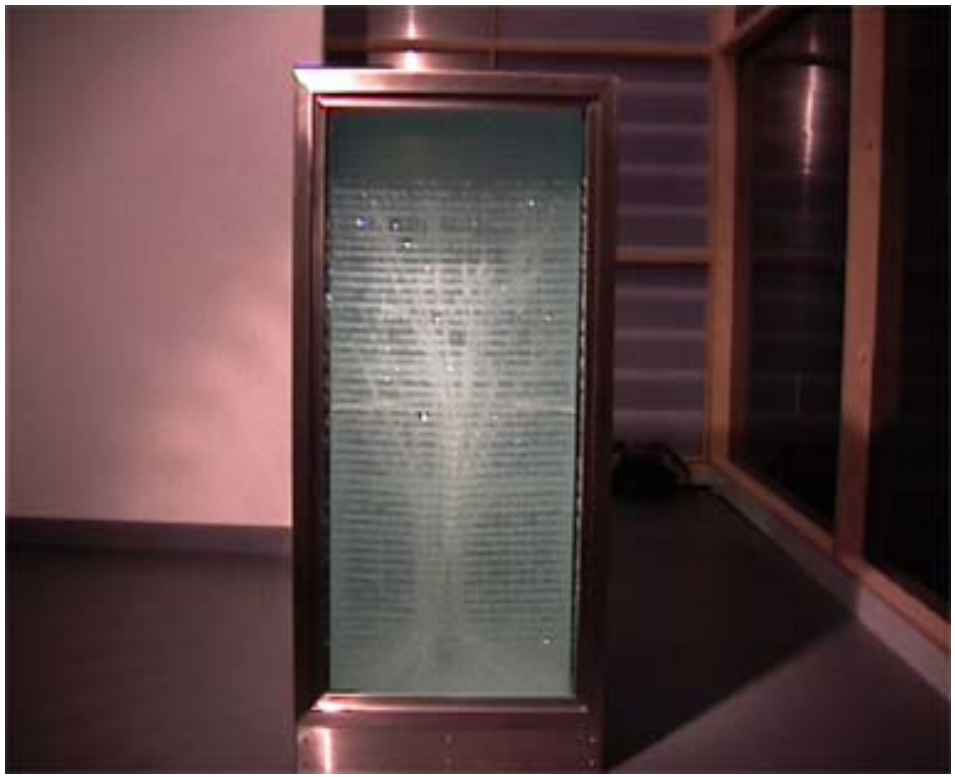

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