UNIVERSITY OF OXFORD

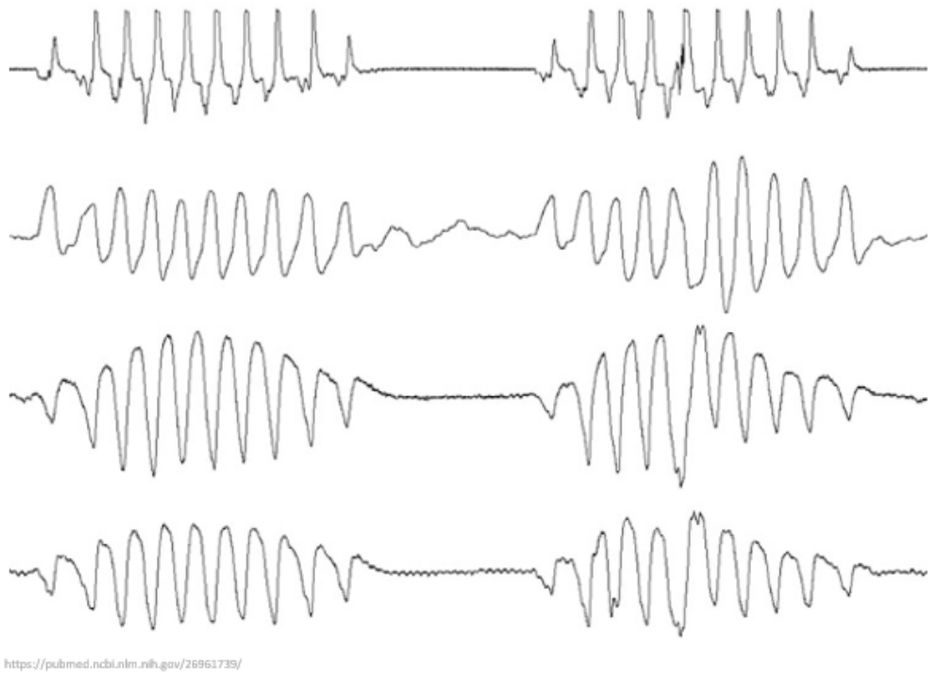
B5.5 Further Mathematical Biology

Ruth Baker - ruth.baker@maths.ox.ac.uk

Delay differential equations

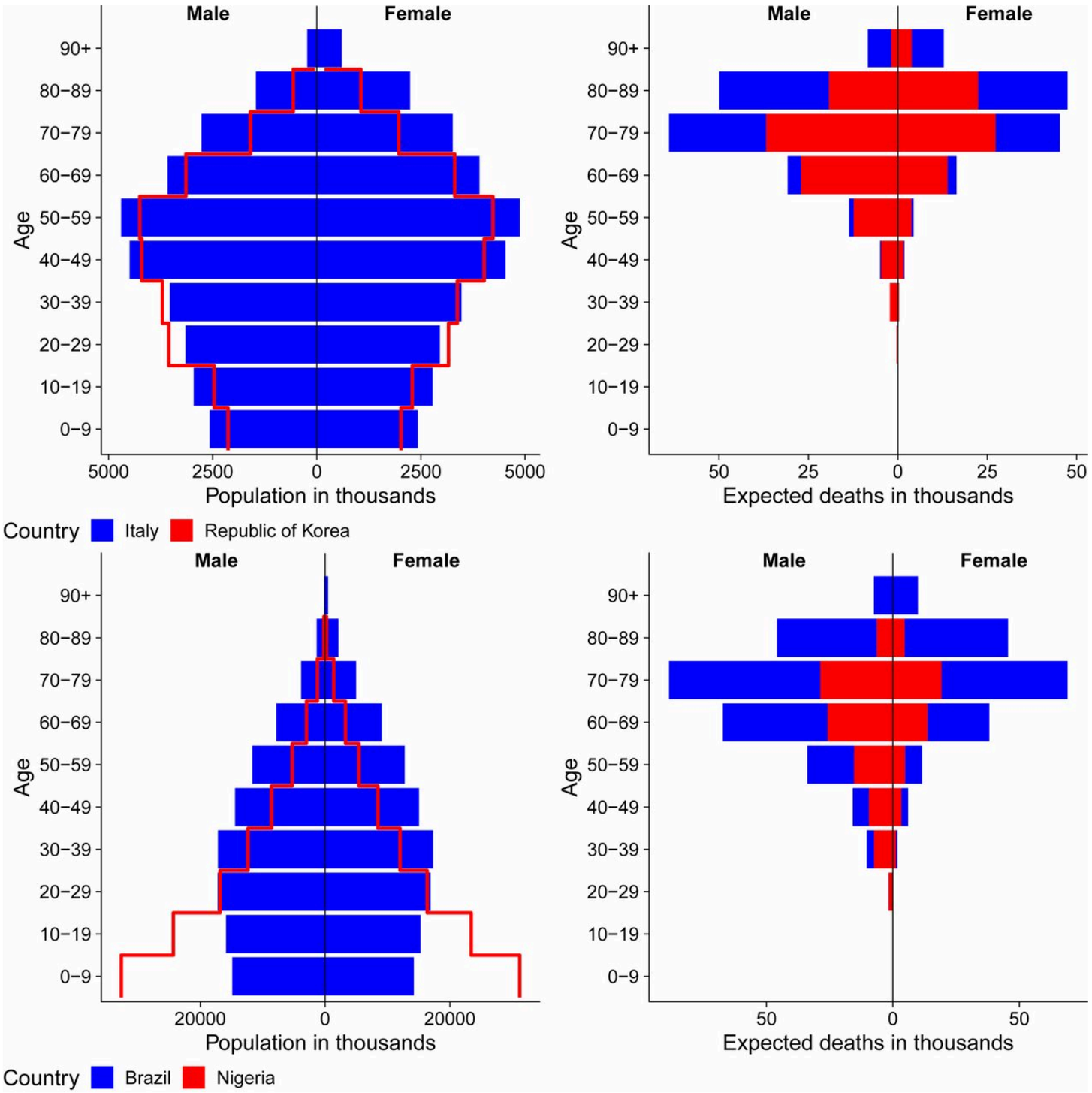
- Why, and how to, include delays into differential equation models of biological systems.

  - Cheyne-Stokes breathing - cyclical episodes of apnea and hyperventilation.



- https://www.youtube.com/watch?v=DQB9rB1_L9w

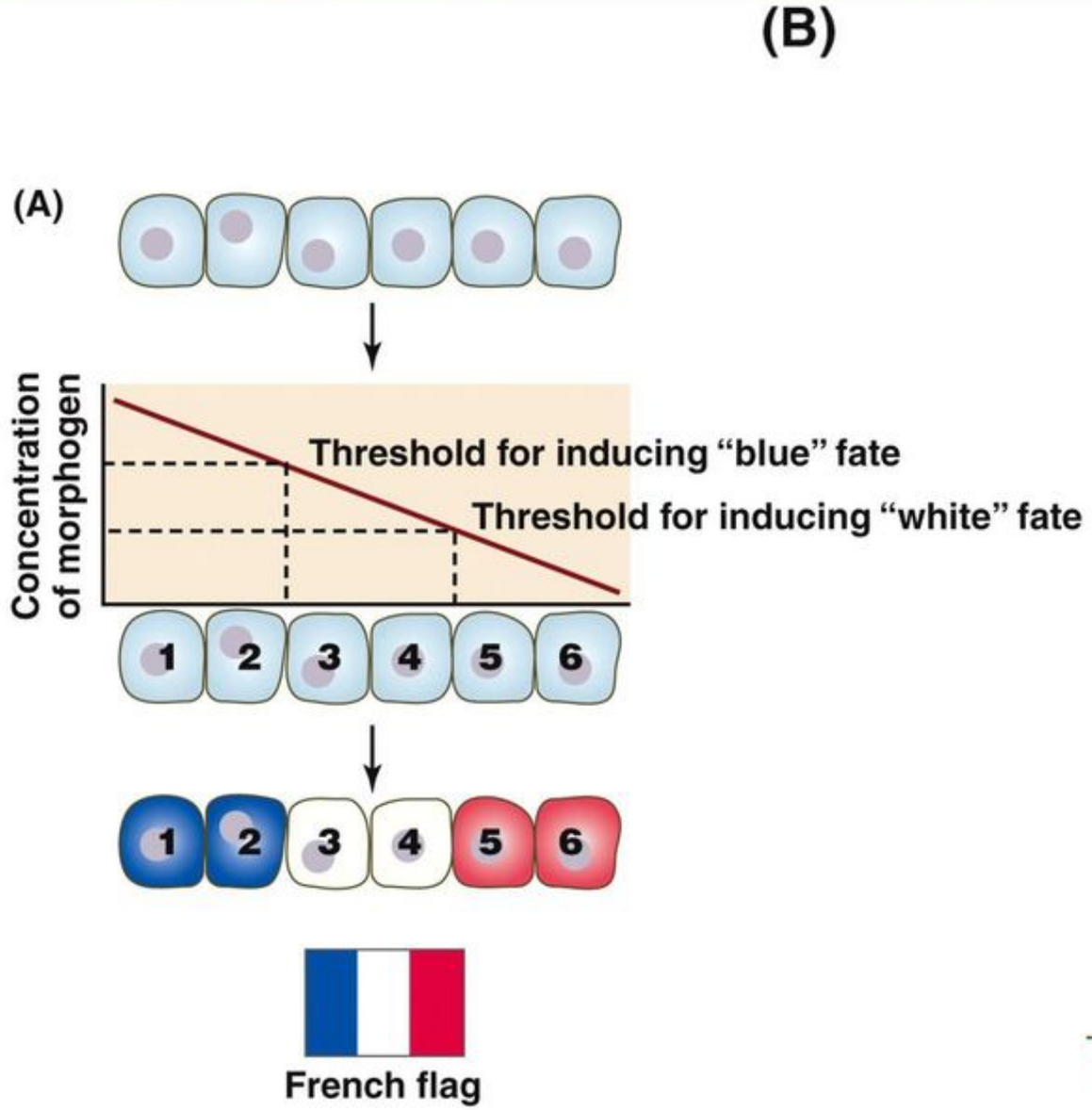
Age-structured models



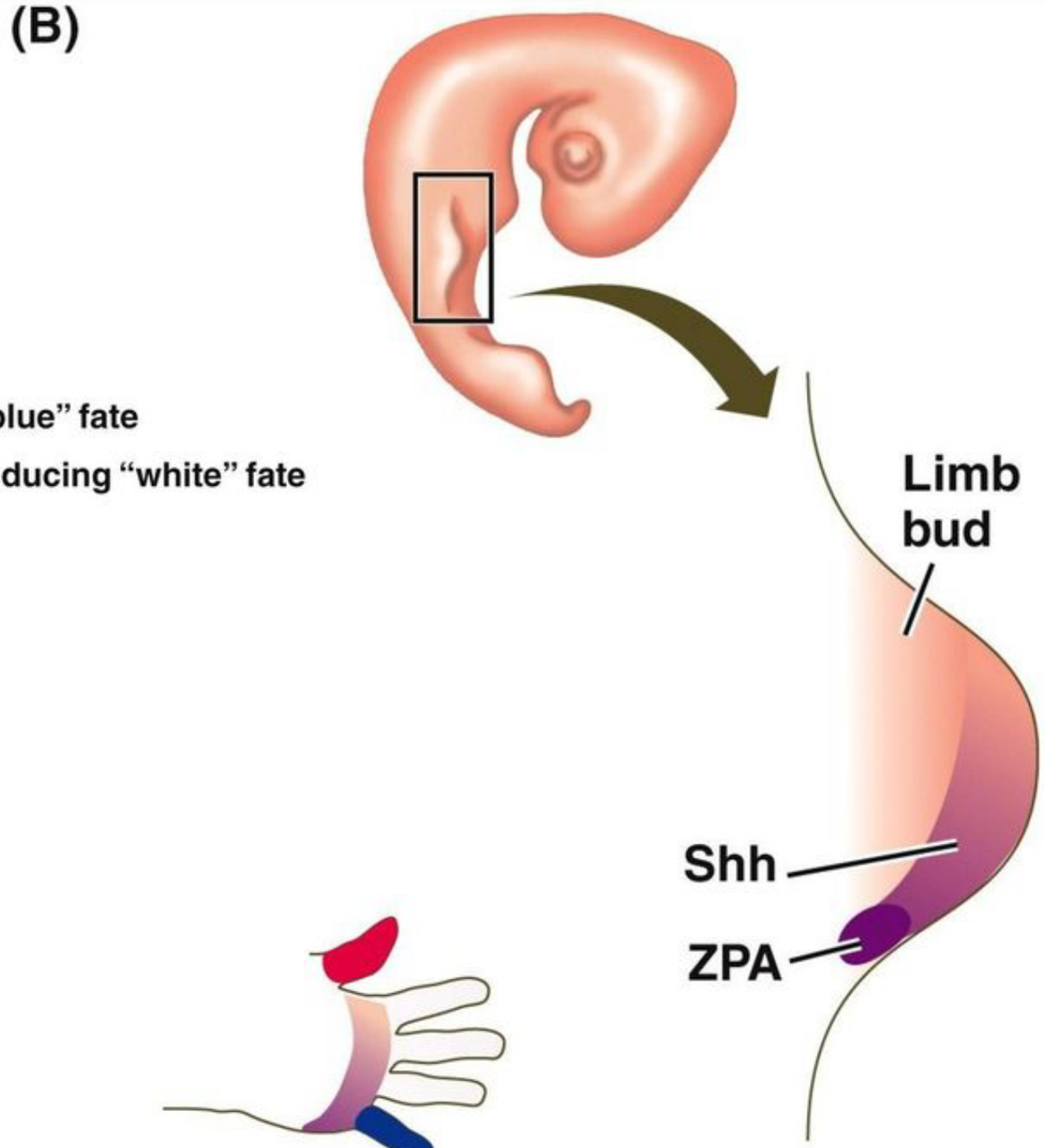
Early data from COVID-19

Morphogen gradients

The French Flag Model

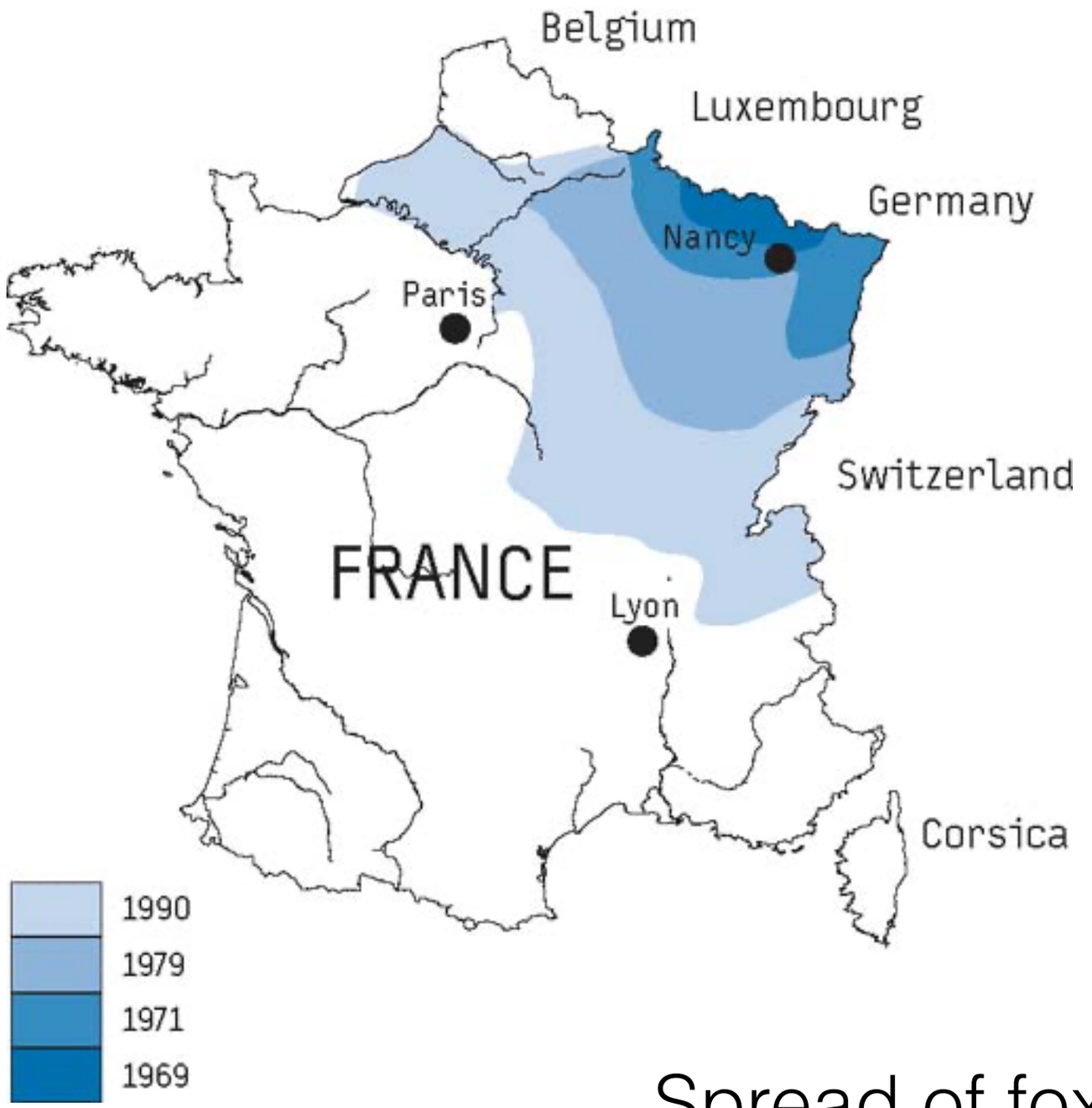


PRINCIPLES OF LIFE, **Figure 14.12 (Part 1)**
© 2012 Sinauer Associates, Inc.



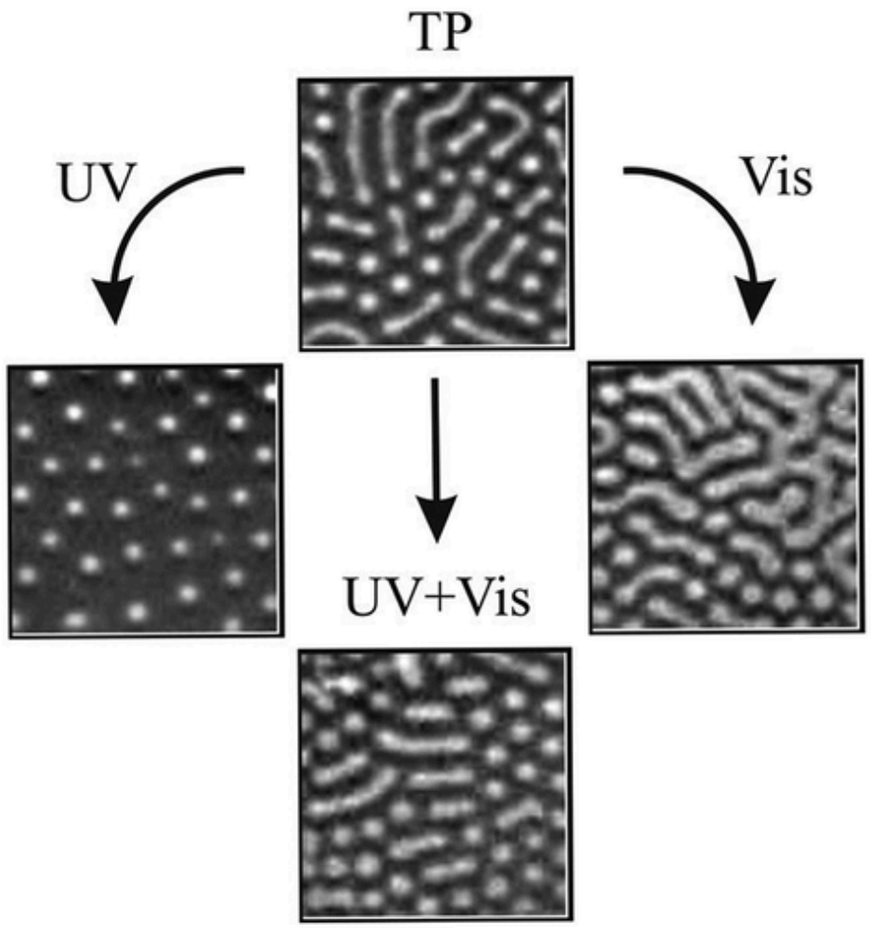
PRINCIPLES OF LIFE, **Figure 14.12 (Part 2)**
© 2012 Sinauer Associates, Inc.

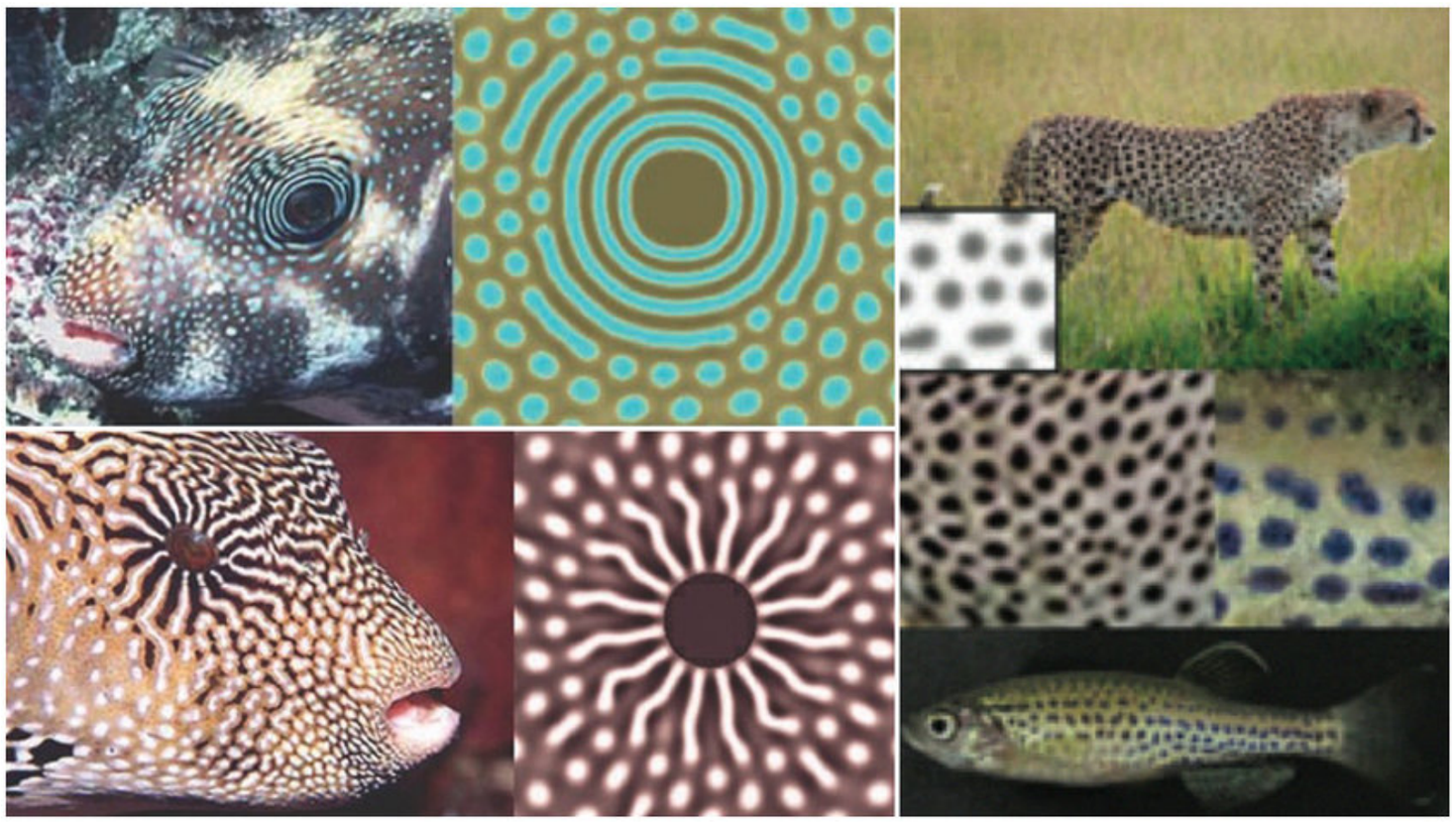
Travelling waves



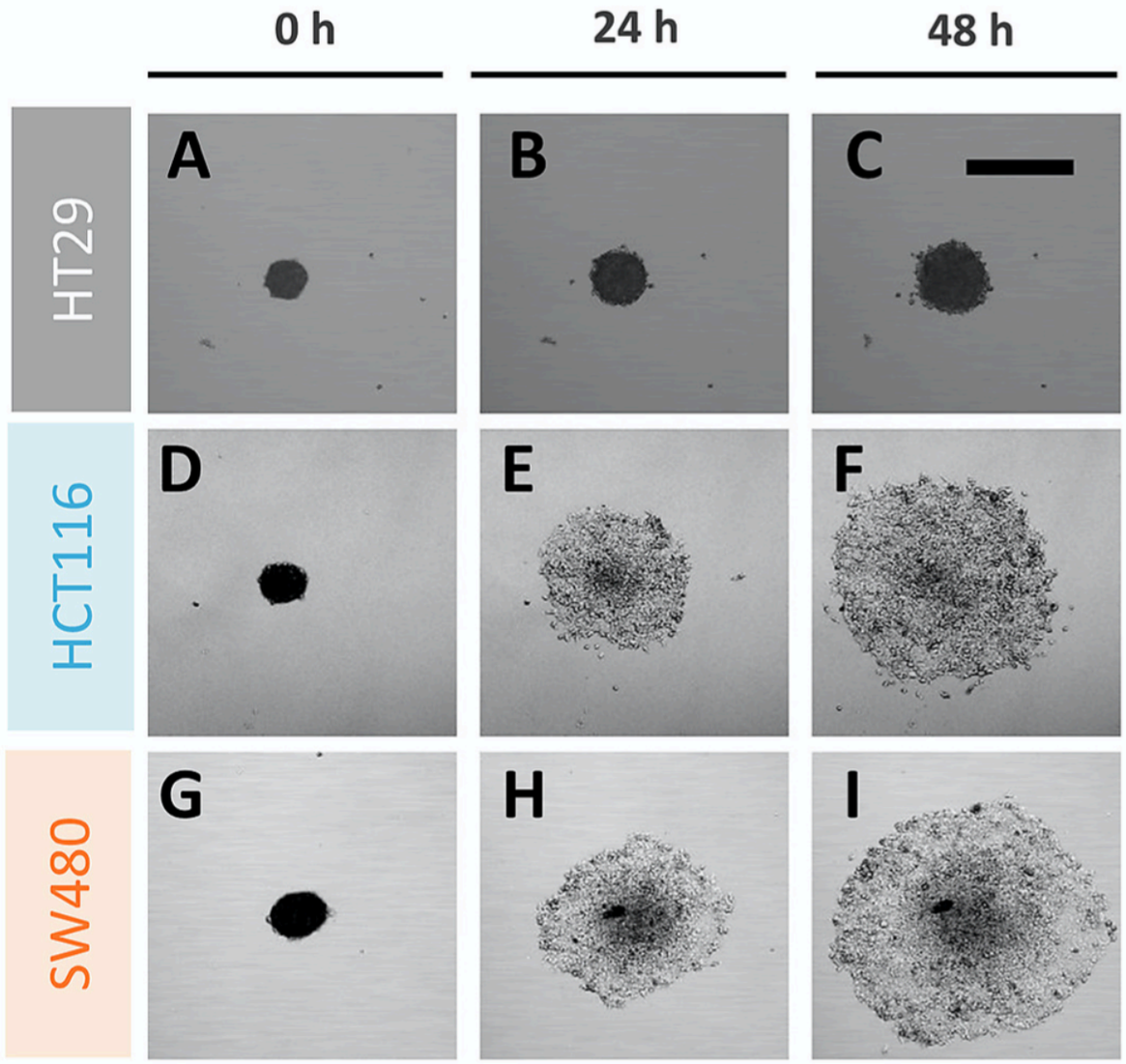
Spread of fox rabies in France

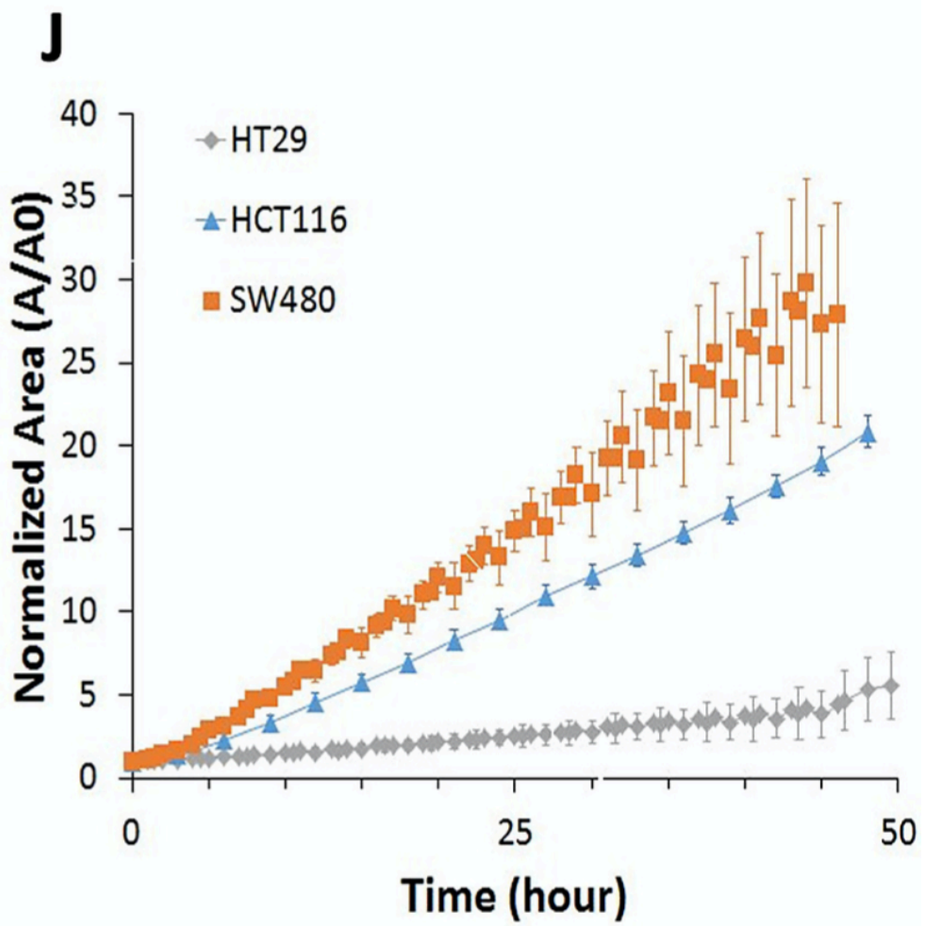
Pattern formation





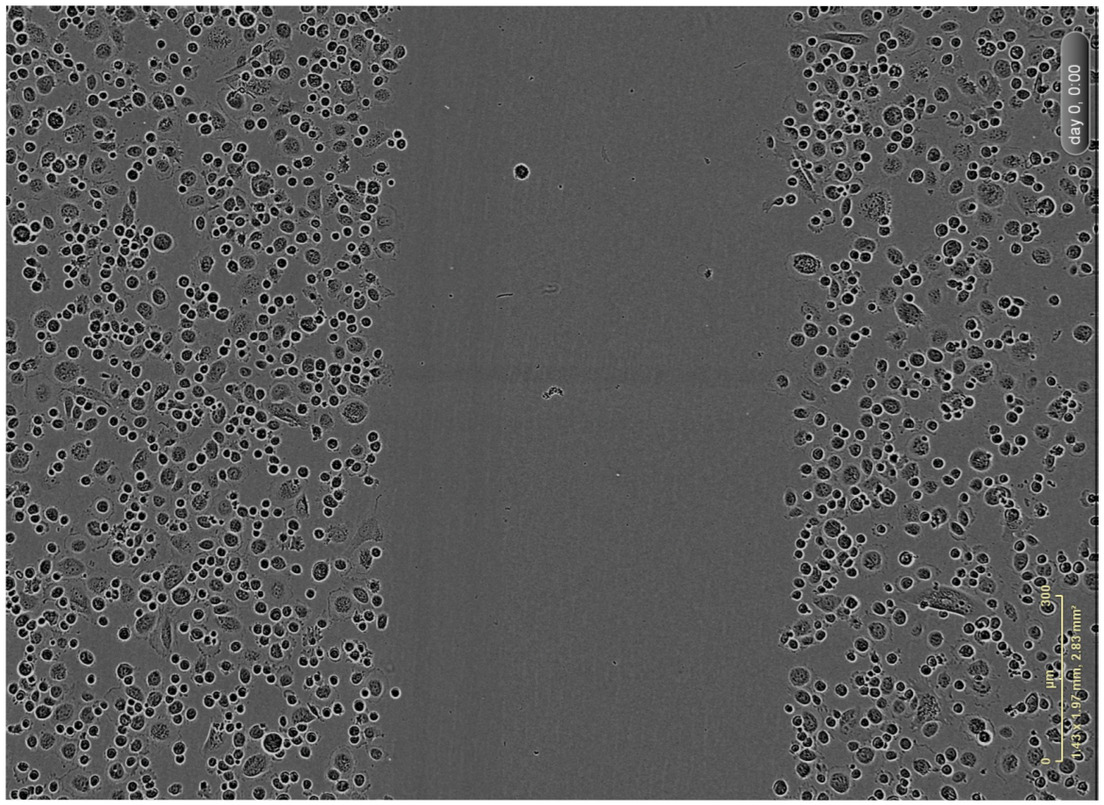
Moving boundary problems

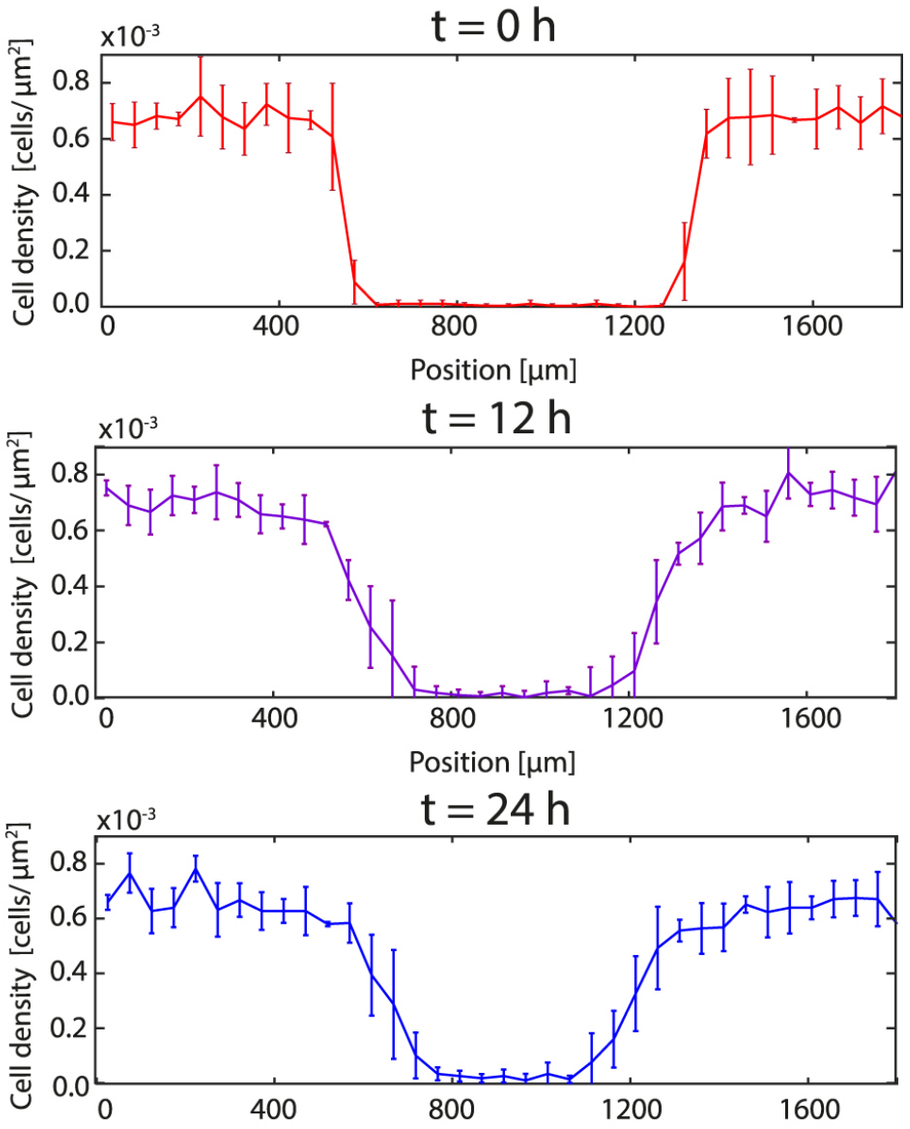




Growth of multicellular spheroids

Discrete-to-continuum





Outline

- Delay differential equation models [Sheet 1]
- Age-structured models [Sheet 2]
- Introduction to spatial variation [Sheet 2]
- Travelling waves [Sheet 3]
- Pattern formation [Sheet 4]
- Moving boundary problems [Sheet 5]
- Discrete to continuum modelling [Sheet 6]