The Age of Computers

1950s: John Von Neuman designs the first (?) electronic computer, ENIAC, applies it to weather forecasting

Imagines uses in weather control, geo-engineering, etc.







Image: http://maths.ucd.ie/~plynch/Publications/ENIAC-BAMS-08.pdf



PHONIAC



Moore's Law



Supercomputers







Where are these supercomputers?



Reminder: How the models work



More resolution...



http://onlinelibrary.wiley.com/doi/10.1111/j.1740-9713.2010.00403.x/abstract

IPCC Model evolution



Can Moore's Law continue forever?



Paper Folding

After 4 folds, 1 cm thick How thick after 33 folds?



Understanding Exponential Growth

Peak Speed of fastest supercomputer



Understanding Exponential Growth

Peak Speed of fastest supercomputer



Understanding Exponential Growth

Peak Speed of fastest supercomputer



Why does this graph have this shape?



http://novel-infectious-diseases.blogspot.ca/2014/10/comparing-who-and-cdc-projections-of.html



Lang et al (2014). The influence of societal individualism on a century of tobacco use: modelling the prevalence of smoking, 1–20. Dynamical Systems; Physics and Society.

Population Growth and Projections



Multi-loop systems







About that Ebola Projection...



Dynamic Behaviour Over Time



www.futuretimeline.net

1) Some curves that look exponential are not!

2) Exponential growth cannot continue forever

3) Predicting the peak of a growth curve is really hard

(be suspicious of any precise predictions)

Key ideas

Finite planet has a "carrying capacity"

Growth of Population x ecological footprint will exceed it This happened sometime in the 1980s Reduction is inevitable; can be managed or can be collapse

There are limits on stocks...

E.g. resources such as oil, coal, scarce minerals E.g. pollution sinks, such as CO2 in the atmosphere (In the past, we've been good at finding substitutions...)

...but the important limits are on flows

E.g. Rate at which we can grow food, recycle waste, etc.E.g. Rate at which we can transition to alternative technologiesHence, population can overshoot carrying capacity

People often deny a limit has been reached until after a collapse

E.g. Dotcom "bubble"; banking crisis of 2007;

E.g. Economic inequality? Climate change?

Planetary Boundaries

