

# Is Technology the Only Driver of Change?

*Pre-industrial England as an example of systemic invention*

**Talk to Global Business Network, London  
18 May 2000**

**Barbara Heinzen PhD**

# Outline

**I. Opening question**

**II. Origins of the industrial curve**

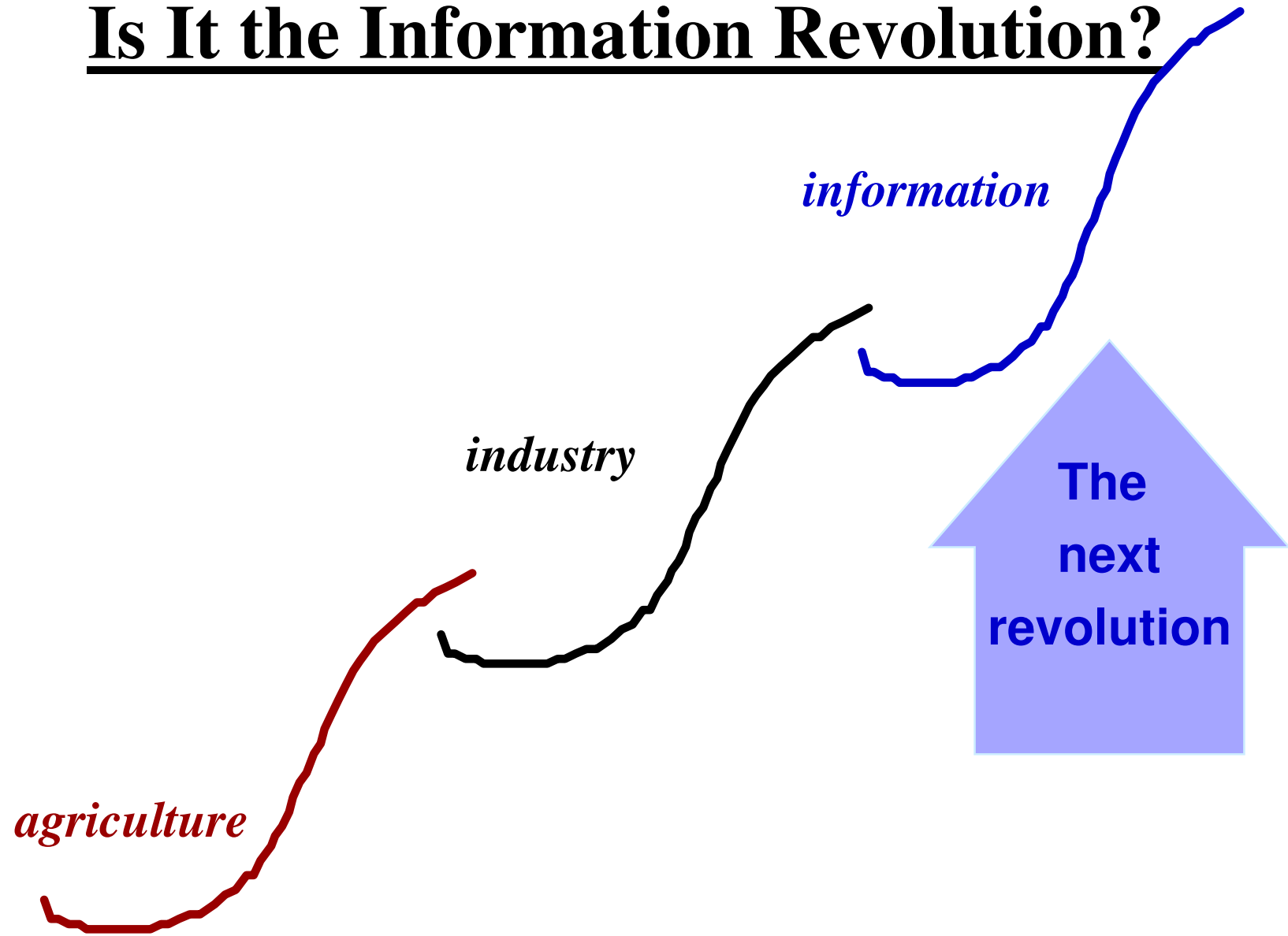
*Lessons of English history*

**III. What are the analogies?**

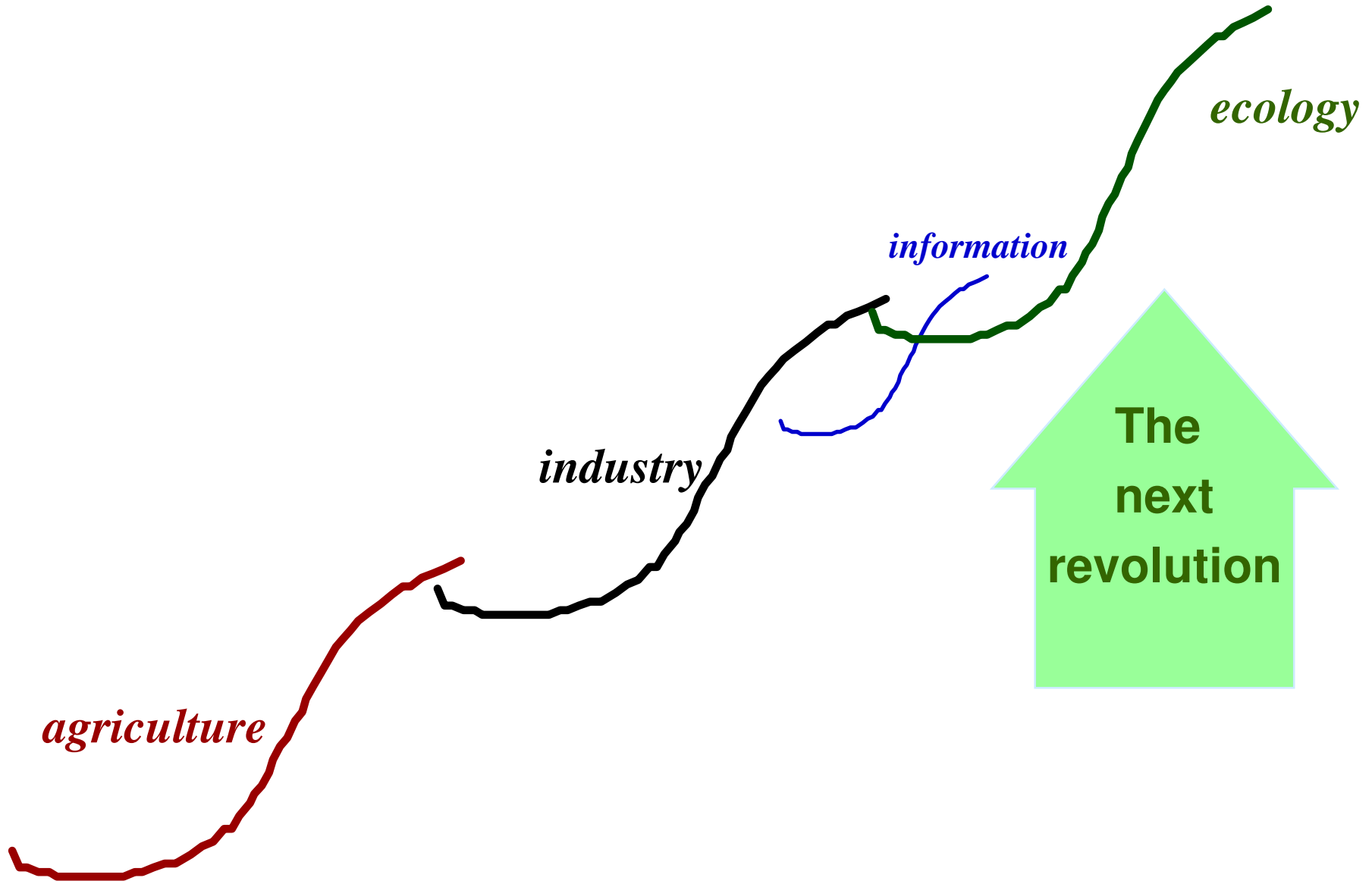
# I. Opening Question

What is the “Third Curve”?

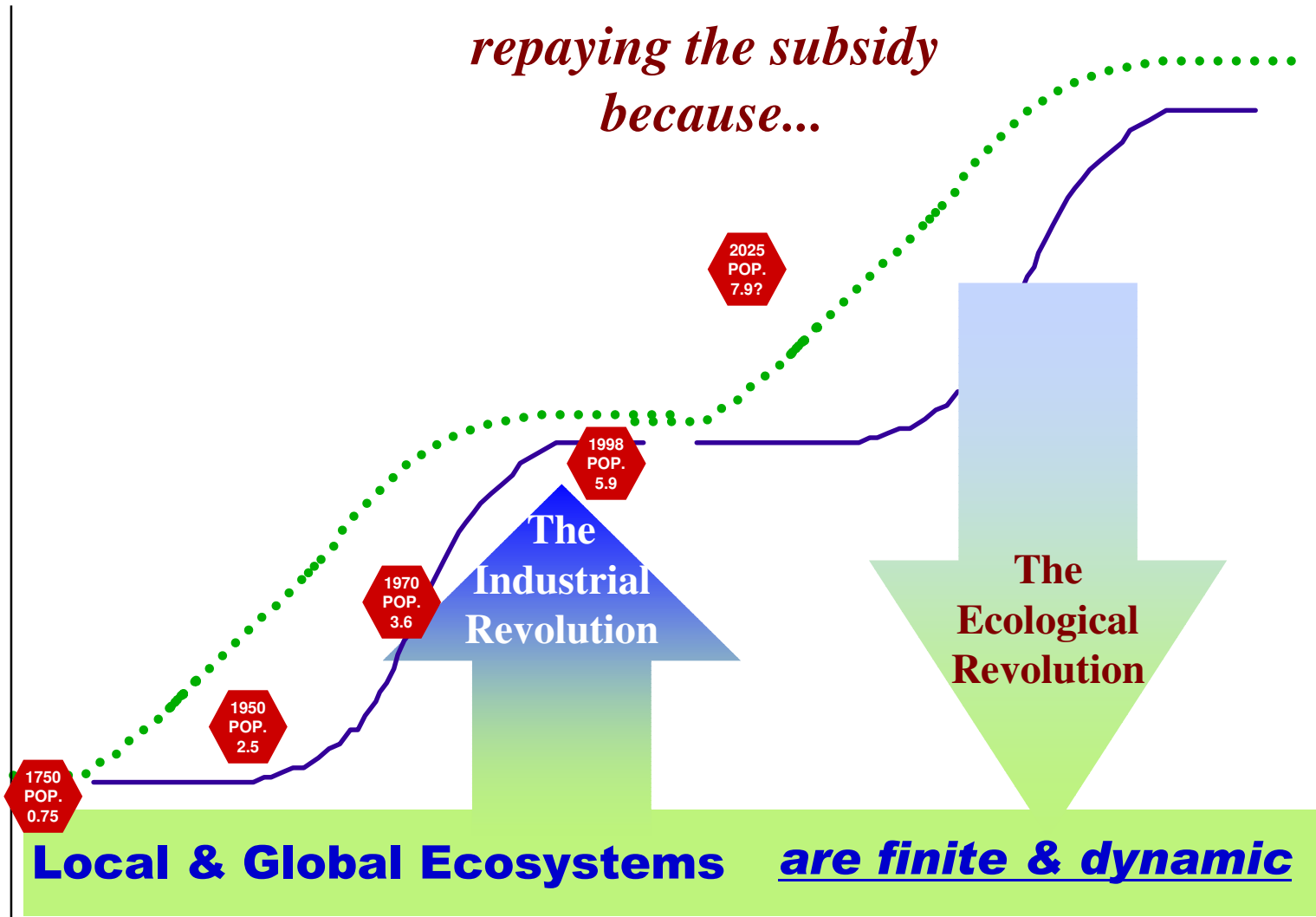
# Is It the Information Revolution?



# Is It the Ecological Revolution?

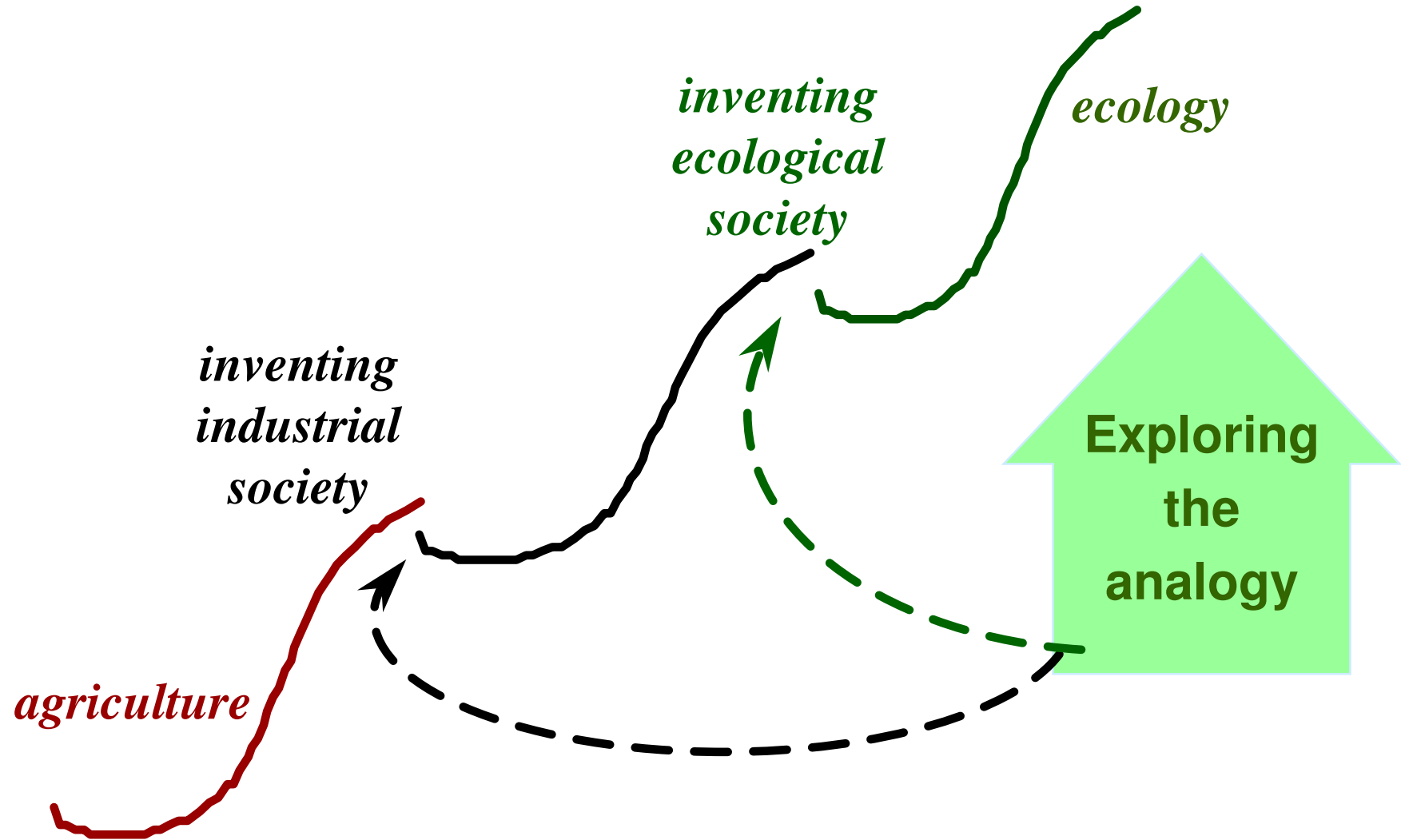


# Will Ecological Change = Industrial Change?



1750 POP. 0.75bn POP. *global population, in billions*

# What Are the Parallels?



# **II. Inventing Industrial Societies**

## *The Example of English History*

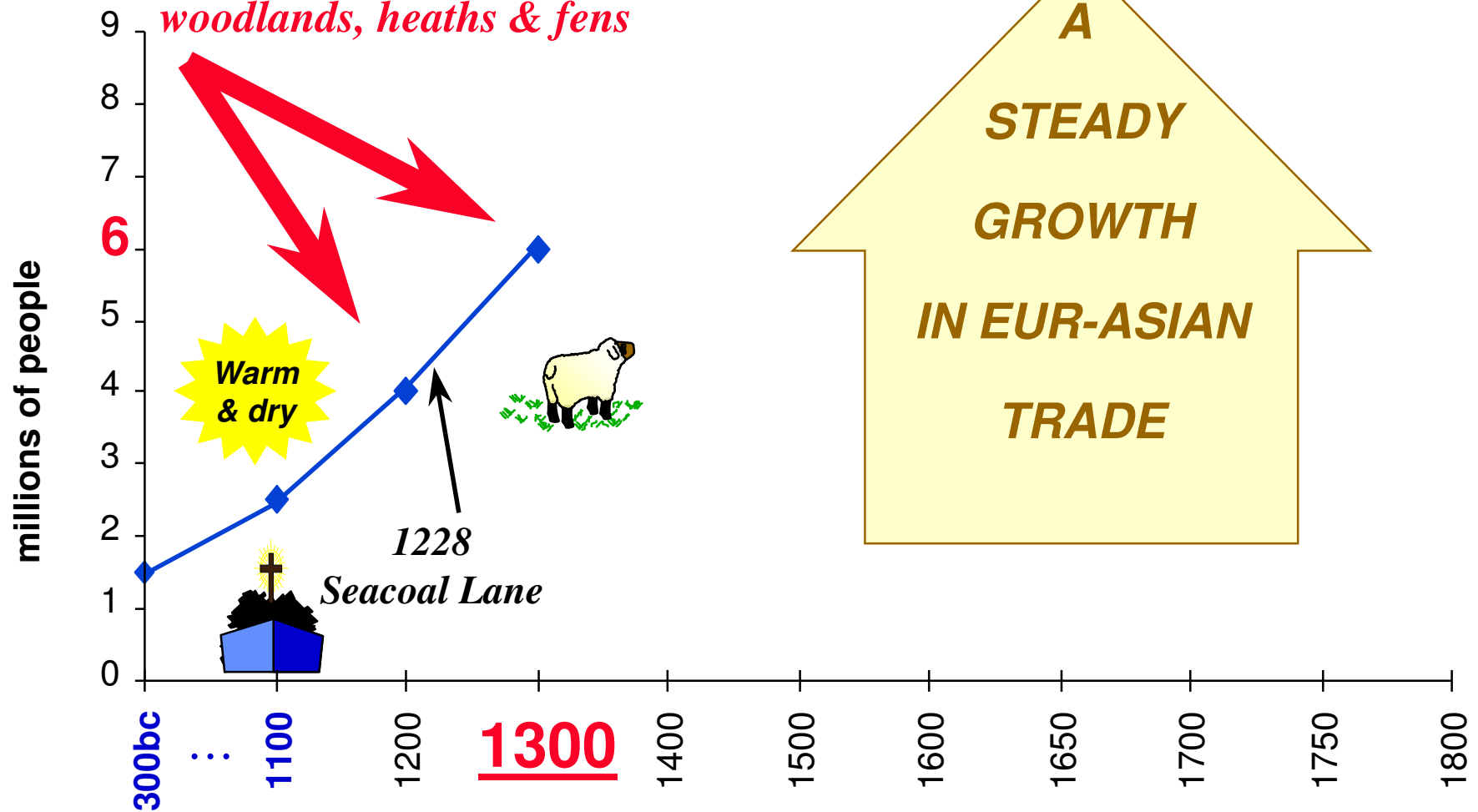
- Necessity
- Disease
- Learning & engagement
- Where technology fits in



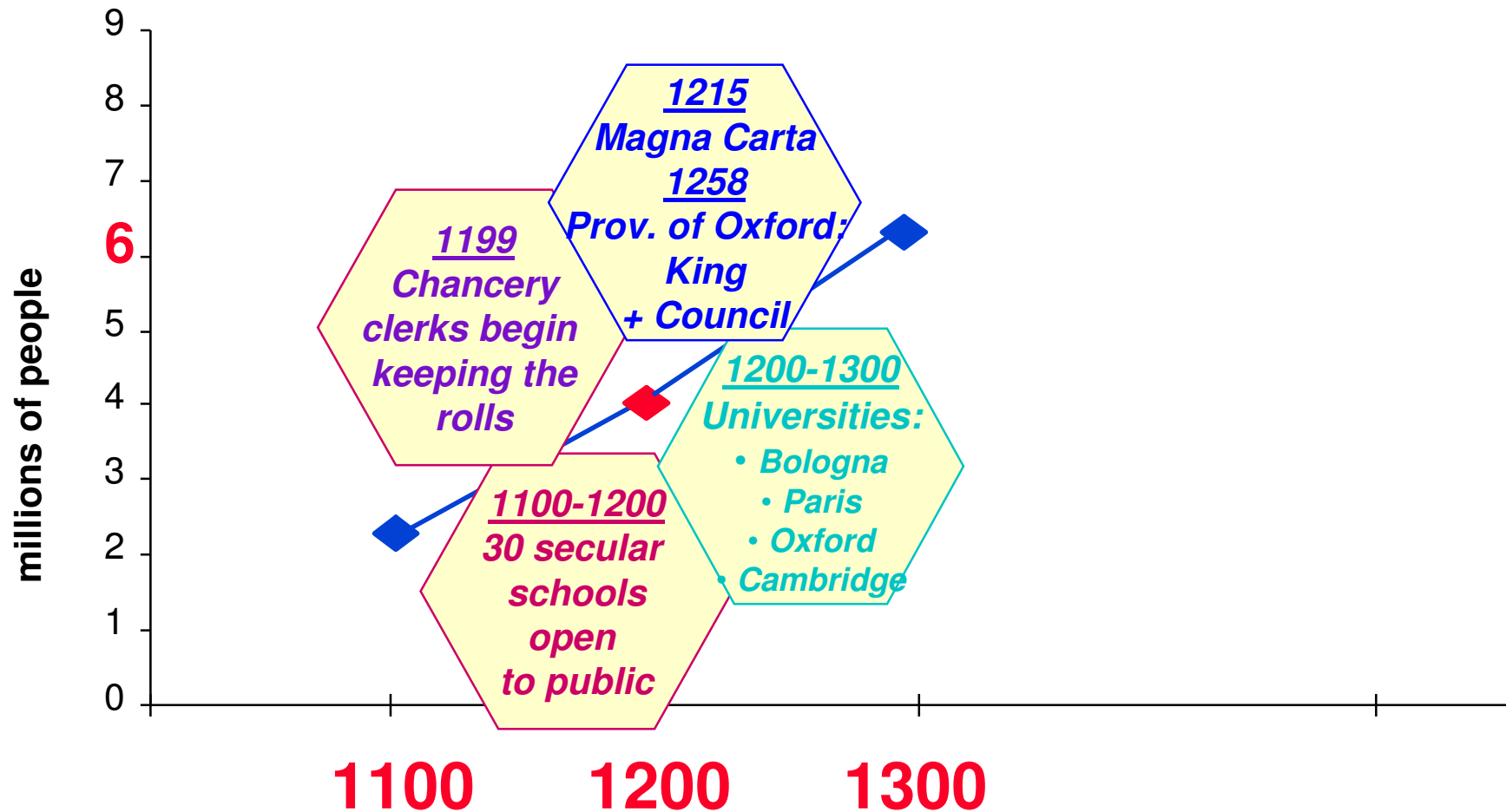
# ***Necessity***

# An Age of Expansion & Innovation

*Expanding colonisation of woodlands, heaths & fens*



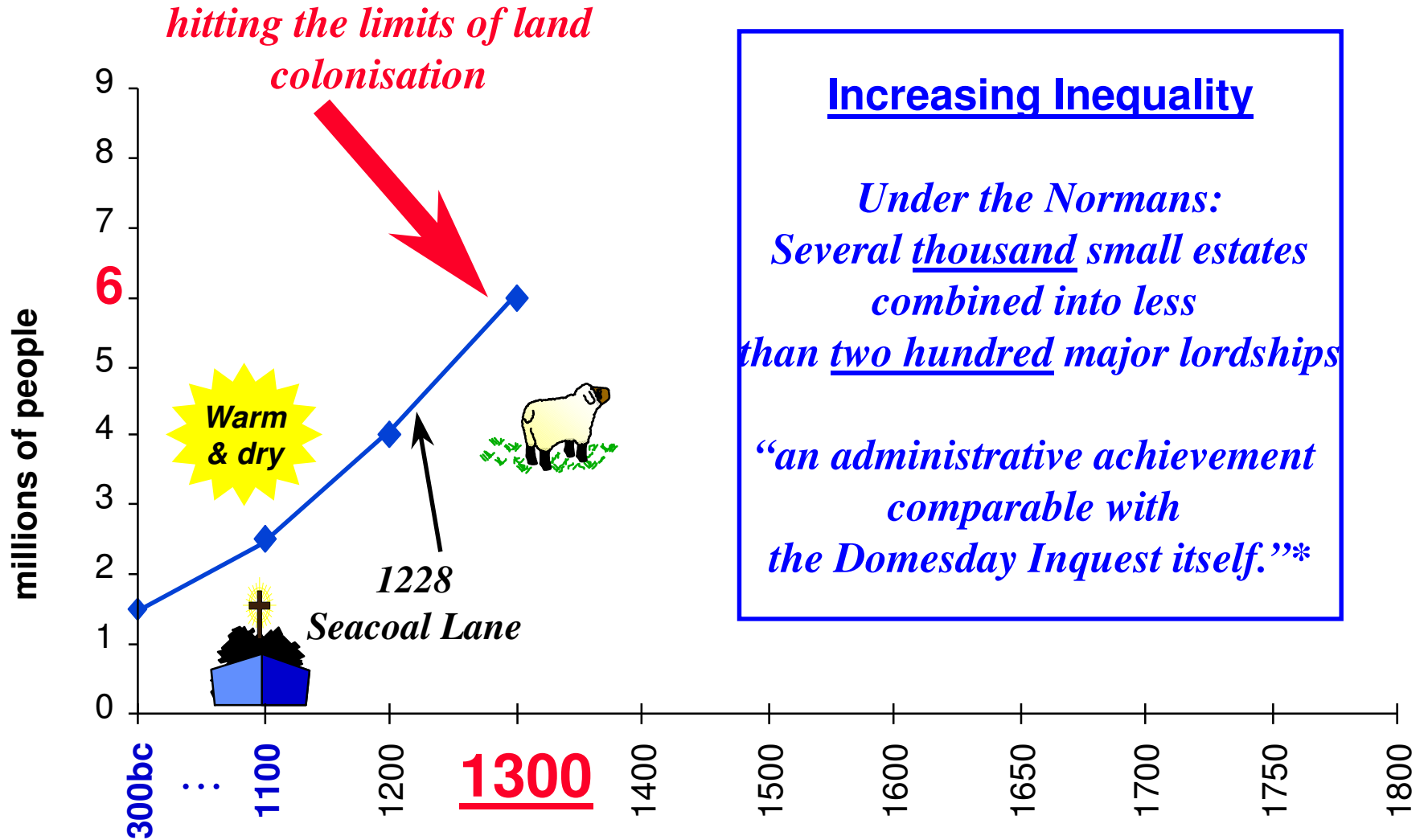
# Educational & Political Experiments



# Two Prosperous, Successful Centuries

- *Growing trade*
- *Growing population*
- *Expanding croplands*
- *Growing political sophistication*

# Entering the Malthusian Trap



\* Sir Frank Stenton, quoted in Christopher Brooke, *From Alfred to Henry III 871-1272*. W.W. Norton, New York 1969 printing, p.107.

# Growing Peasant Hardship

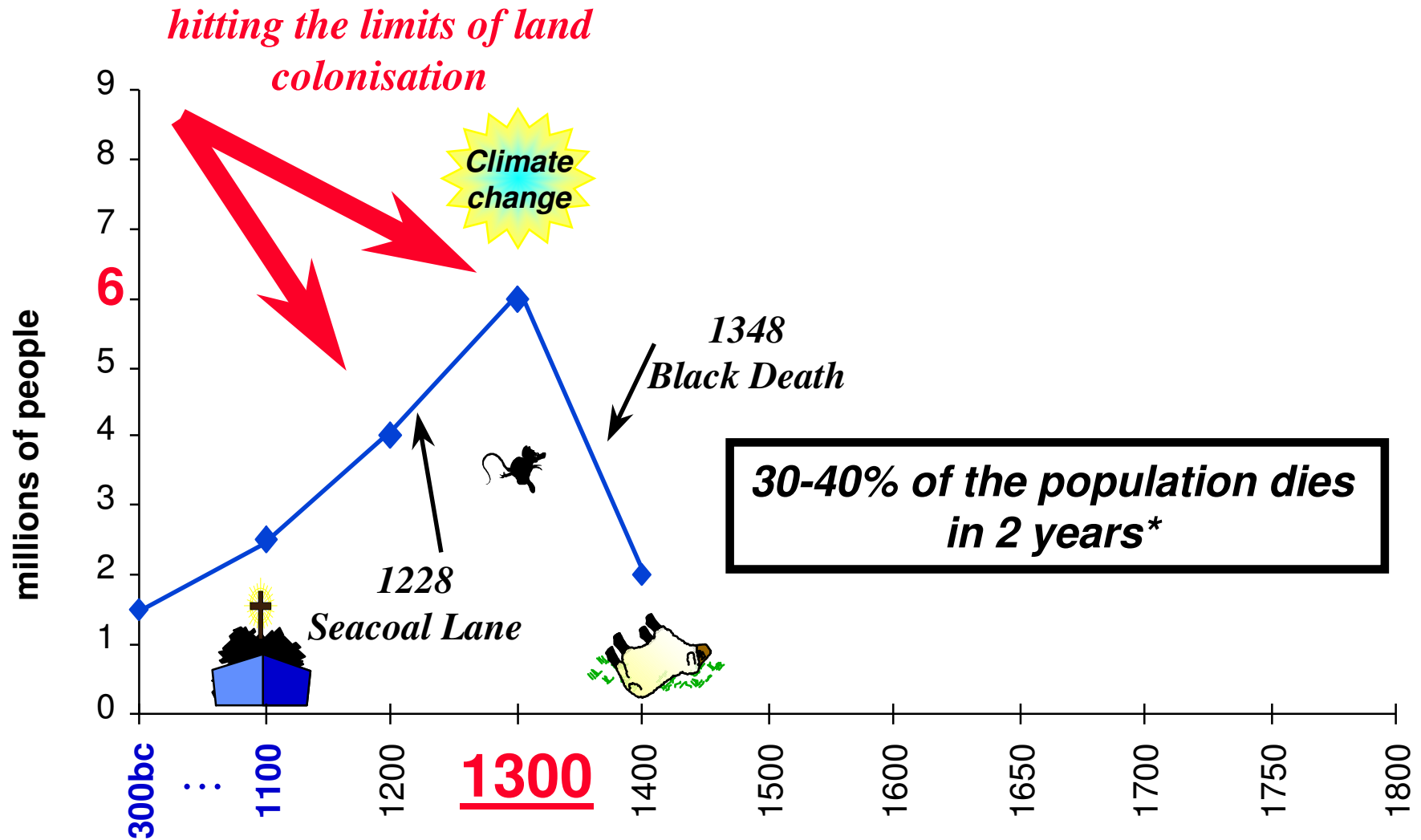
*“The tale of the villager’s fortunes in this period is one of the progress of poverty.”*

***Famines in England: 1272, 1277, 1283, 1292, 1311***

***1316-17:***

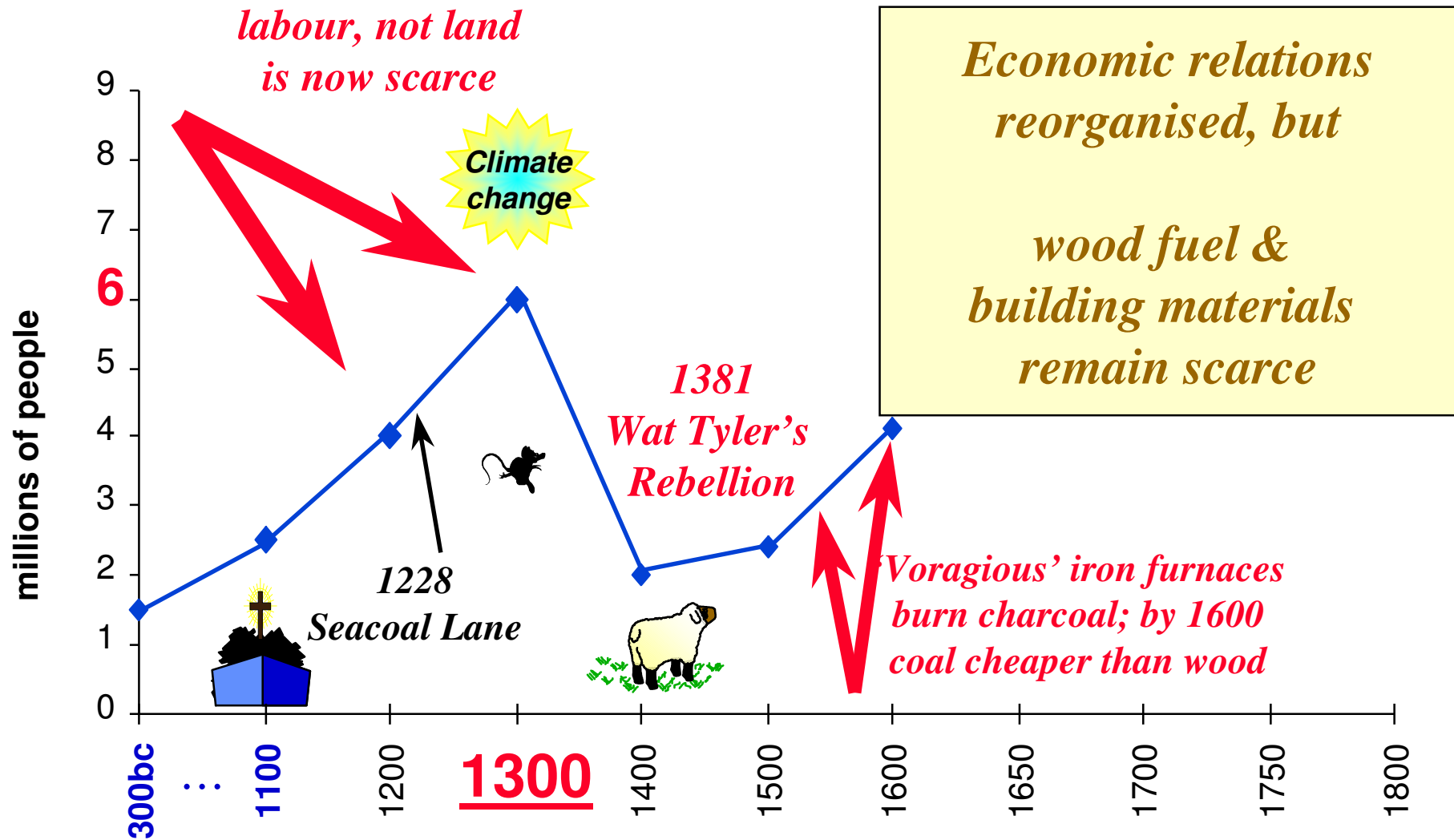
*“grain liveries were suspended altogether by the Bishop of Winchester ‘on account of the dearness of corn.’”*

# The Calamitous 14th Century



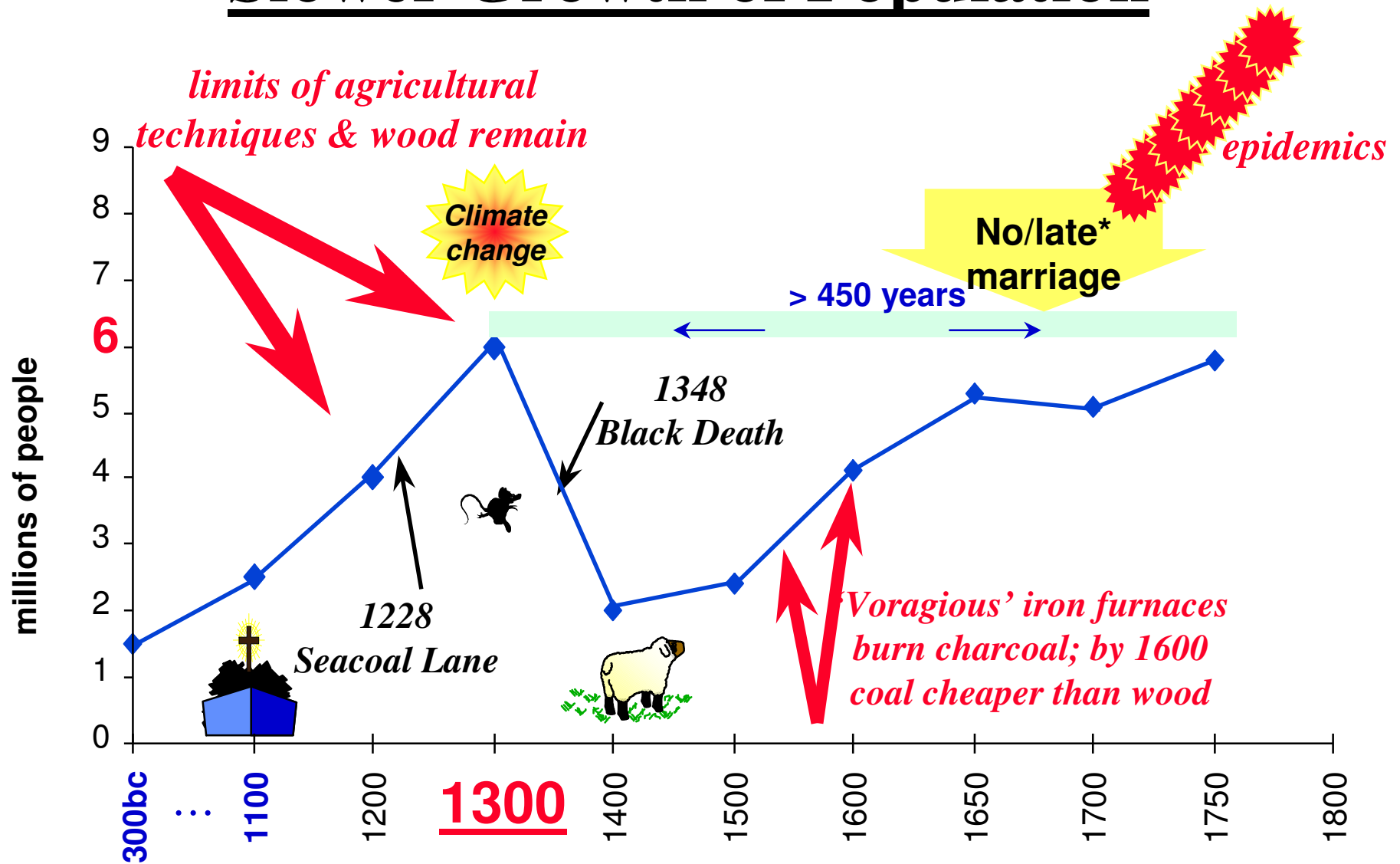
\* various sources

# Recovery & Reorganisation Begins



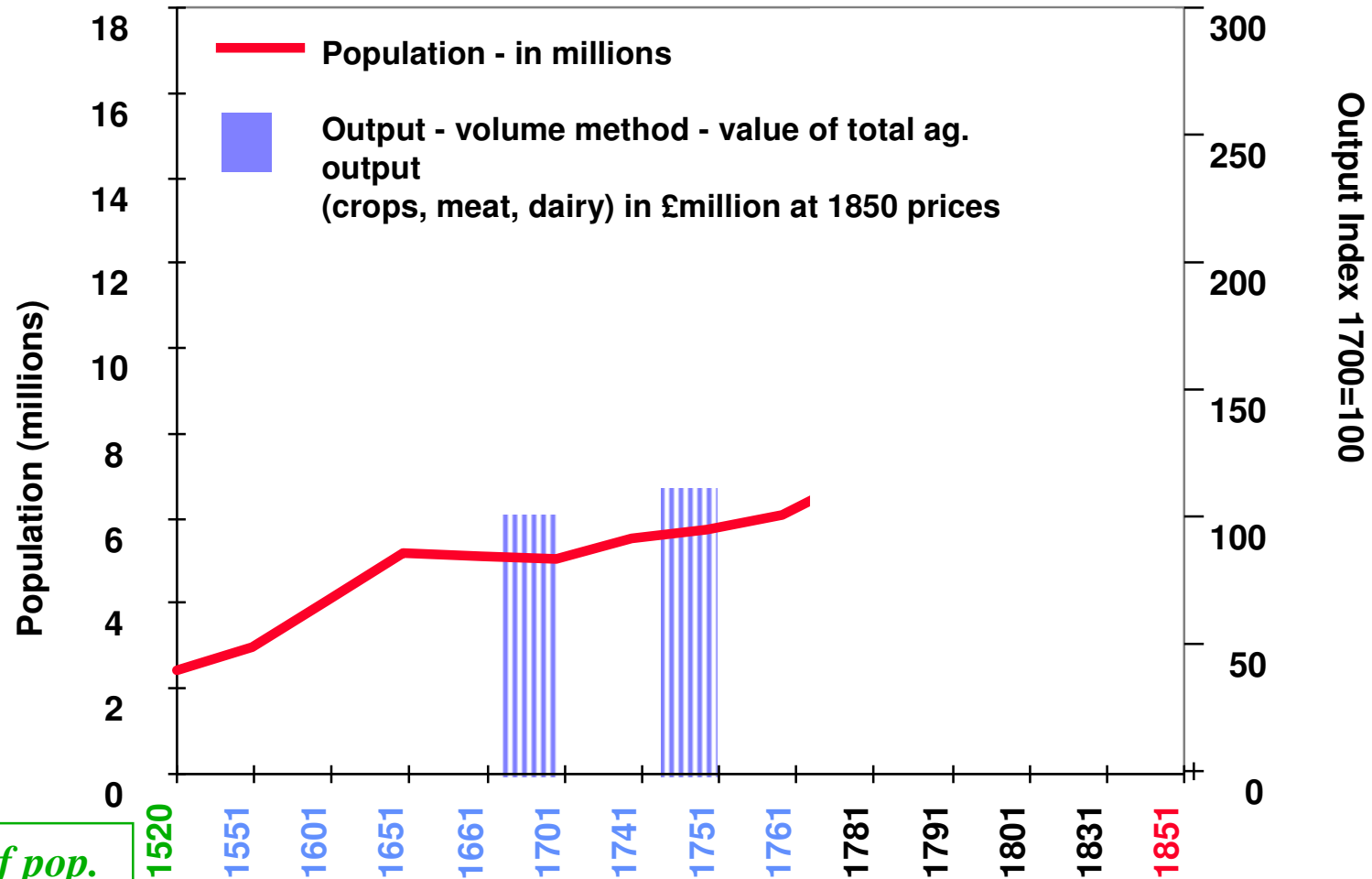


# Slower Growth of Population



\* Lawrence Stone, *The Family, Sex and Marriage in England 1500-1800*, Harper Torchbooks, 1979, chap. 2, *passim*. 1625-1825: 15-25% of peers' daughters never married; 15-20% of peers' sons never married. 1695 Lichfield, 9% of women > age 30 unmarried.

# Estimates of English Agricultural Output



*80% of pop. in agric. for own family*

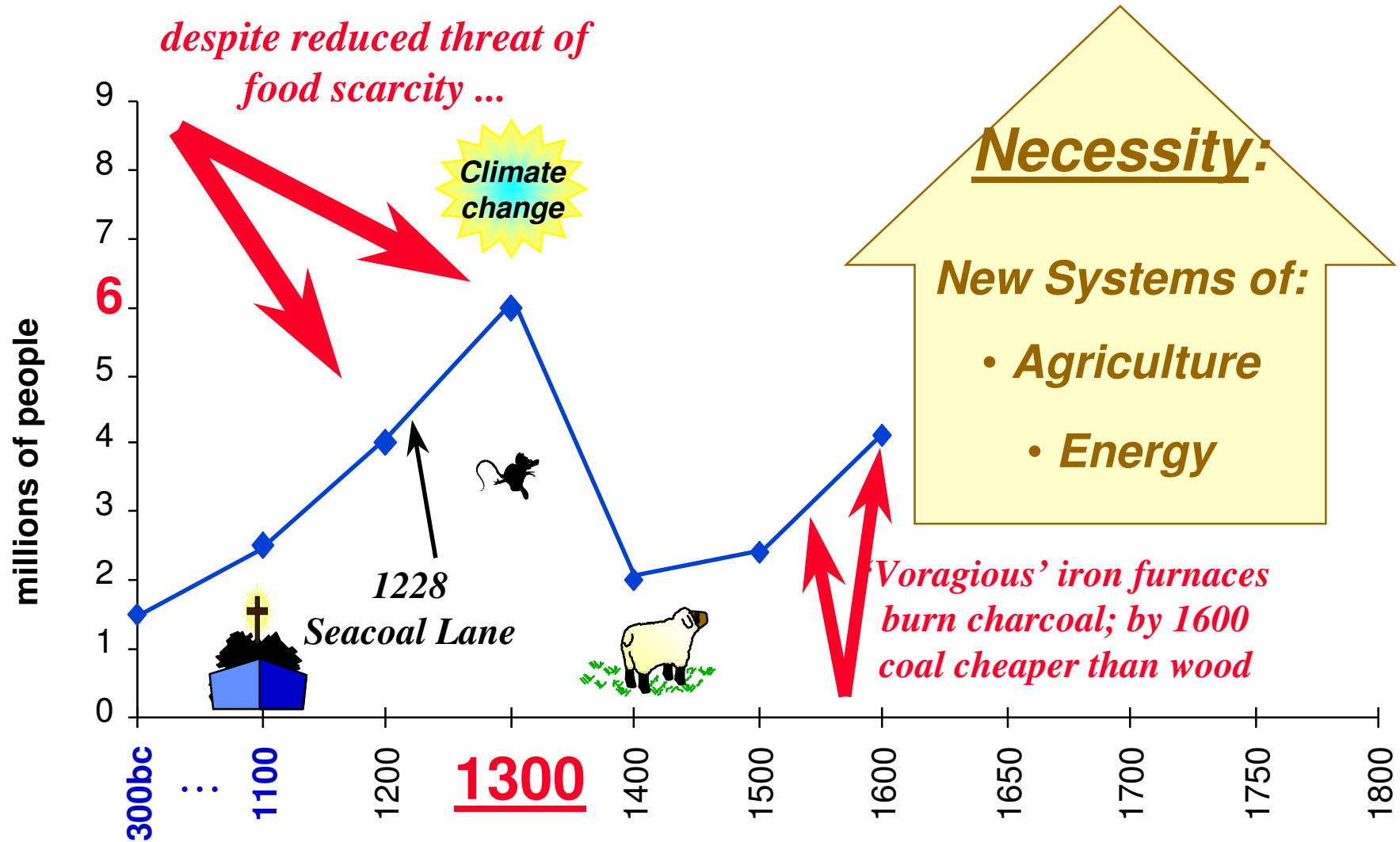
# 1630 - A New England Indian's View

*“Why come the Englishmen hither?*

*It is because [they] want firing:  
for ...*

*having burnt up the wood in one place ...  
they are faine to follow the wood ...”*

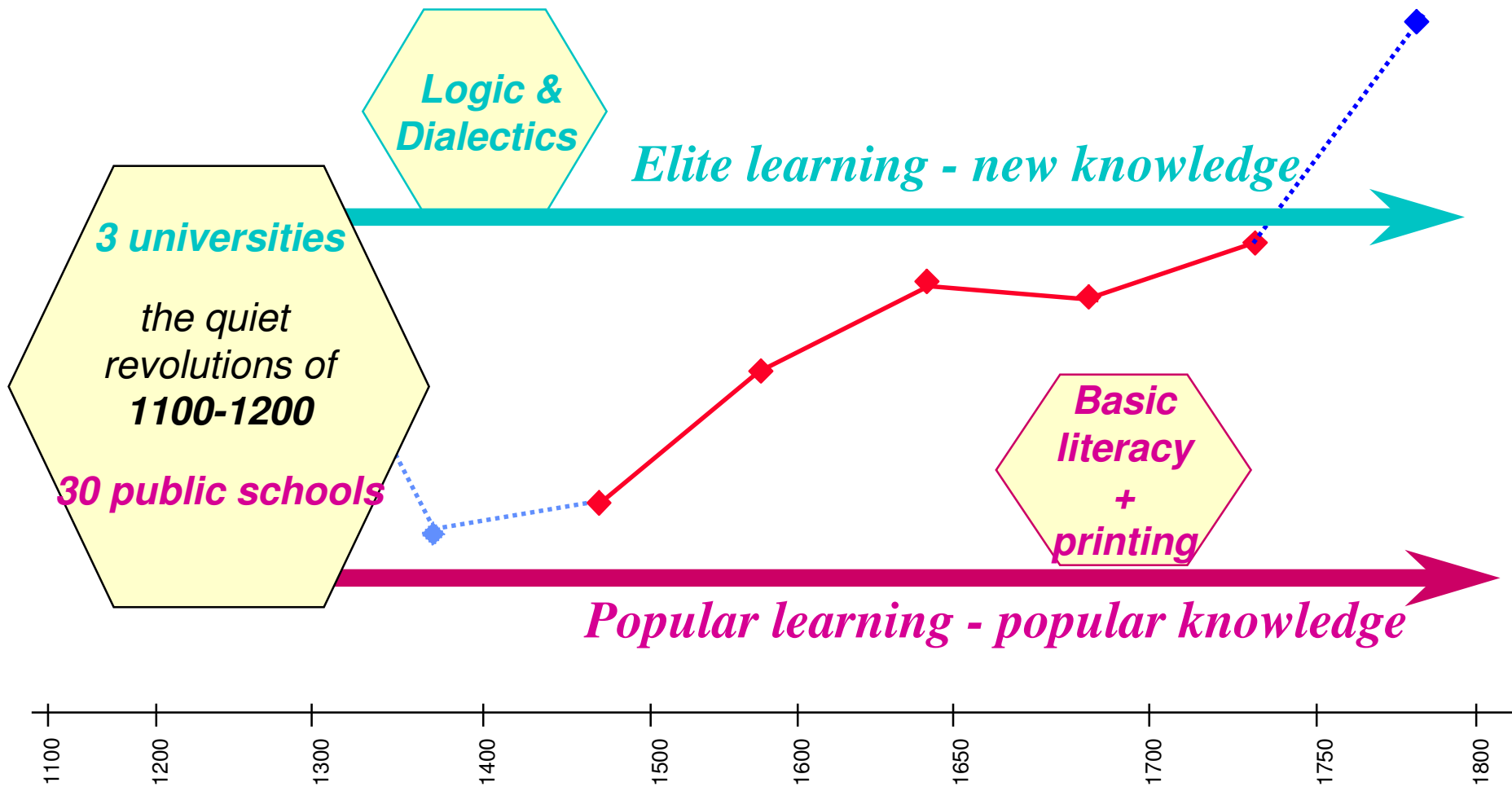
# Necessity & the Origins of Invention



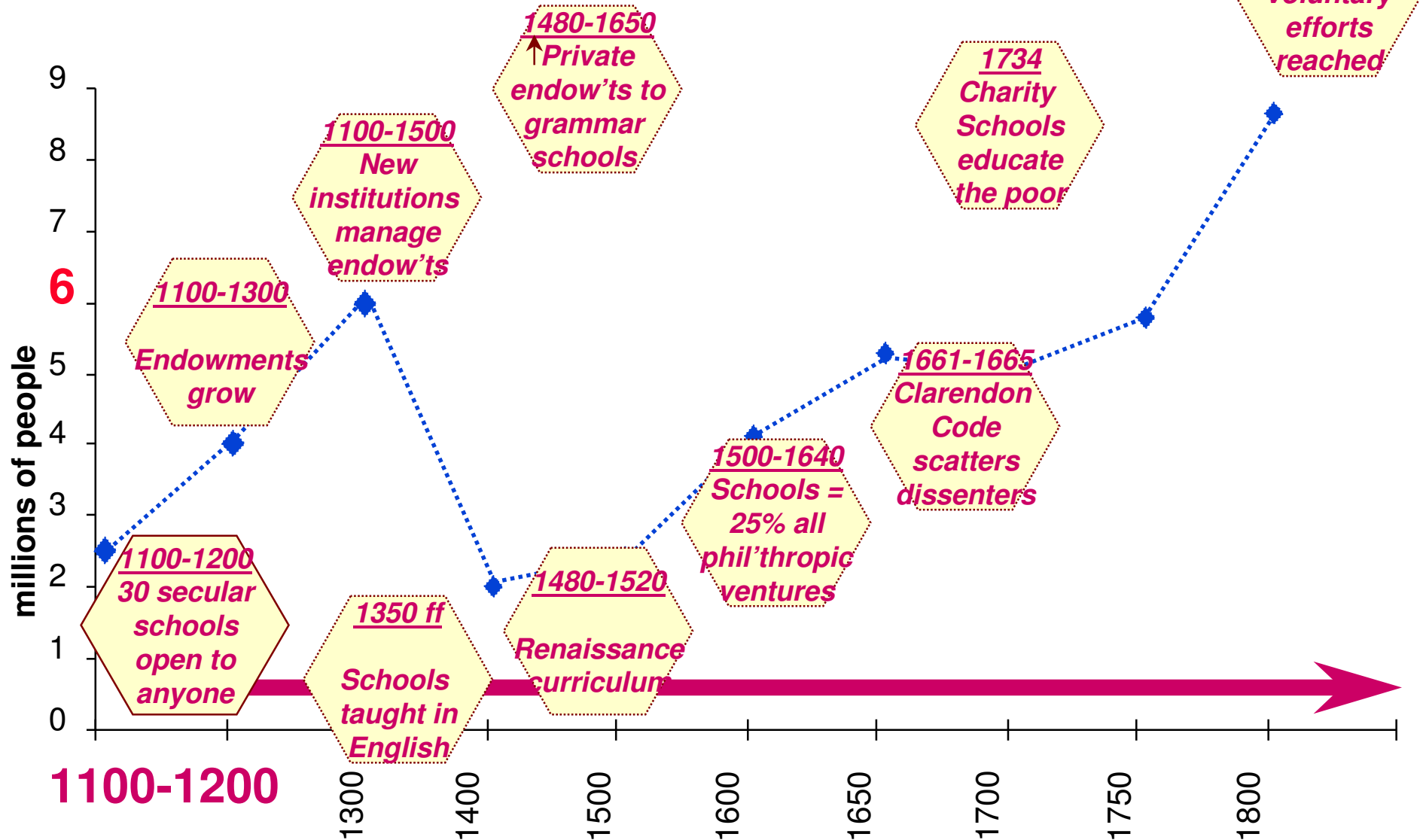
***Learning:***

*Entering the Age of Learning*

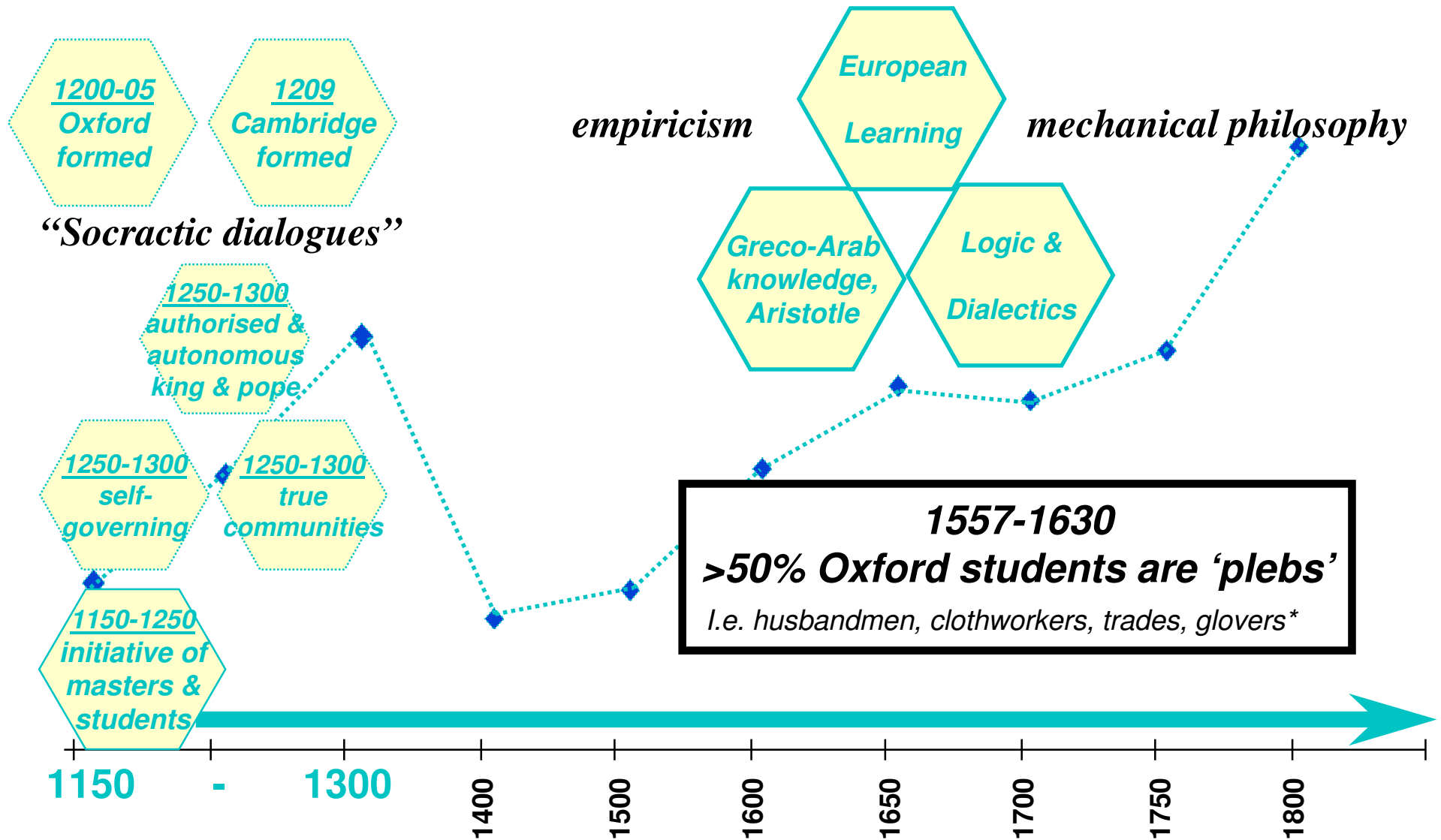
# 2 Important Drivers in the Age of Learning



# Schooling Continues to Expand



# Spread of New Method & Conceptual Framework

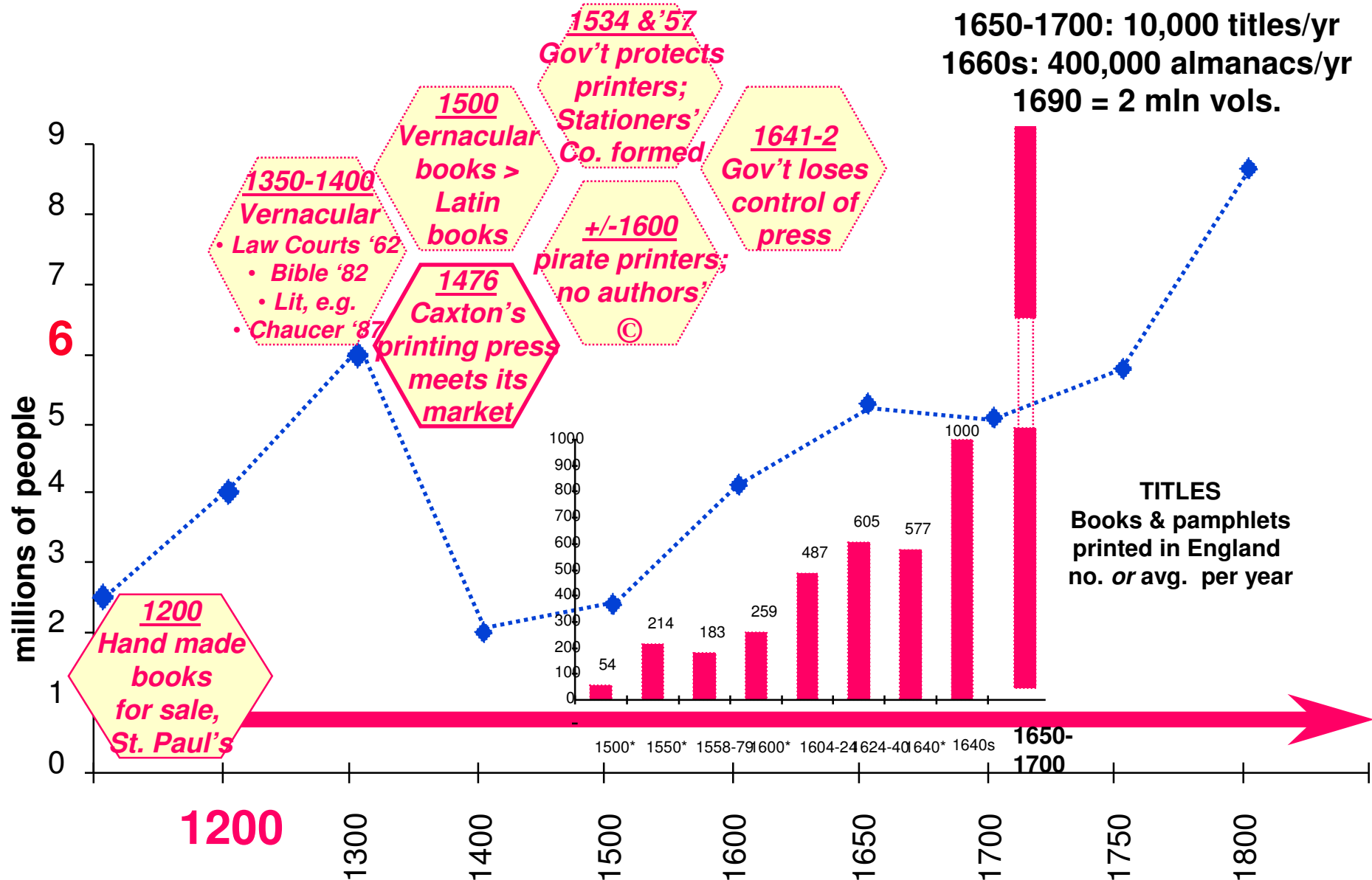


Re plebs: Nigel Whealey, *Writing and Society: Literacy, print and politics in Britain 1590-1660*. Routledge, London and New York, 1999, p. 37.

rest: from: Jacques Verger, “The Universities and Scholasticism”, ch. 10 in *The New Cambridge Medieval History, vol. 5*, CUP, 1999, *passim*. © B.J. Heinzen 2000, slide 24

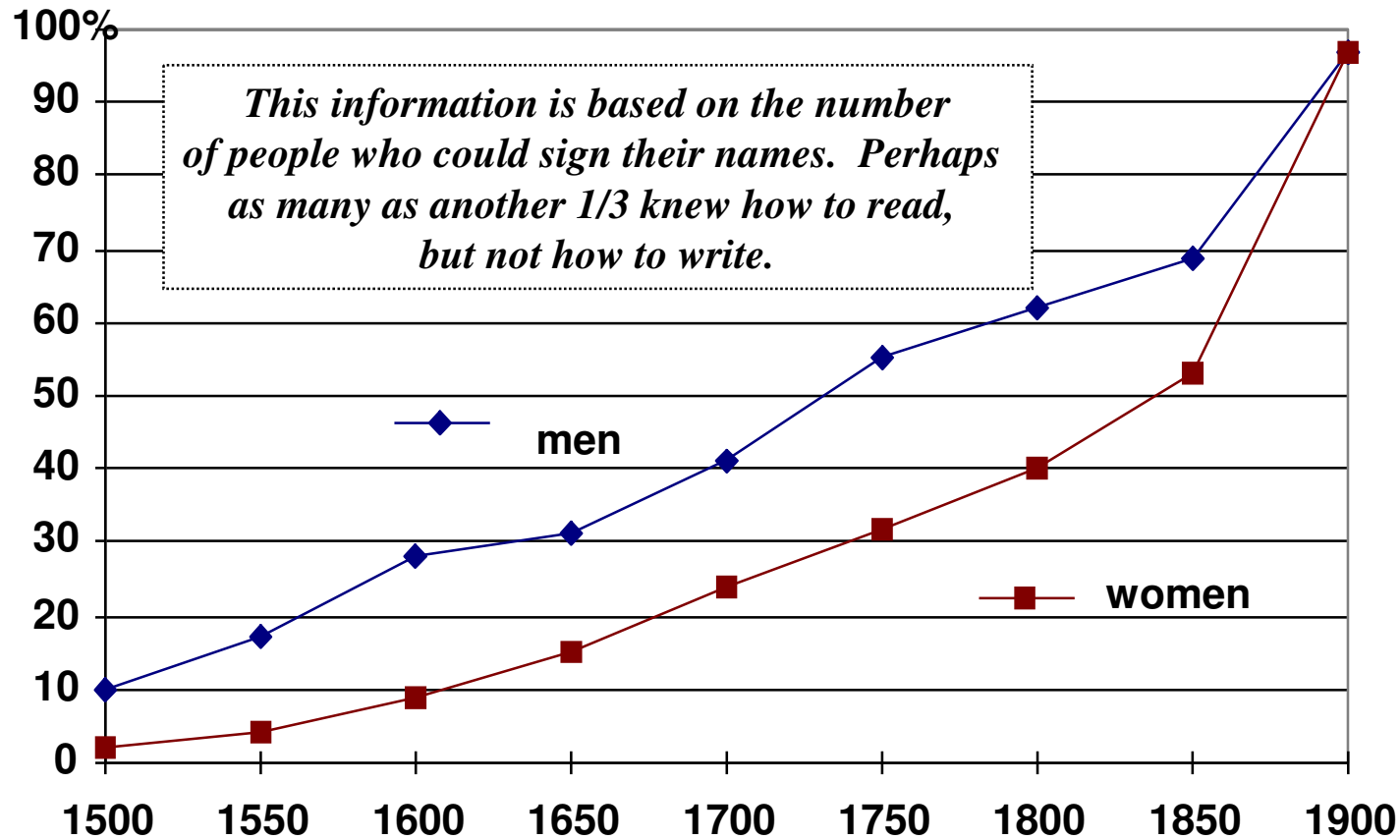


# Book Buying, Selling & Publishing | Grows



Average no. of titles from: Nigel Whealey, *Writing and Society: Literacy, print and politics in Britain 1590-1660*. Routledge, London and New York, 1999. No. of titles from: Cecile M. Jagodzinski, *Privacy and Print: Reading and Writing in Seventeenth-Century England*. University of Chicago Press, 2000.

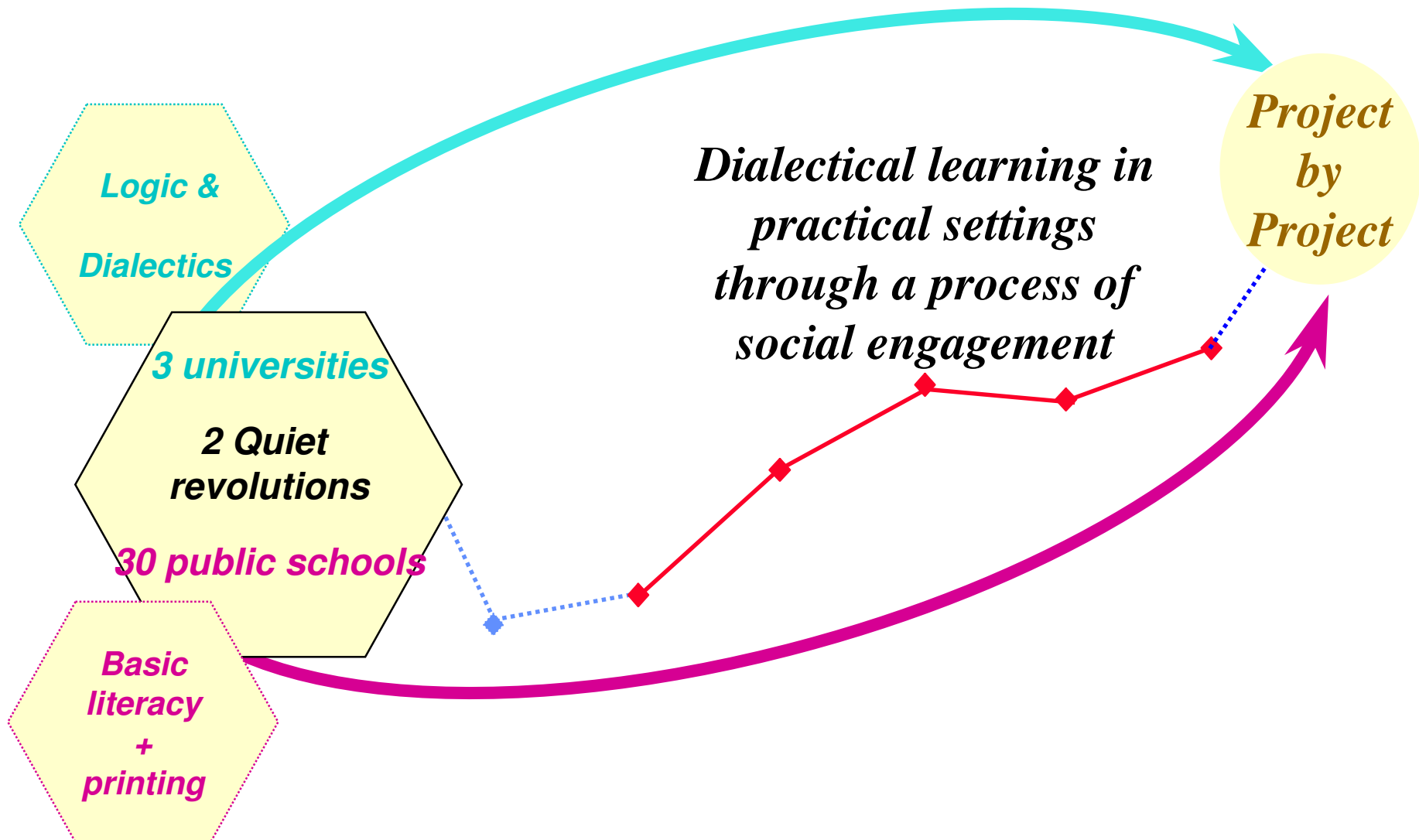
# Englishmen & Women Learn to Sign



Literacy data from *Literacy and the Social Order* by David Cressy, Cambridge University Press, numbers read off graph on p. 177

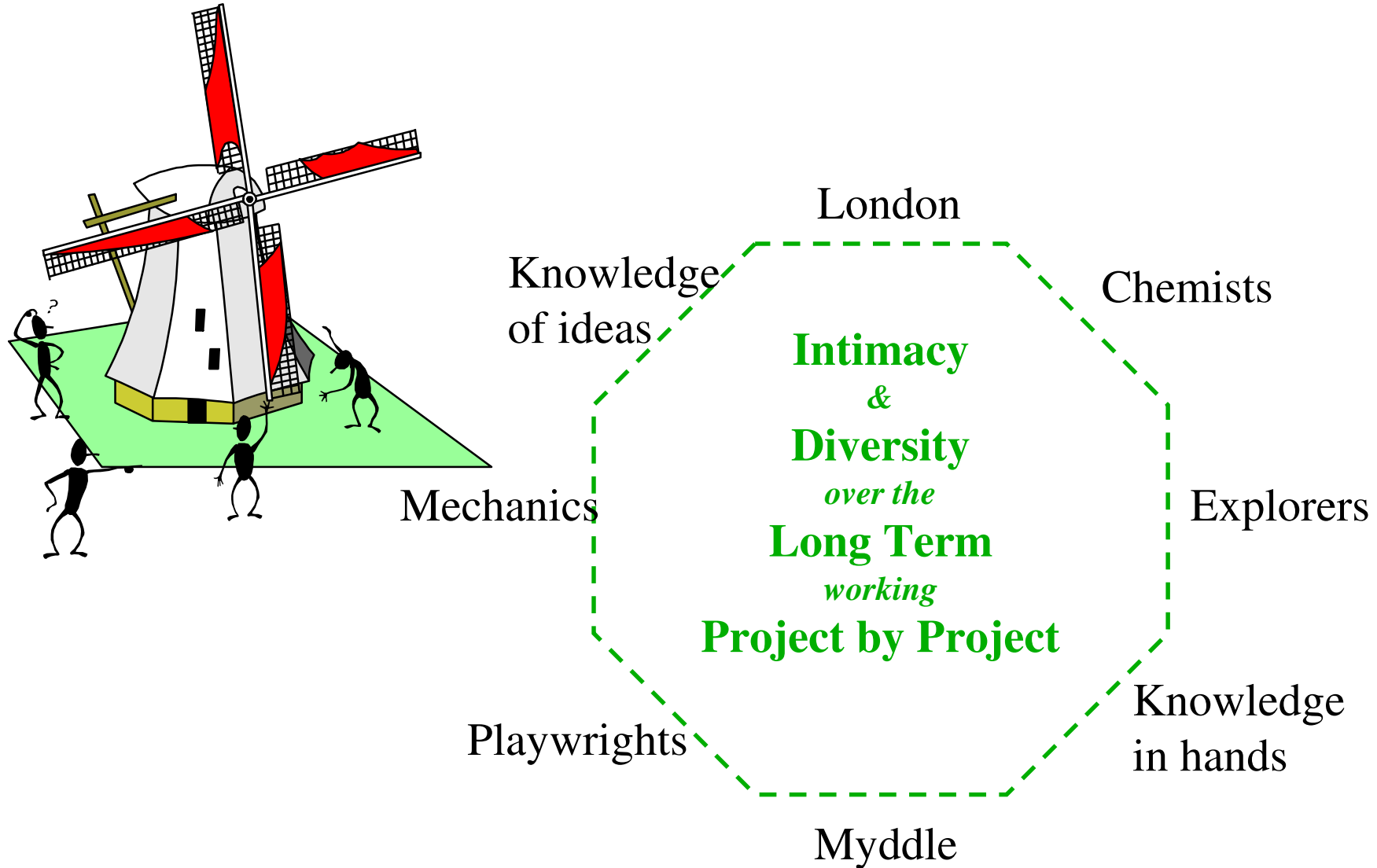
Estimate of reading from: Nigel Whealey, *Writing and Society: Literacy, print and politics in Britain 1590-1660*. Routledge, London and New York, 1999. © B. J. Hazen 2000, slide 26

# Novelty: Creation of Shared Knowledge



# ***Engagement***

# Engagement = Creative Societies



# Mobility Created Engagement

*Primogeniture*

1400

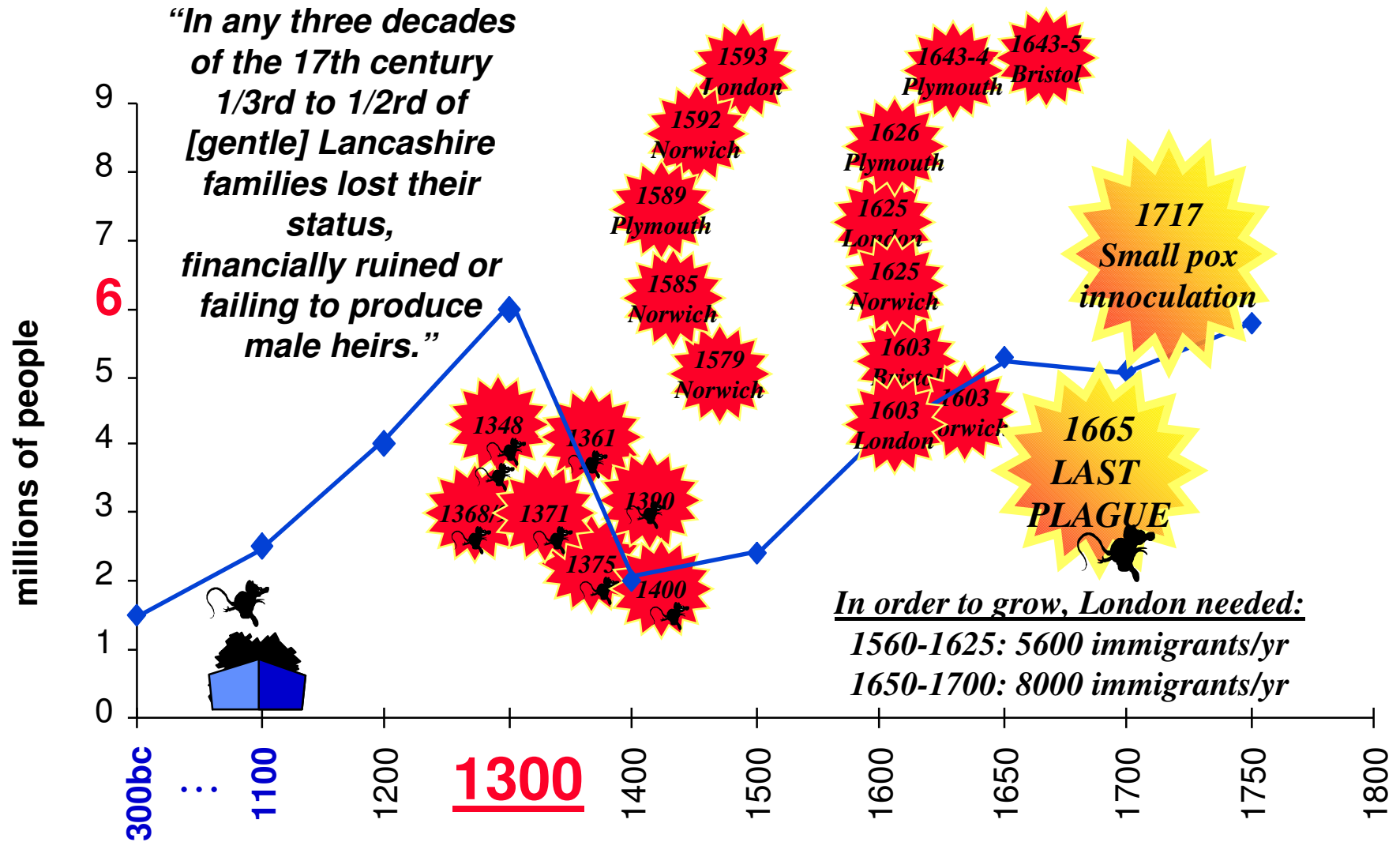
*“Gentleman” & “Yeoman”*

*Epidemics*

*Necessity*

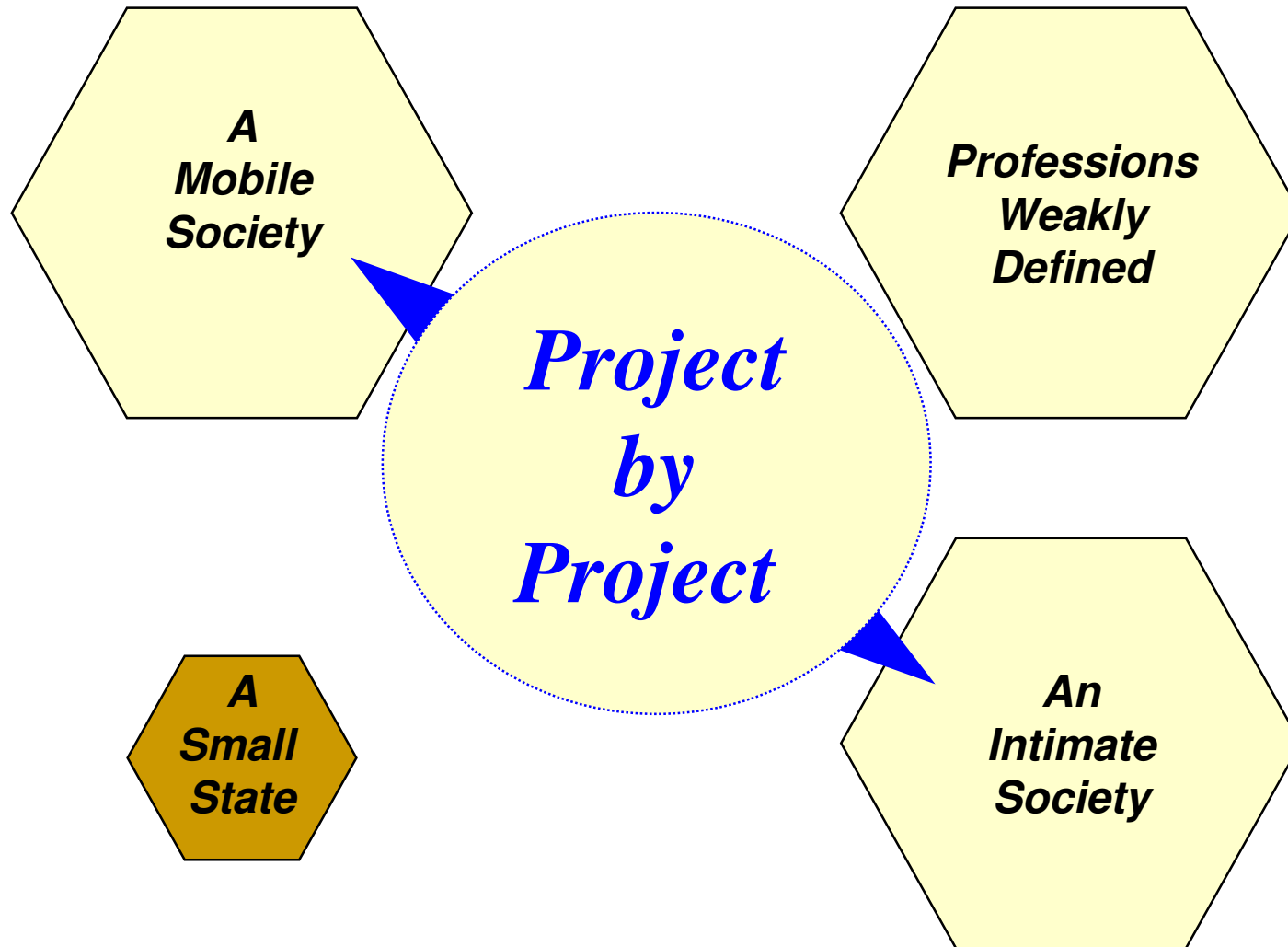
**Social &  
geographic  
mobility**

# Primogeniture, Epidemics & Mobility



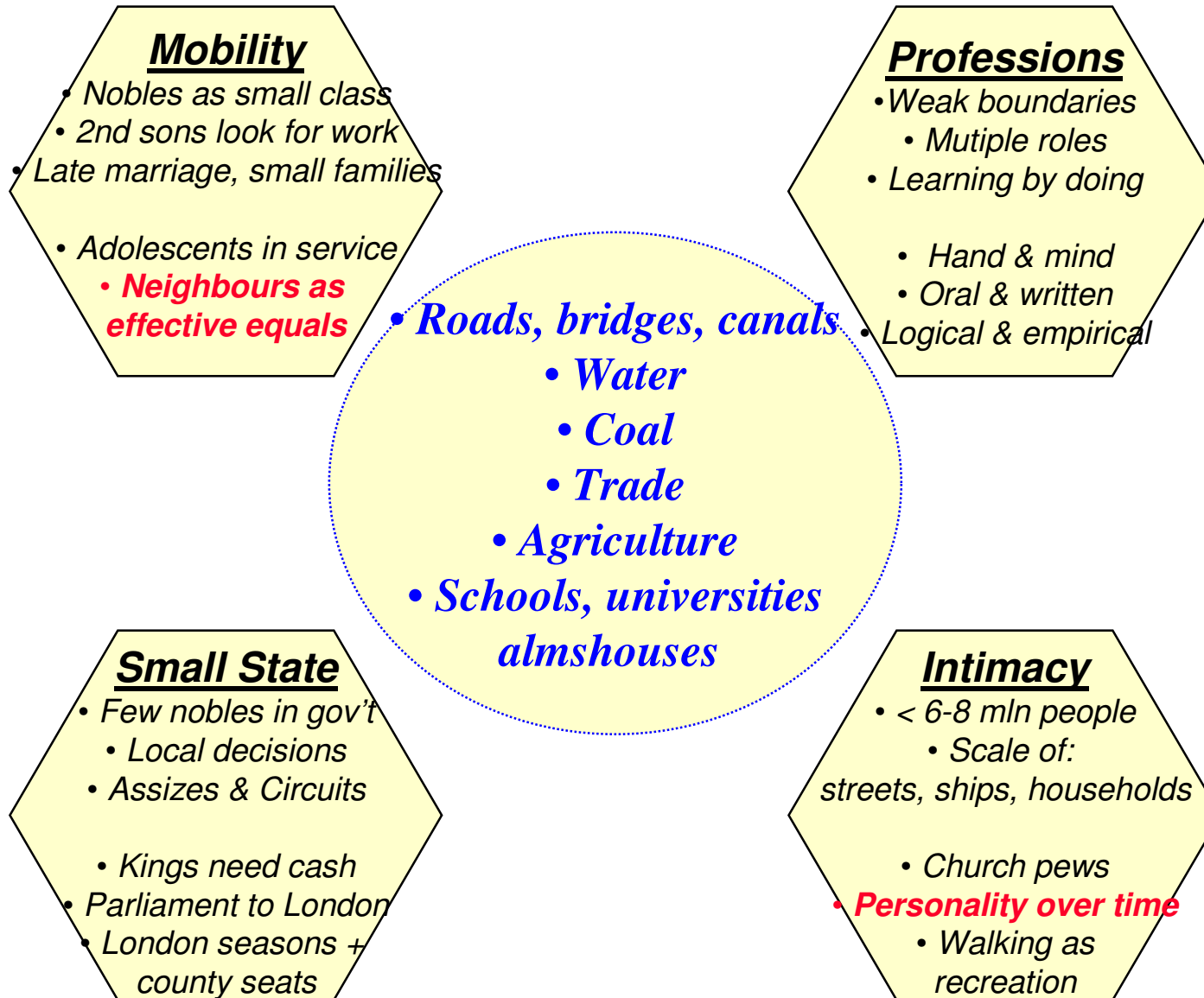
dates of epidemics & London population from: Keith Wrightson, *English Society, 1580-1680*, Routledge, 1982, p. 128; epidemics of 14thc. from “Health, Diet, Medicine & the Plague” by Simone Macdougall in Chris Given-Wilson, *An Illustrated History of Late Medieval England*, Manchester University Press, 1996, p. 97; Lancashire quote from Nigel Whealey, *Writing & Society*, Routledge, 1000 p. 26

# Engagem't thru Openness, Projects & Gossip





# Face to Face Projects on a Human Scale



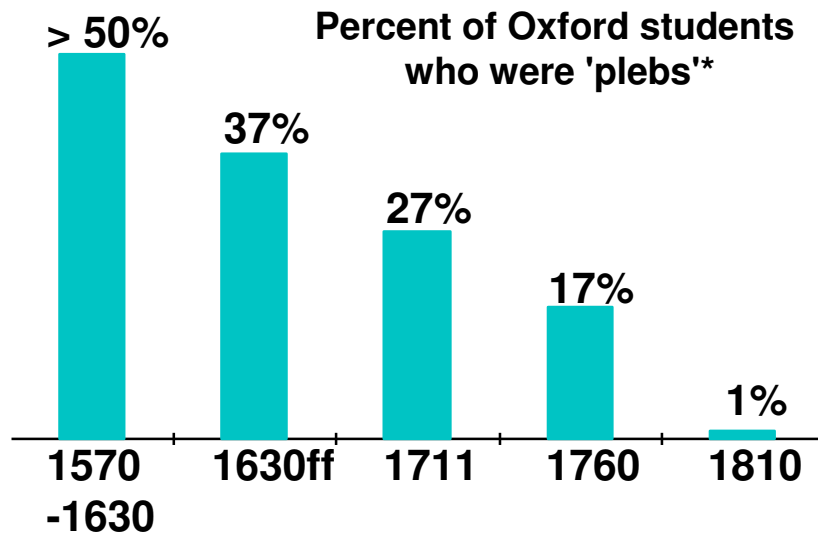
# Creation of the “Dispersed University”

## 1660ff: Decline of Oxbridge & Inns

- higher fees
- no dissenters allowed
- loss of reputation at Inns of Court

*“Intellectual life was concentrated outside the universities and merged with practical affairs.”*

*“The most remarkable [in 19<sup>th</sup> century] was the **Lunar Society of Birmingham** in which men such as Watt, Boulton, Wedgewood, Joseph Priestley and Erasmus Darwin met and exchanged scientific, philosophical and technical information. Many of these societies started in coffee houses which served not only as centres of business and the spreading of news, but as potential learned societies.”*

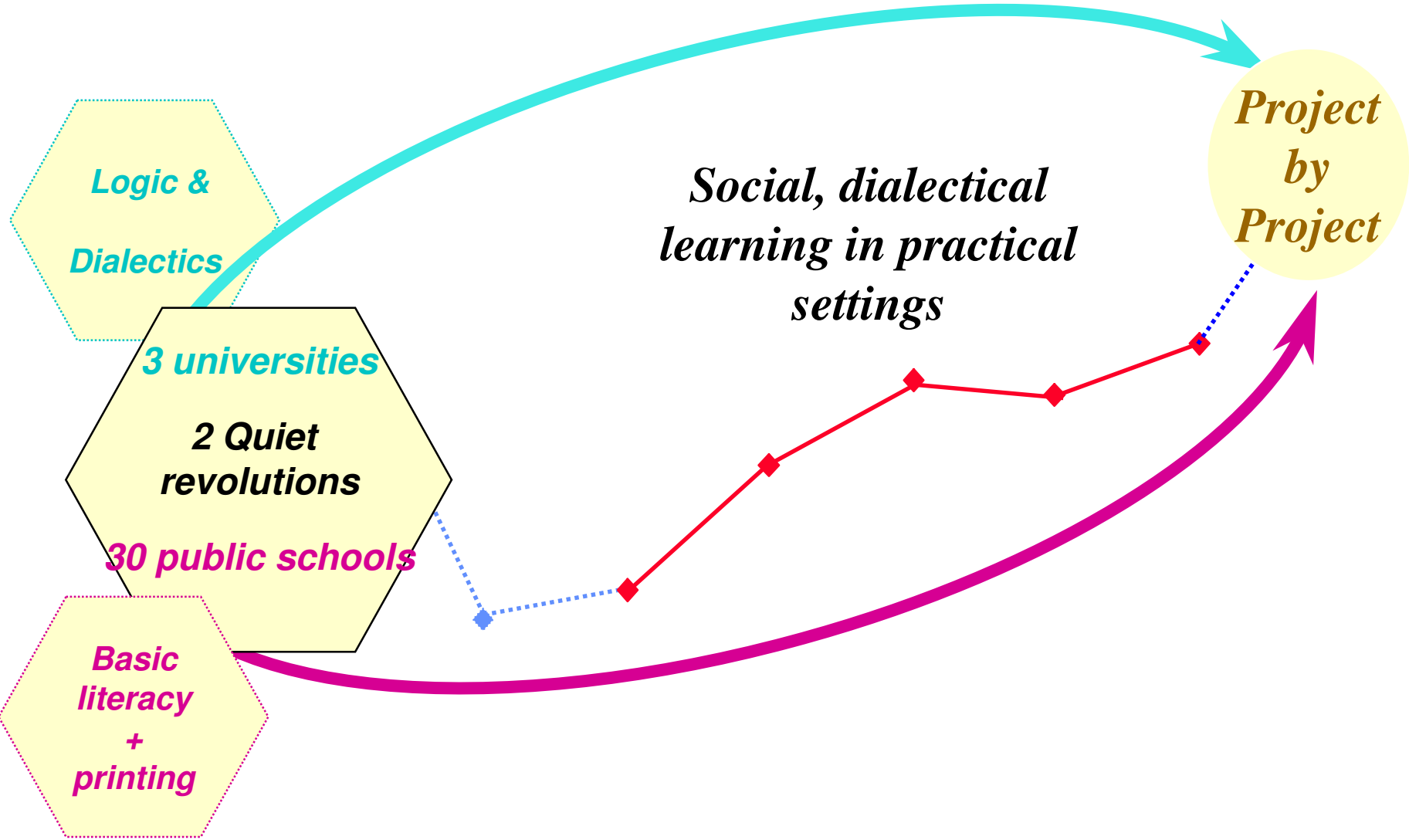


\*husbandmen, clothworkers, trades, glovers

Oxford plebs from: Nigel Whealey, *Writing & Society*, Routledge, 1999, p.37, quotation from: M.D. Shipman, *Education & Modernisation*, Faber & Faber, 1971, p. 100.

**To be a ‘gentleman’:**  
**Leisure, wealth & learning**

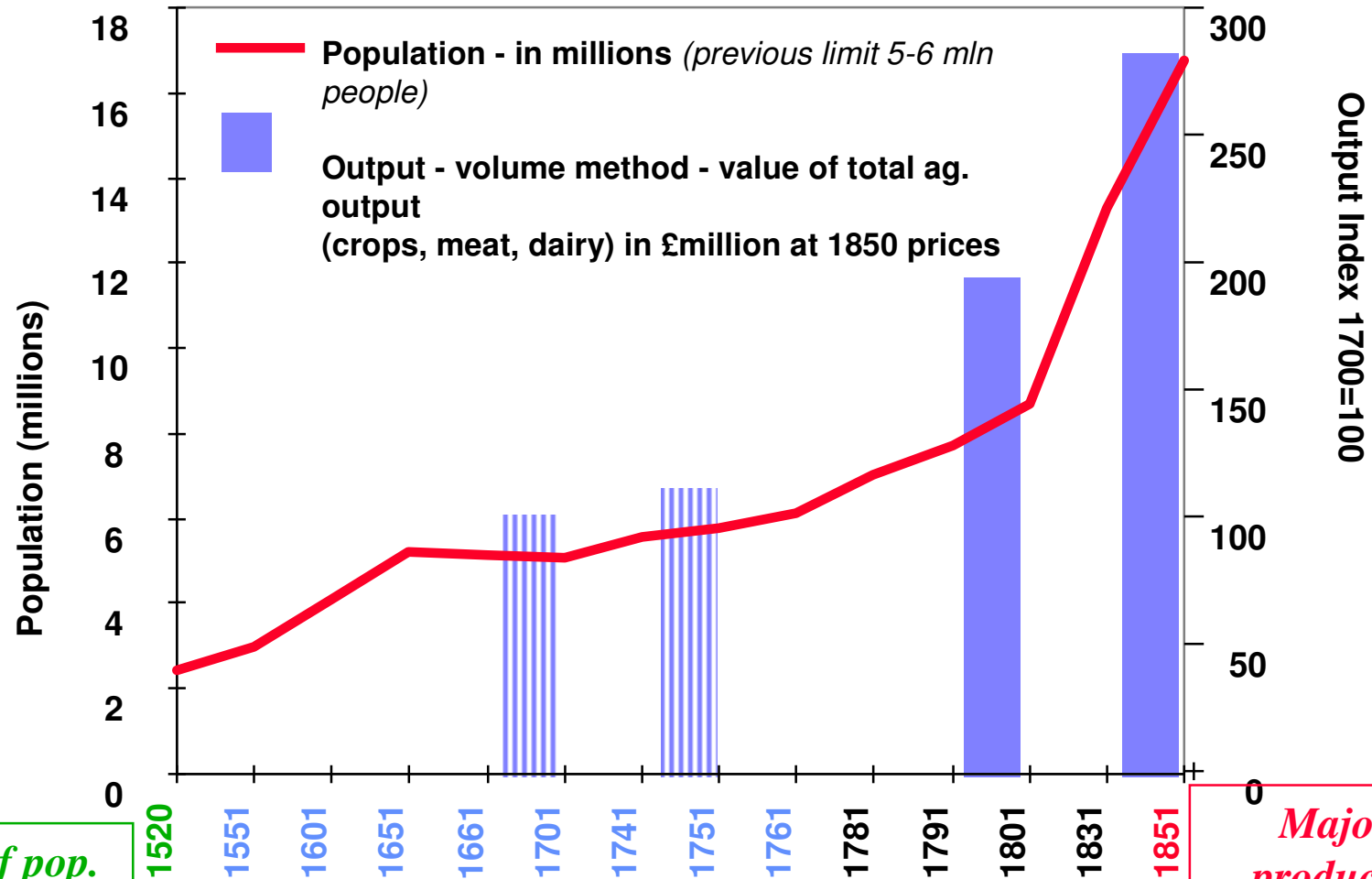
# Learning & Engagement: Drivers of Change



***Where Technology  
Fits In...***

# Estimates of English Agricultural Output

## 1520--1850

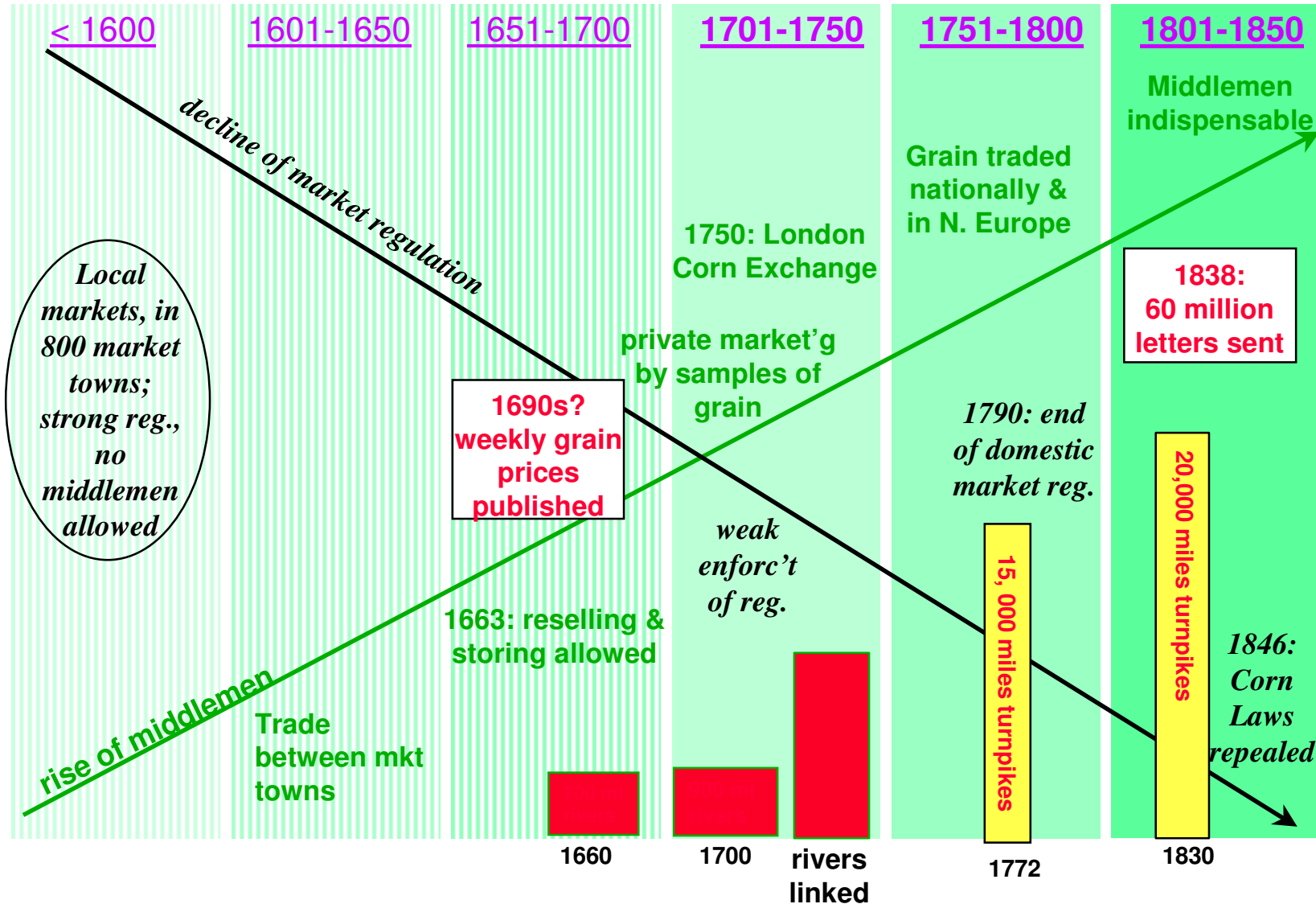


*80% of pop. in agric. for own family*

*Majority produce for family & markets*

# Development of Markets: 1701-1750

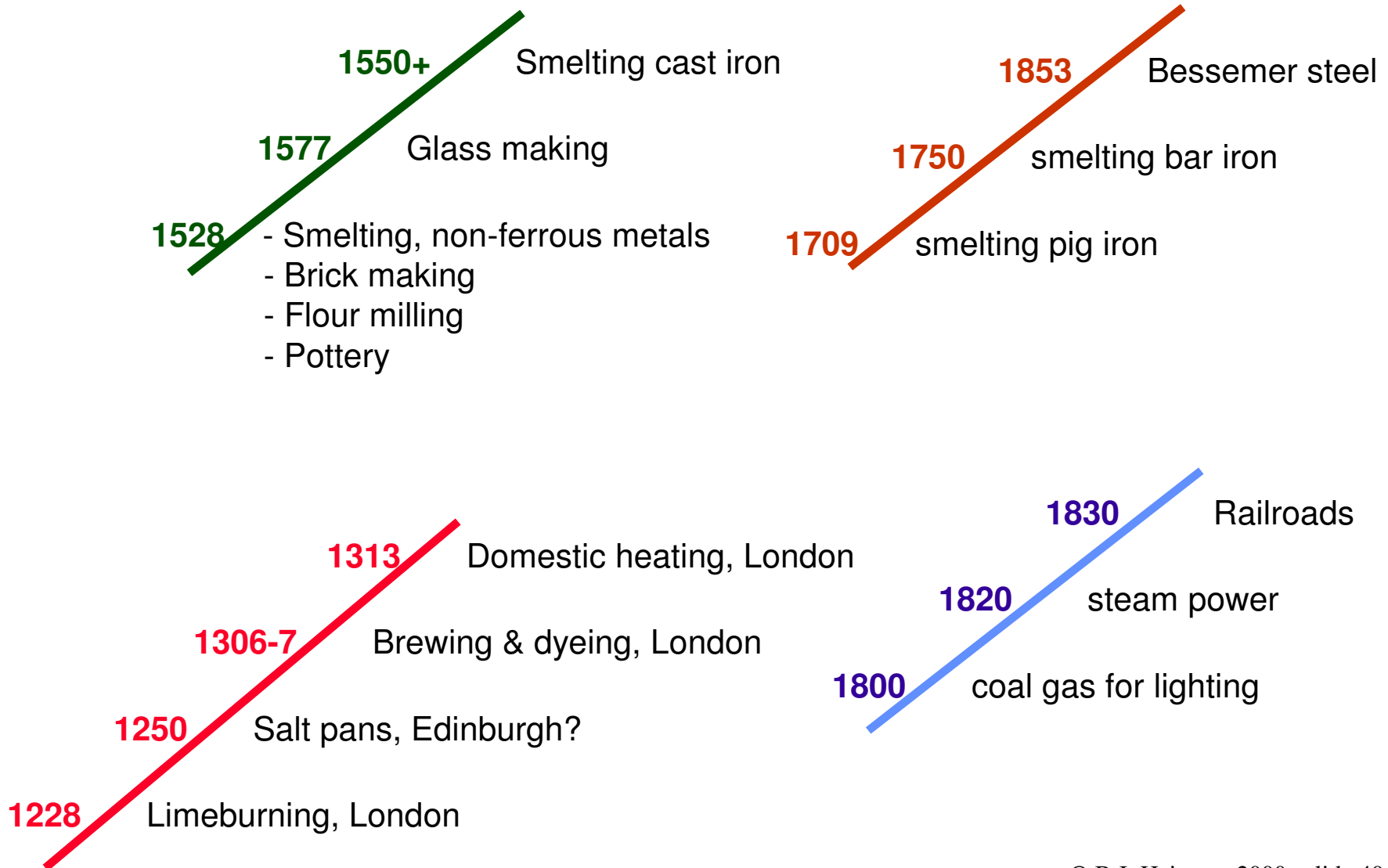
*Middlemen + transport react to prices that signal necessity*



# Development & Diffusion of Technology

<u>&lt; 1600</u>	<u>1601-1650</u>	<u>1651-1700</u>	<u>1701-1750</u>	<u>1751-1800</u>	<u>1801-1850</u>	<u>1851-1900</u>
<b>DIFFUSING</b>				<p><u>1770s</u> Jethro Tull seed drill imitated</p> <p><u>1790s</u> R'm plough made in local foundaries</p>	<p>Norfolk system* spreads widely</p> <p><u>1835</u> scythes widespread</p> <p><u>1830s</u> ag. engin'g indus. dev'd</p>	<p><u>1870</u> 80% of wheat harvest'd with scythes</p> <p><u>1850s</u> seed drill widely used</p>
<b>LEARNING</b>		<p>Upsurge in ag. writing</p> <p><u>1664</u> Royal Society studies ag. practices</p>		<p><u>1767</u> Royal Lancashire Ag. Society</p> <p><u>1770s</u> 1st local farmers' assoc.</p>	<p><u>1845</u> Cirencester Ag'l College</p> <p><u>1838</u> Royal Ag. Society of Eng.</p> <p><u>1803</u> 23 local farmers' assoc.</p>	<p><u>1850s</u> wide range of farm'g journals: 17,000 readers</p> <p><u>1855</u> 700 local farmers' assoc.</p>
<b>INTRODUCING</b>				<p><u>1731</u> Jethro Tull's seed drill</p> <p><u>1730</u> new R'm plough patented</p>	<p><u>1799</u> scythes introduced in S. Engl'd</p>	
<p><u>1500s</u> designs for seed drills published</p>	<p><u>1630</u> turnips* known as fodder crop</p>	<p><u>1650s</u> clover* appears as fodder crop</p>				

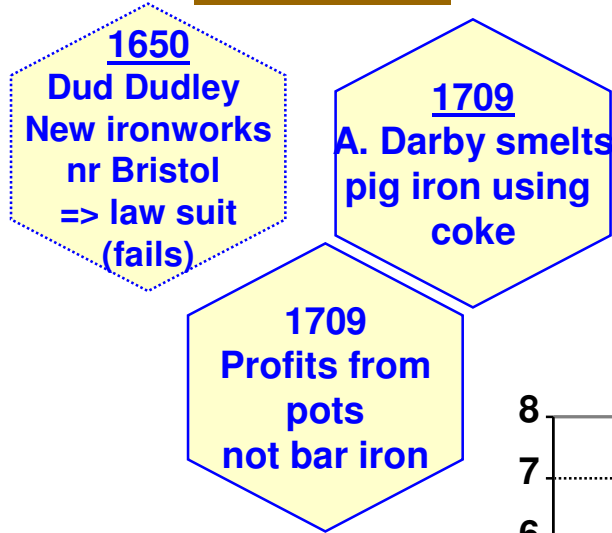
# Uses of Coal in England Over Time





# Rise of Coal in Iron & Steel

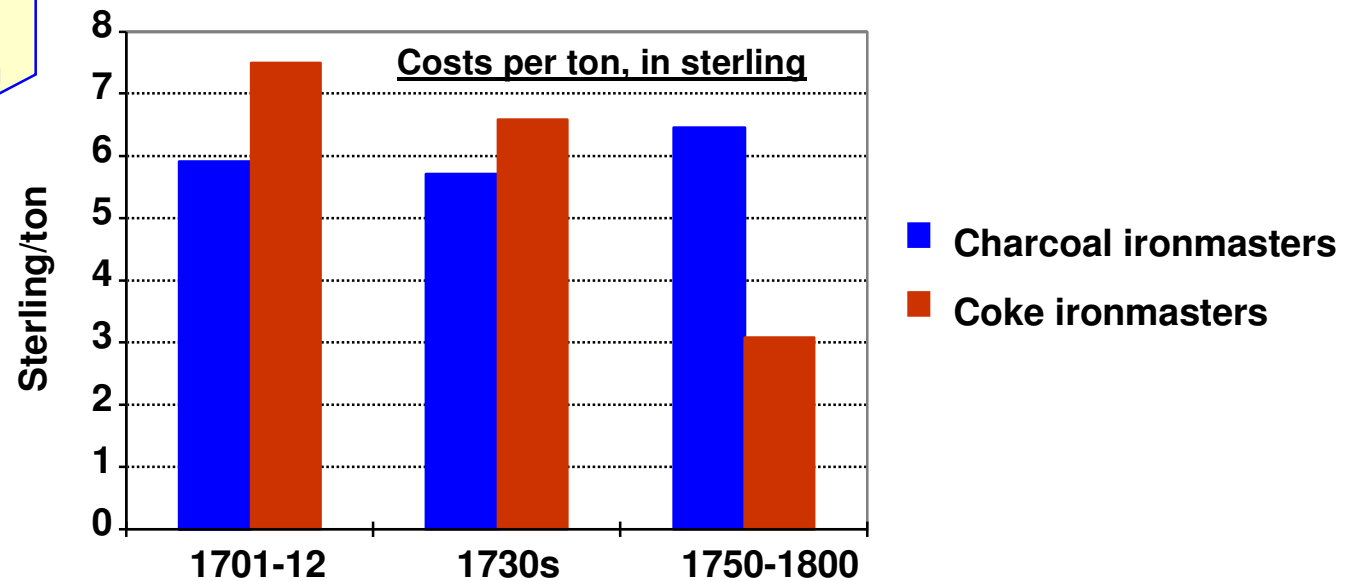
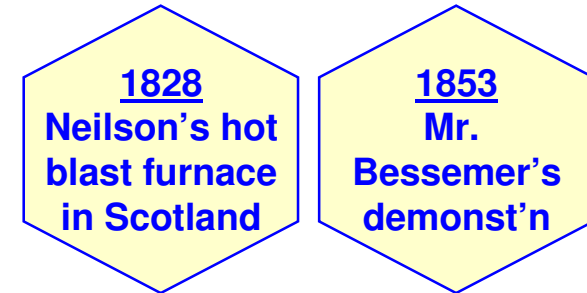
## Invention



## Diffusion



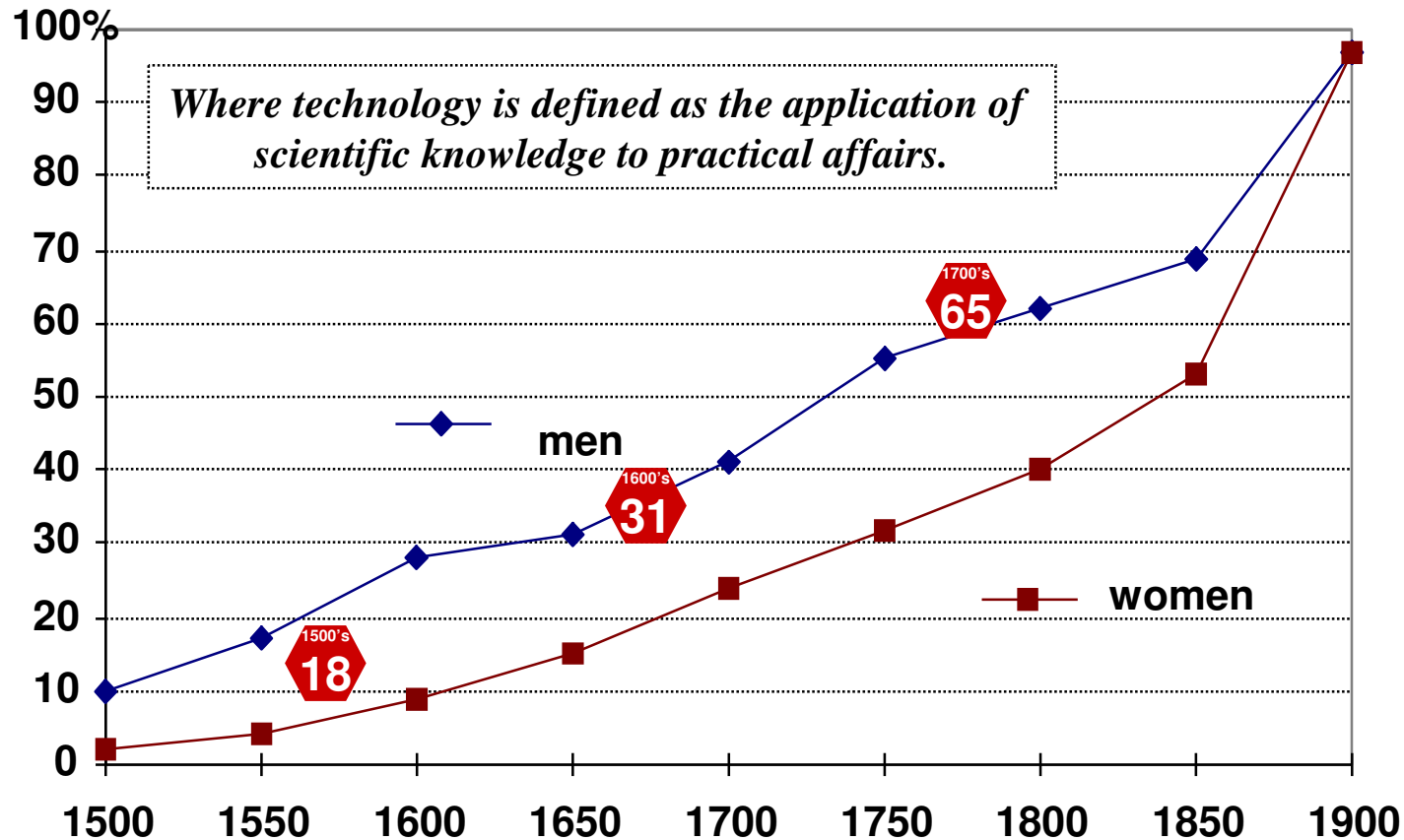
## Improvement



**1750-1800: Prices signal necessity  
differential largely due to rise in charcoal prices + fall in coked coal prices**

# Technology Tracks Social Learning

pulled along by price signals of necessity



No. of tech's

Literacy data from *Literacy and the Social Order* by David Cressy, Cambridge University Press, numbers read off graph on p. 177

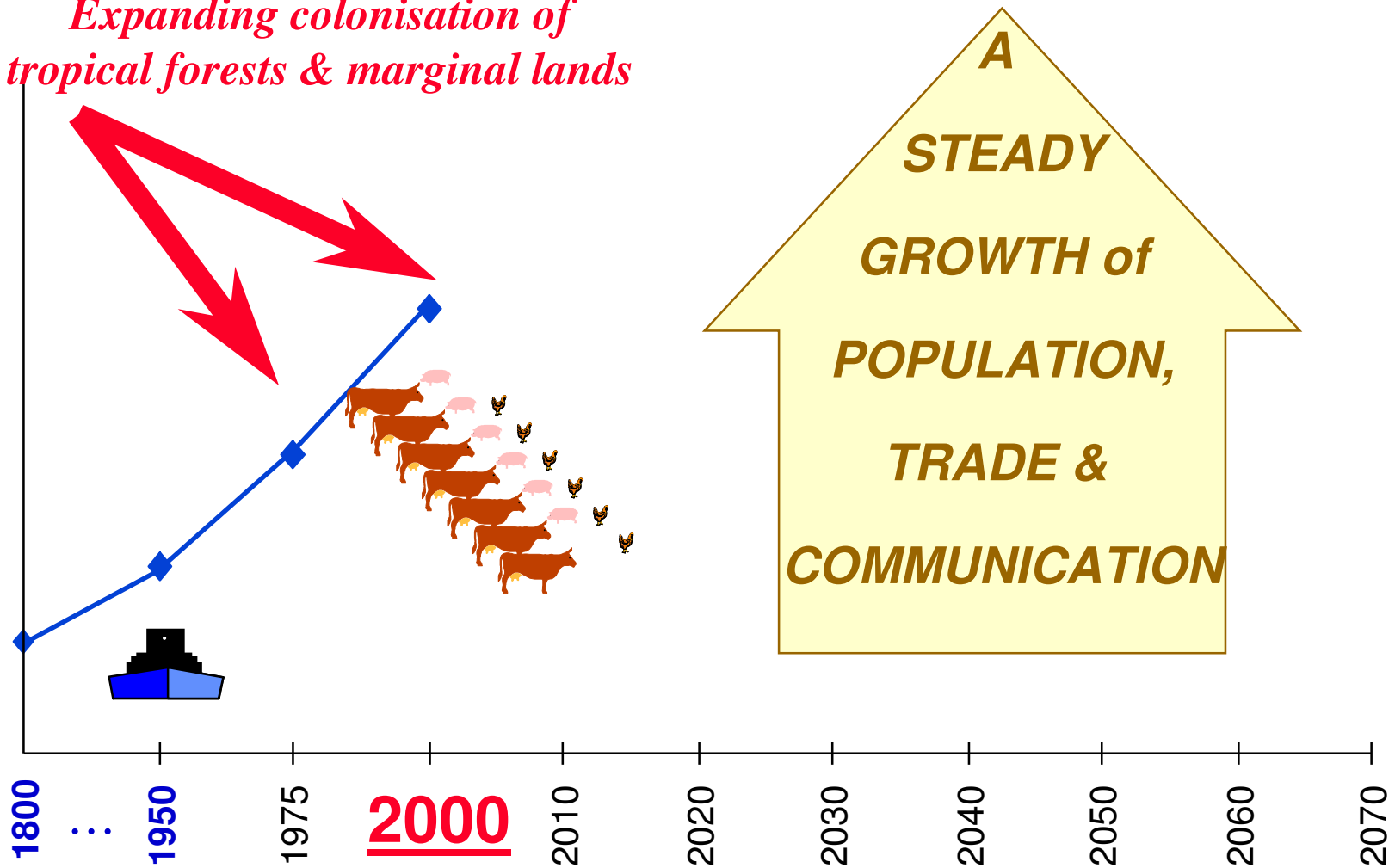
Estimate of reading from: Nigel Whealey, *Writing and Society: Literacy, print and politics in Britain 1590-1660*. Routledge, London and New York, 1999, p. 22.

Technology data from *The Timetables of History* by Bernard Grun. Simon & Schuster, New York, 1979, from the column 'Science, Technology, Growth' *passim*.

# **III. What are the analogies?**

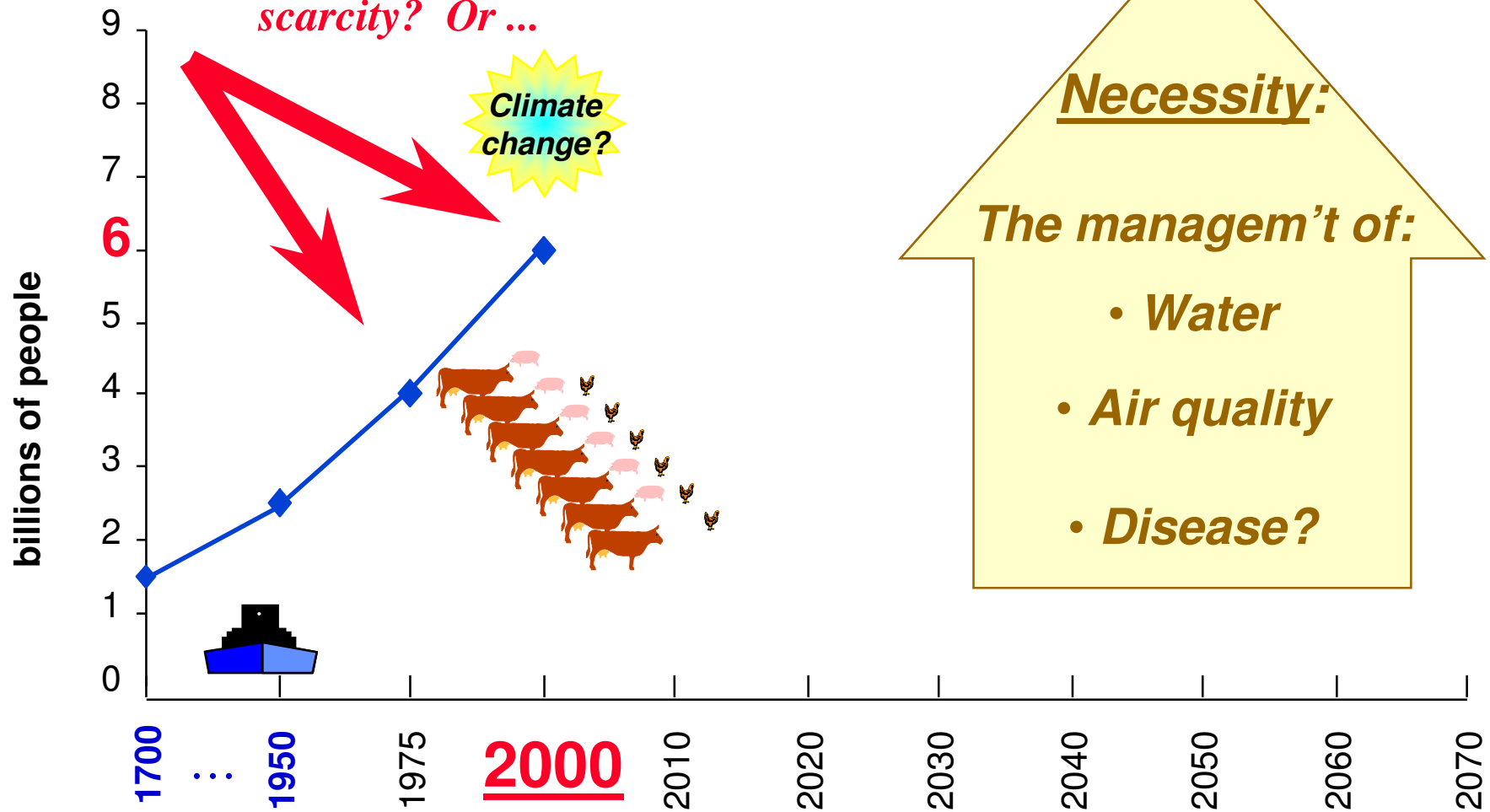
# 200 Years of Expansion & Innovation,

*Expanding colonisation of  
tropical forests & marginal lands*

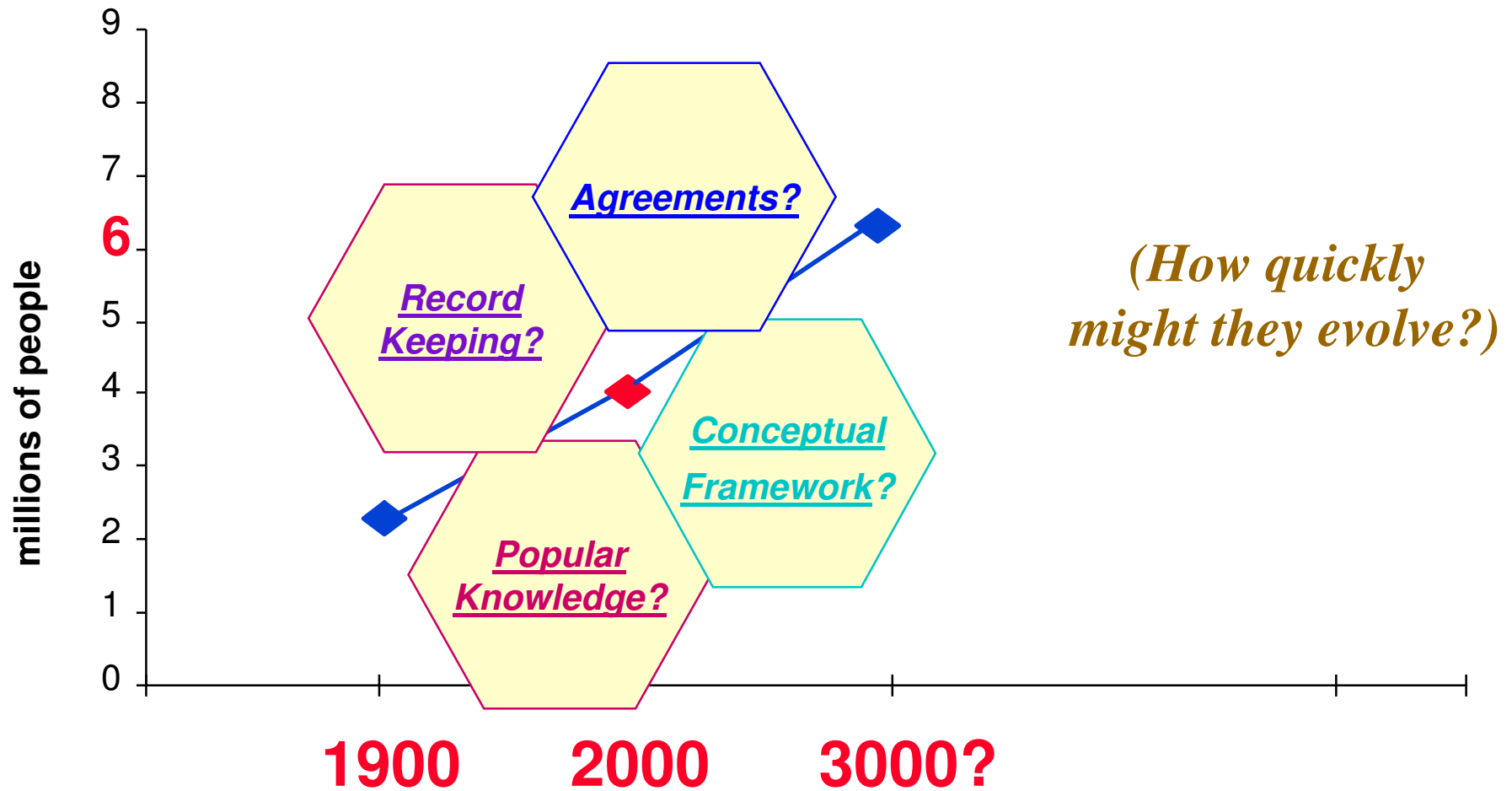


# What Might Be the New Necessity?

*Will it be the threat of food scarcity? Or ...*



# What Are Today's Experiments?



# What Will Be the Conceptual Framework?

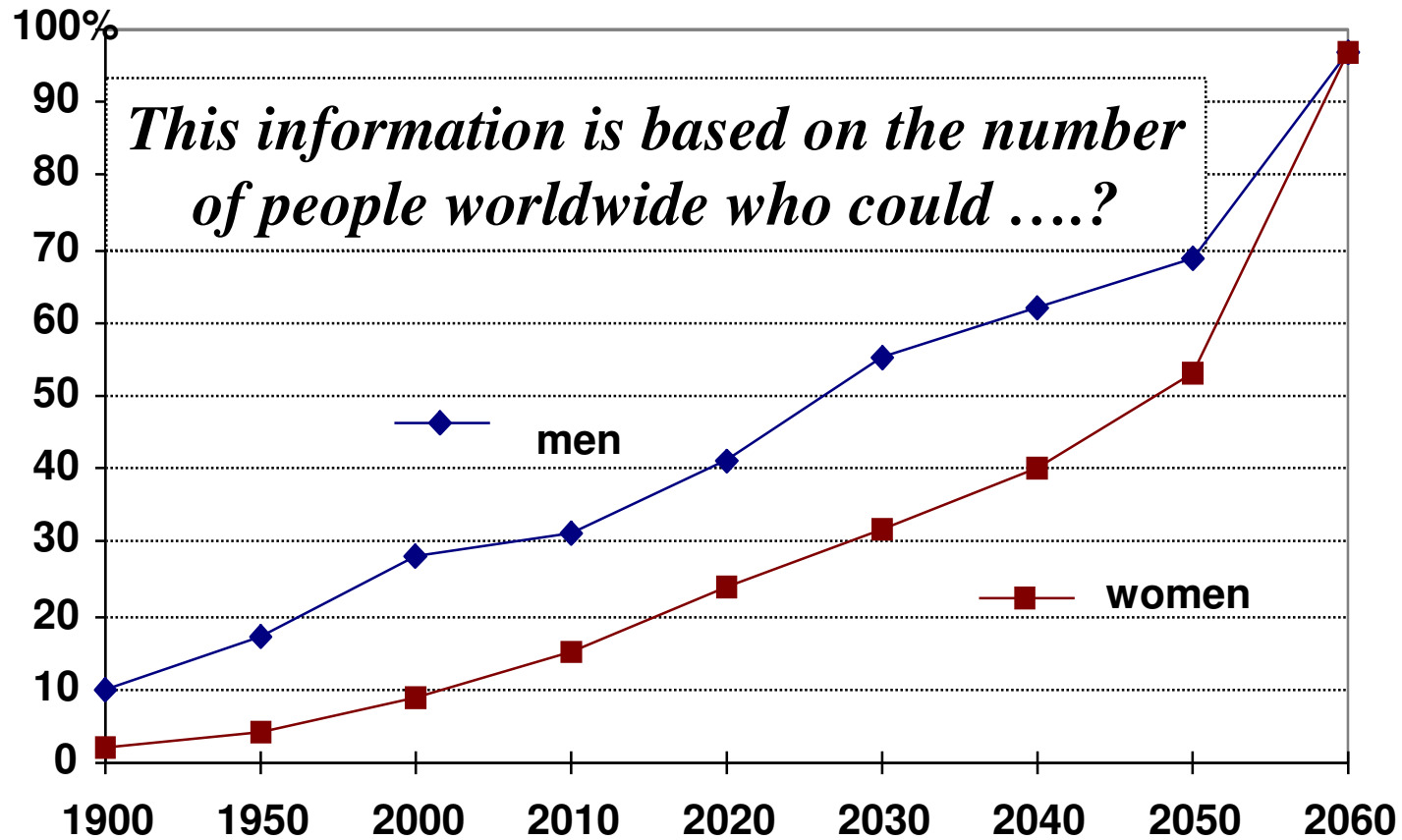
*Predictable  
homogeneities?*



*Or diverse, resilient mosaics?*



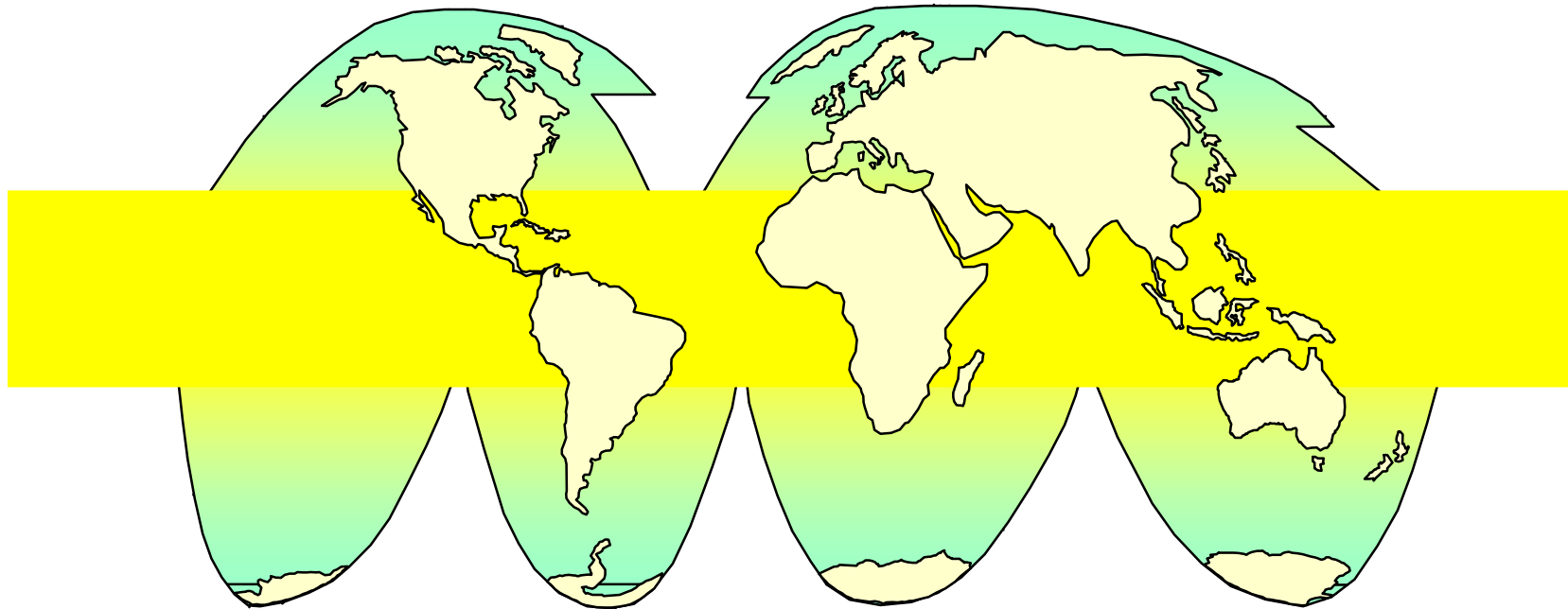
# What Will Be the Necessary Universal Skill?





# What Will Be the Important Engagements?

**Biodiversity increases in the tropics.**



**The most populous developing countries are also in the tropics.**

**Is there a form of non-industrial modernisation?**

# Where Will We Find a Workable Scale?

## Intimacy?

- < 6-8 mln people
  - Scale of:  
*streets, ships, households*
- Church pews
- Personality over time
  - Walking as  
*recreation*

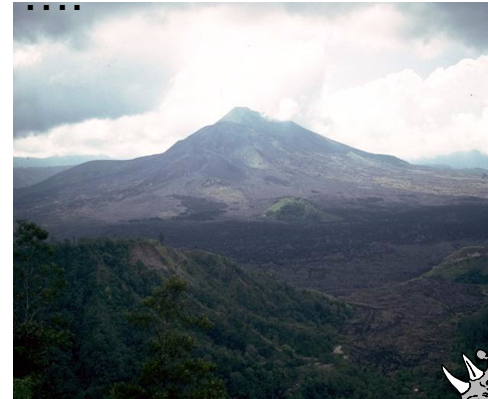
**Where will we engage  
face to face  
over the long term?**

# What Will Be the Price Signals?

There is a clear market for eggs, fruits & vegetables



Where is the market for



Sinks



Non-use of Resources?

Biodiversity?

*Where are the positive incentives?*

# Another View of Technology

