

# **THE EVOLUTION OF HUMAN BEHAVIOUR**

## **Principles and Processes**

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THE UNIVERSITY OF  
**SYDNEY**

## Evolution

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## **KEY ISSUE: THE MILLENNIA-LONG ACCELERATION OF THE RATE OF HUMAN BEHAVIOURAL CHANGE**

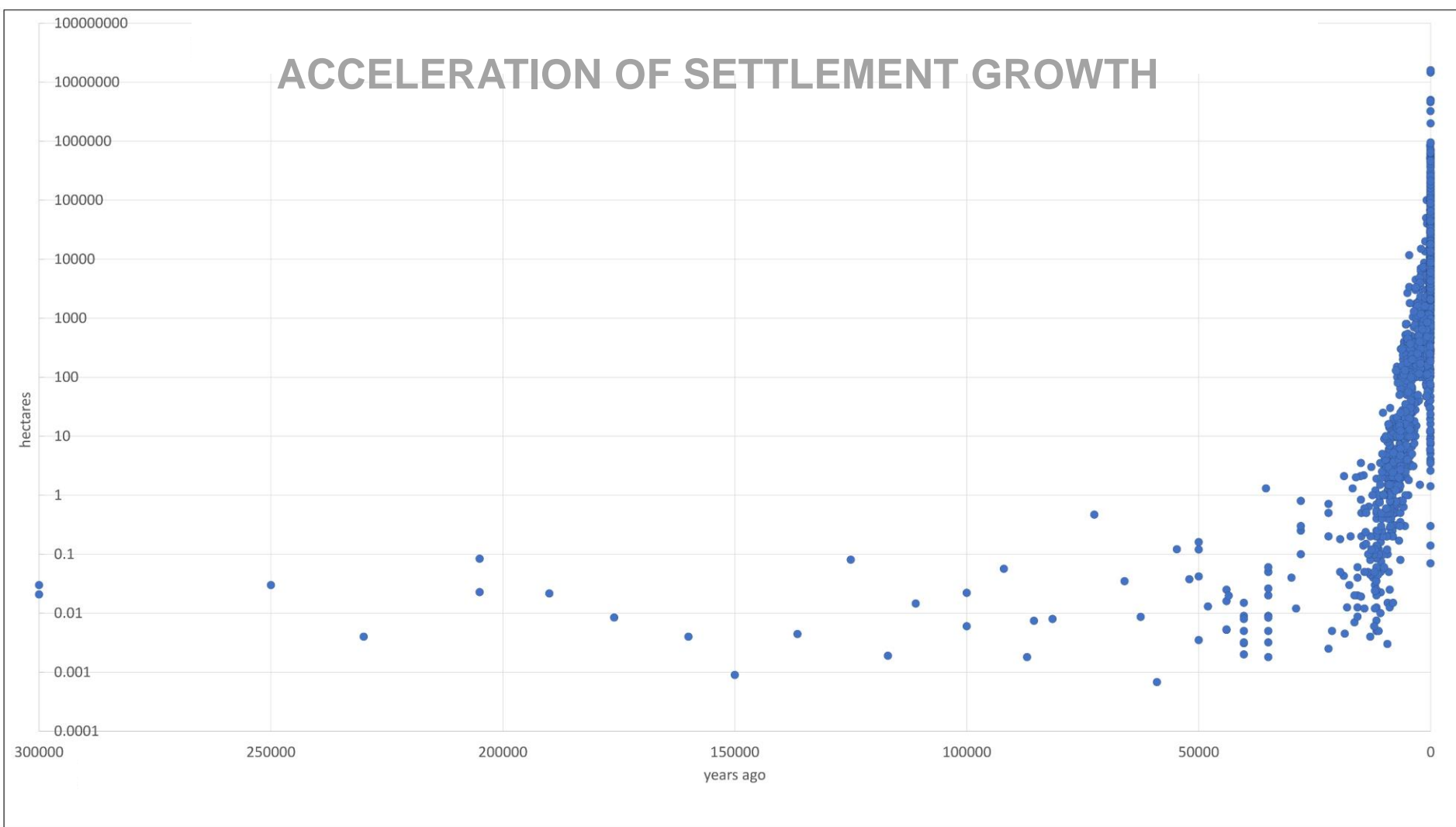
**A chaotic process of disparate trajectories and diverse combinations of behaviour punctuated by abrupt, brief, highly ordered spatial transition phase changes.**

**As with biological evolution per Gould and Eldredge, this is a process of punctuated equilibrium with divergent development occurring between the punctuated phase changes.**

**This talk is focussed on the phase changes and the divergent ancestries from which those phase changes derive.**

Behaviour stable for about 4 million yrs with acceleration beginning after 50,000 BP

A classic expression of the accelerating recombinations derived from adjacent possibles



# **BASIC PRINCIPLES OF AN EVOLUTIONARY PROCESS**

**SELECTION - operates on variation**

**VARIATION - randomly generated relative to context**

**CODES – internally coherent replicators which generate variation**

## **SELECTION in HUMAN BEHAVIOUR**

Internal selection affecting **interaction and communication** is generated by operational, behavioural, boundary limits

*Unavoidable selection effects impacting all behaviour*

## **VARIATION in HUMAN BEHAVIOUR**

Variation on which selection operates. In human behaviour this includes durable materials – which generate ways to manage **interaction** and enhance **communication**.

*Internal selection continuously generates new modes of interaction and communication*

## **SIGNAL CODE STRUCTURE in HUMAN BEHAVIOUR**

Behaviour has a triple code, with each code operating at different replicative rates and therefore producing variations at different rates.

*Disjunctions occur between the three codes of speech, action and materiality and these disjunctions generate accelerating change*



# THREE SIGNAL CODES IN HUMAN BEHAVIOUR

**Speech**

**fast replication rate**

**Action**

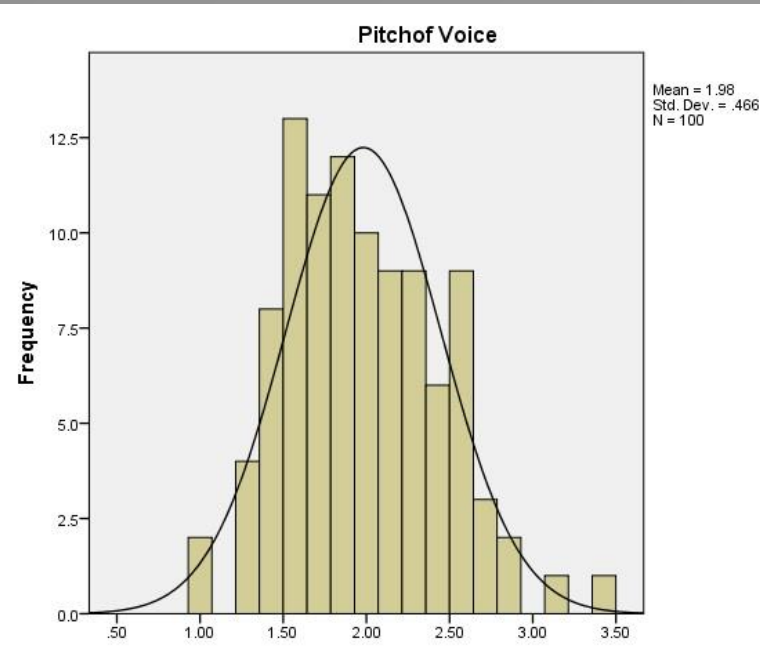
**slower replication rate**

**Material**

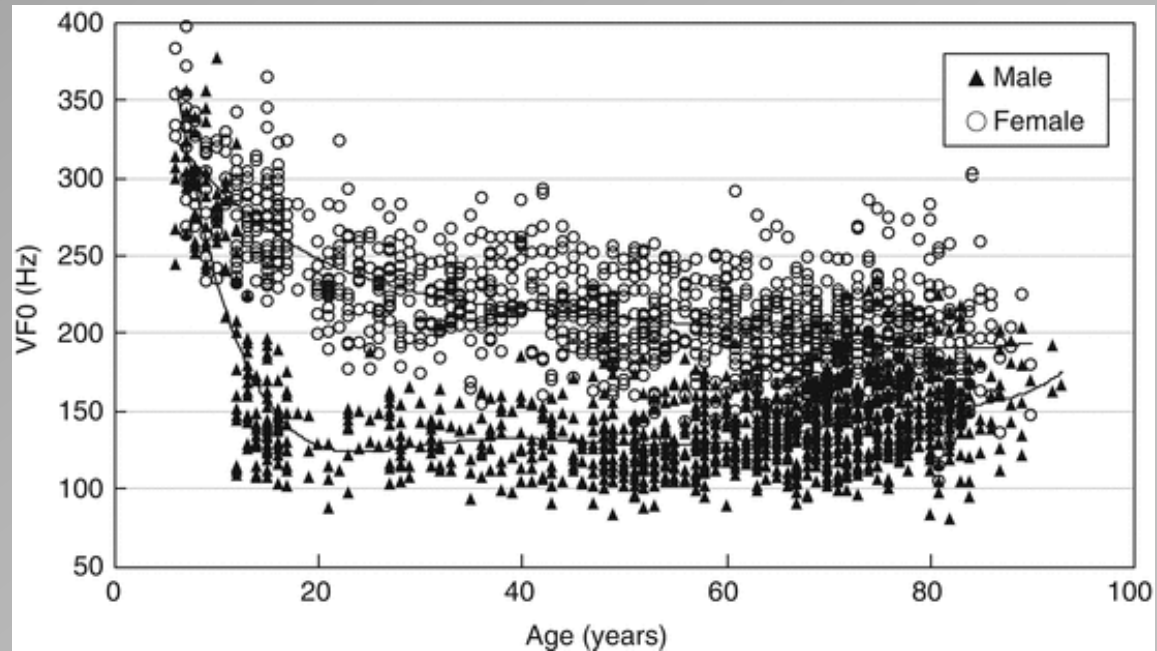
**much slower rate to very slow rate**

**NOTE: THE THREE SIGNAL CODES EACH PRODUCE VARIATION**

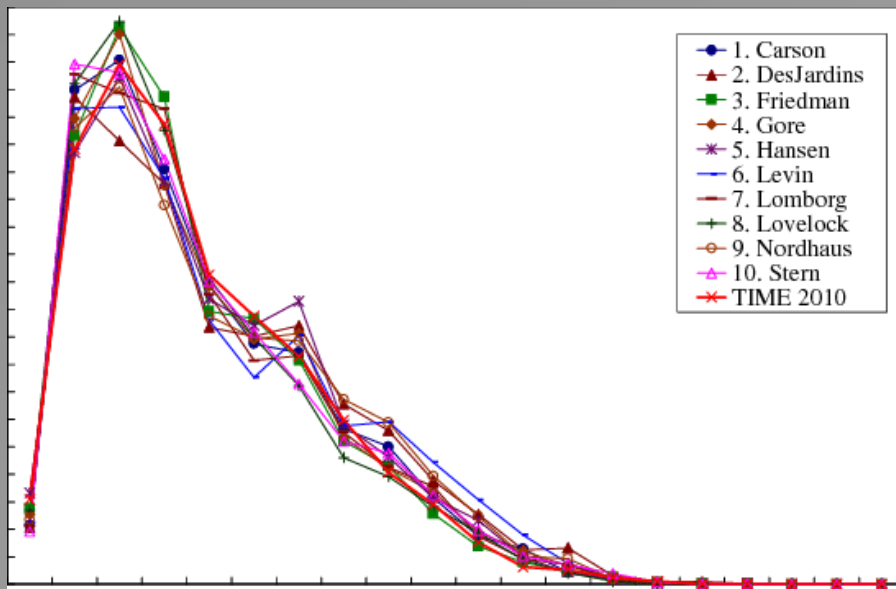
# SPEECH



Asgher, Ilyas and Rubab 2021



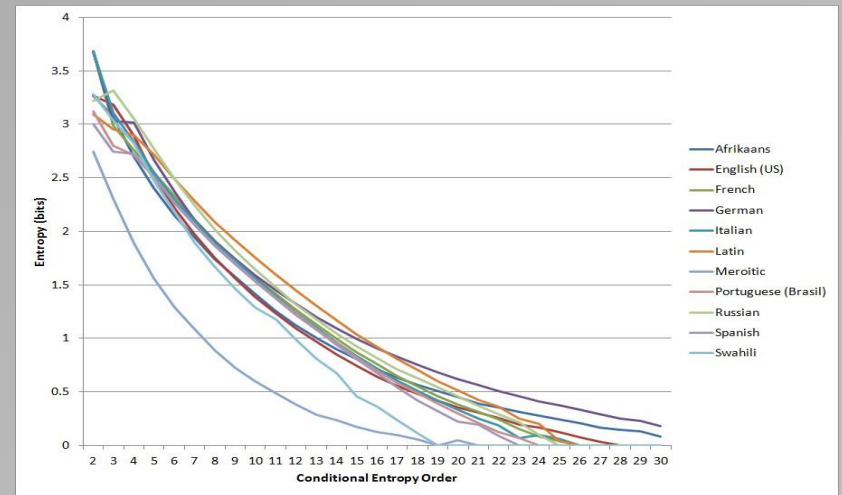
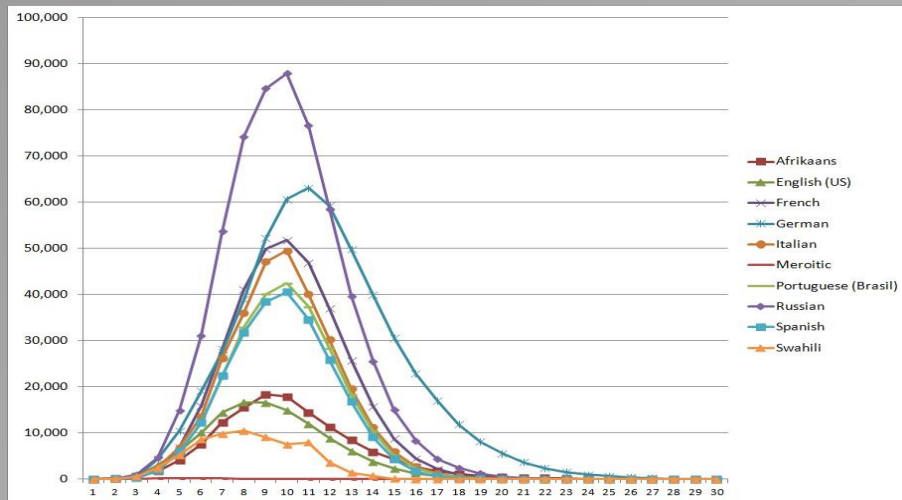
Kasuda and Yoshida  
2017



Ban and Oyabu 2012

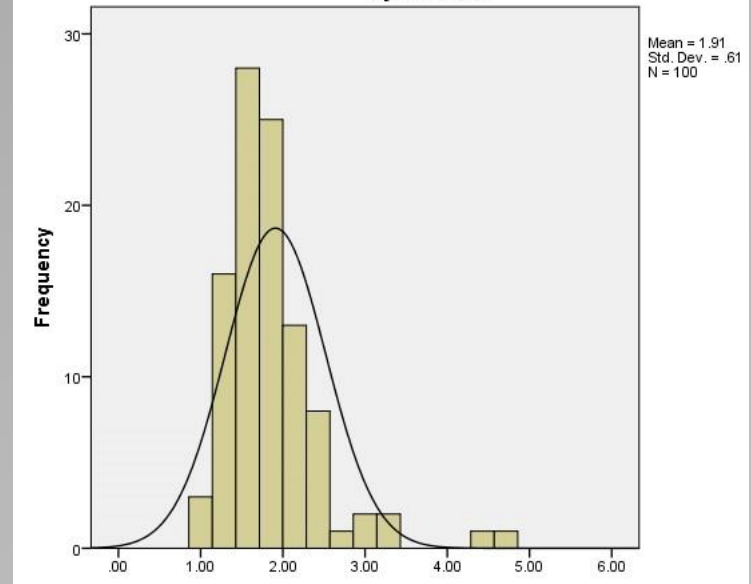
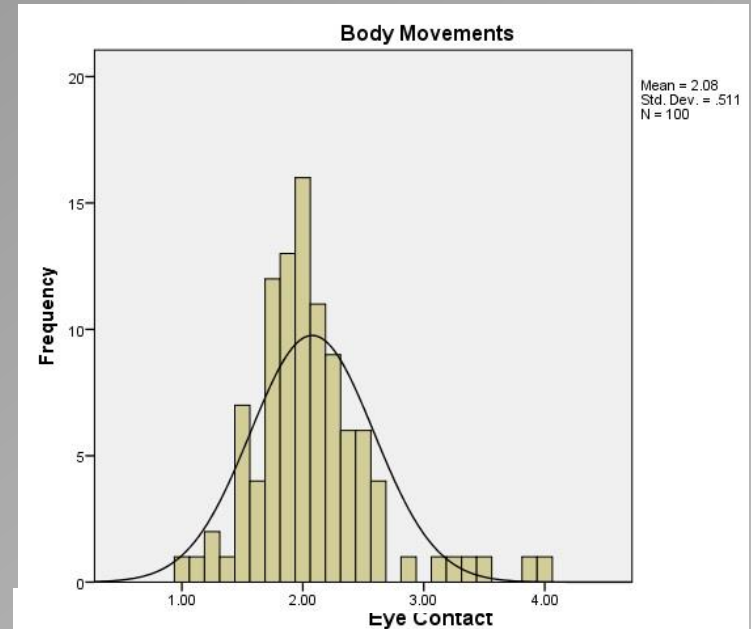
Within a language  
(books on the environment)

Between languages



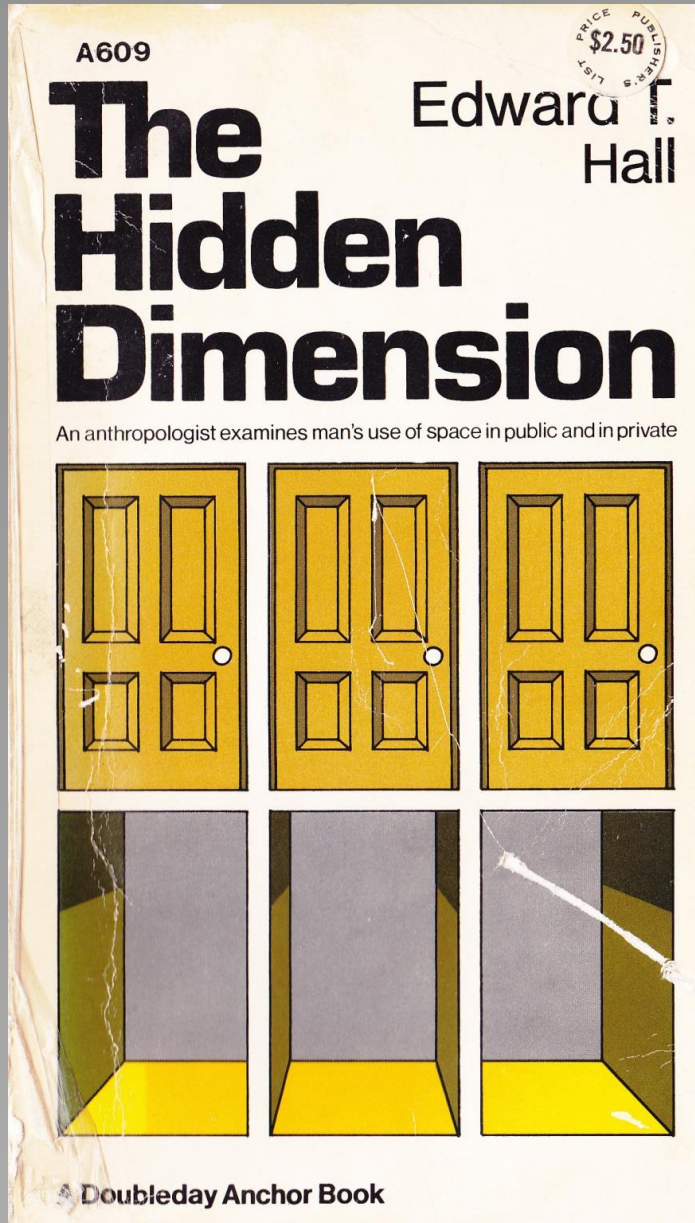
Smith 2012

# ACTION Non-verbal action - kinesics





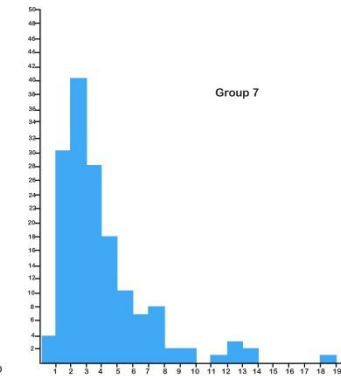
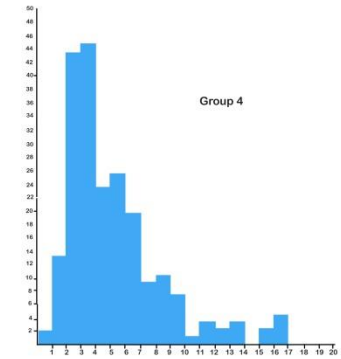
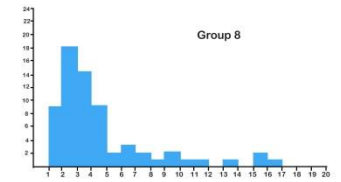
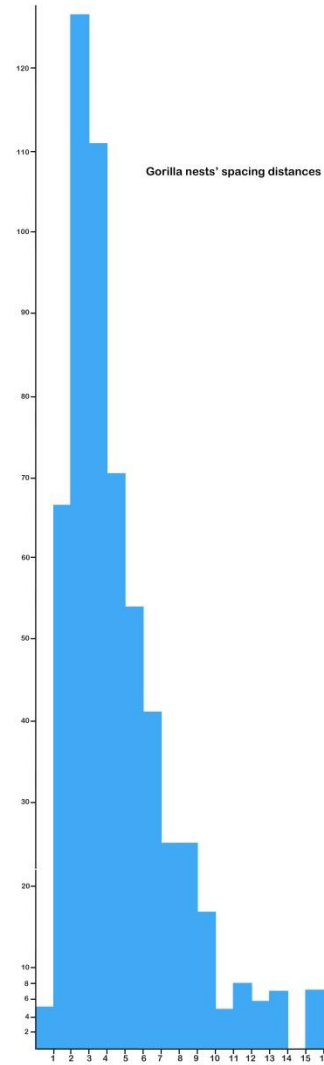
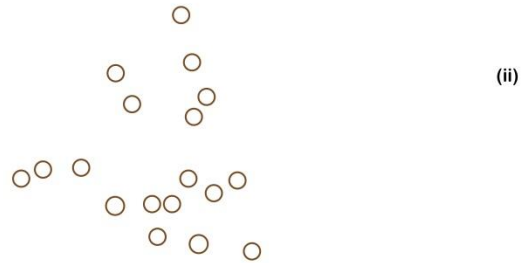
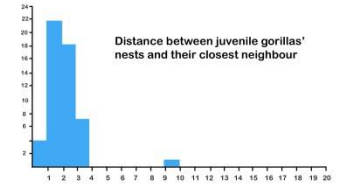
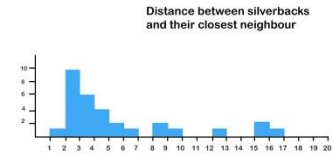
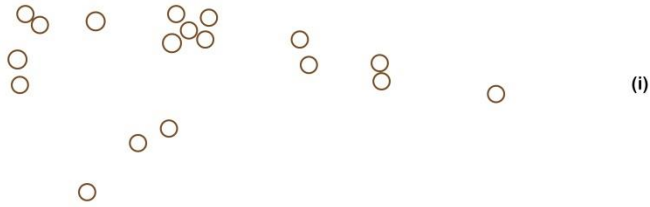
# Nonverbal action – proxemics



Psychology Today Ireland.



Veronesi



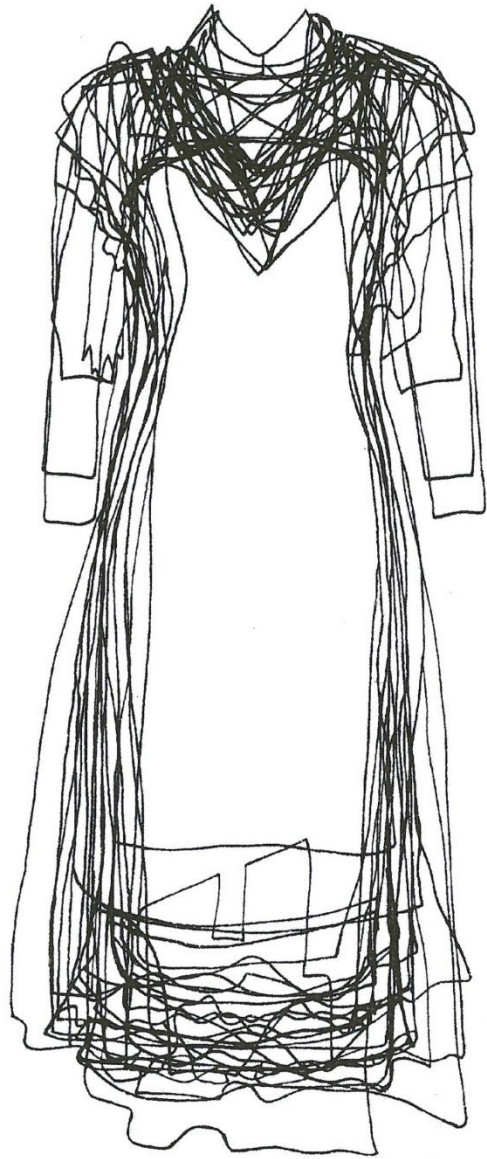
# GORILLA CAMPS (after Schaller)





Malin





Catherine Wu

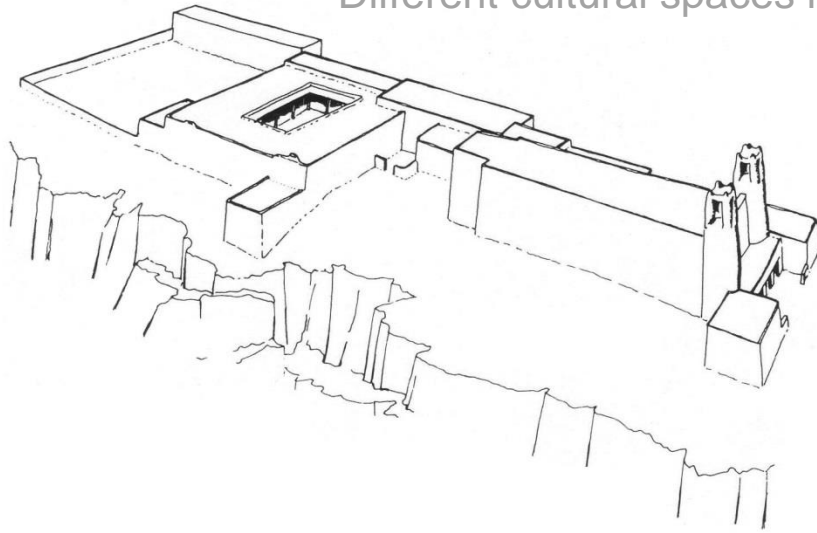
## MATERIAL



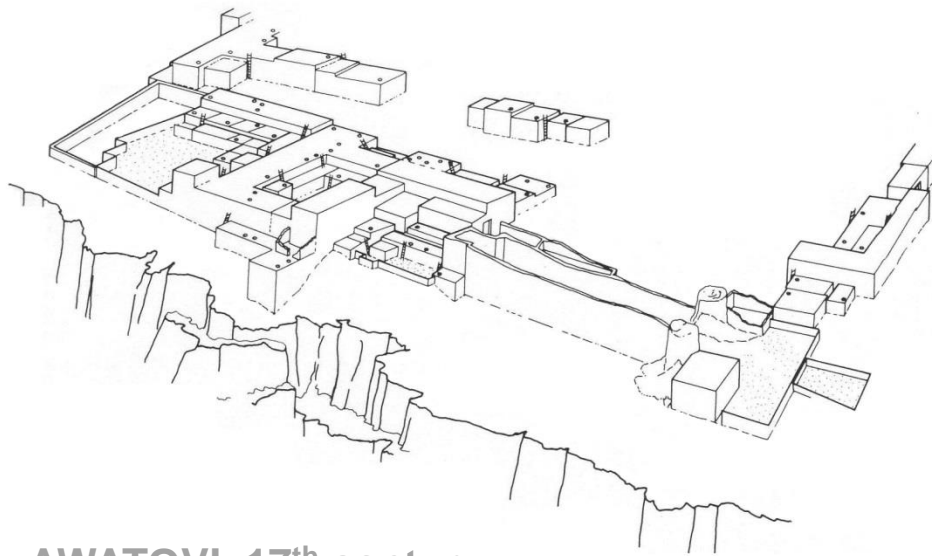
Source Marie Claire magazine



Different cultural spaces in the same environment



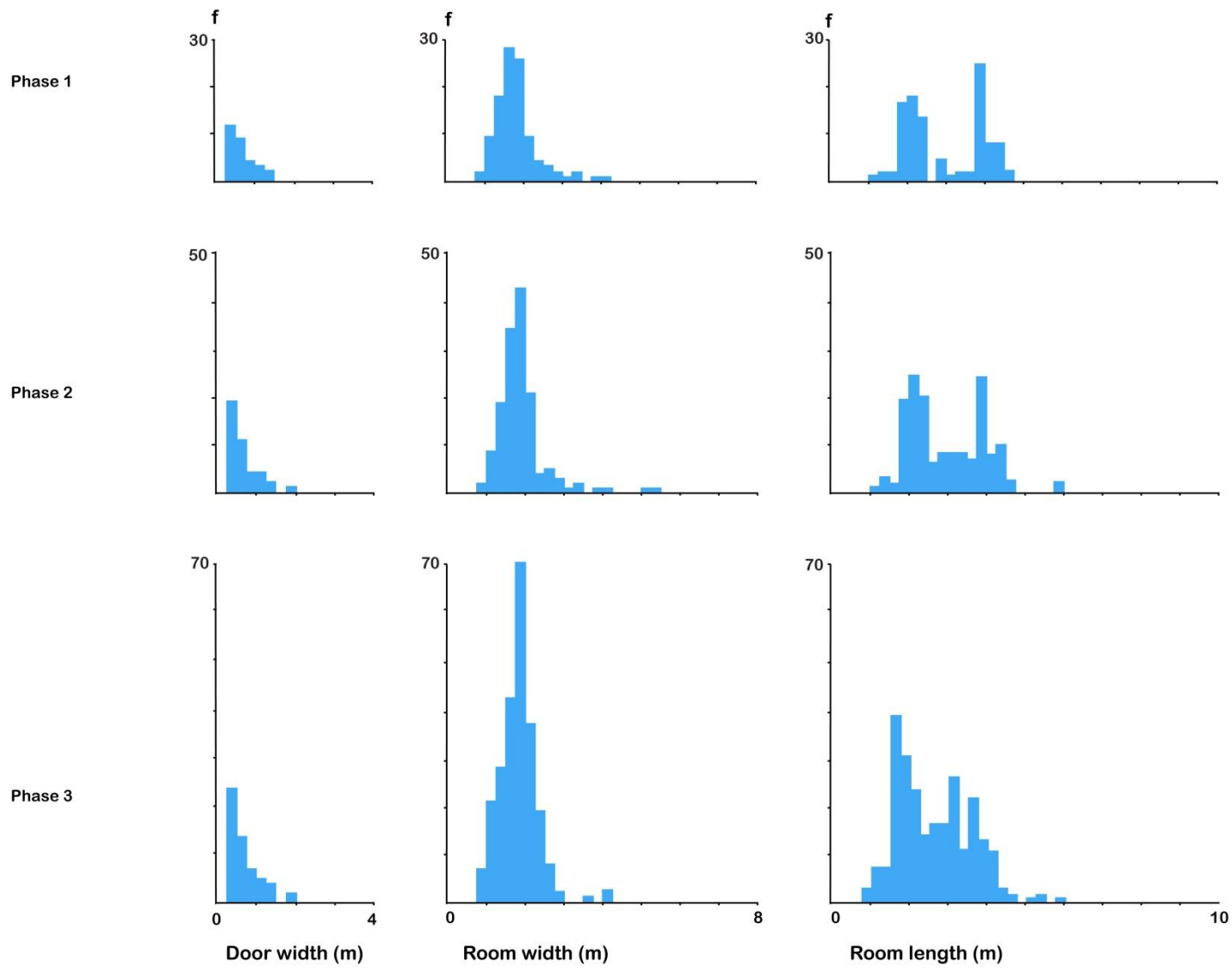
Mission



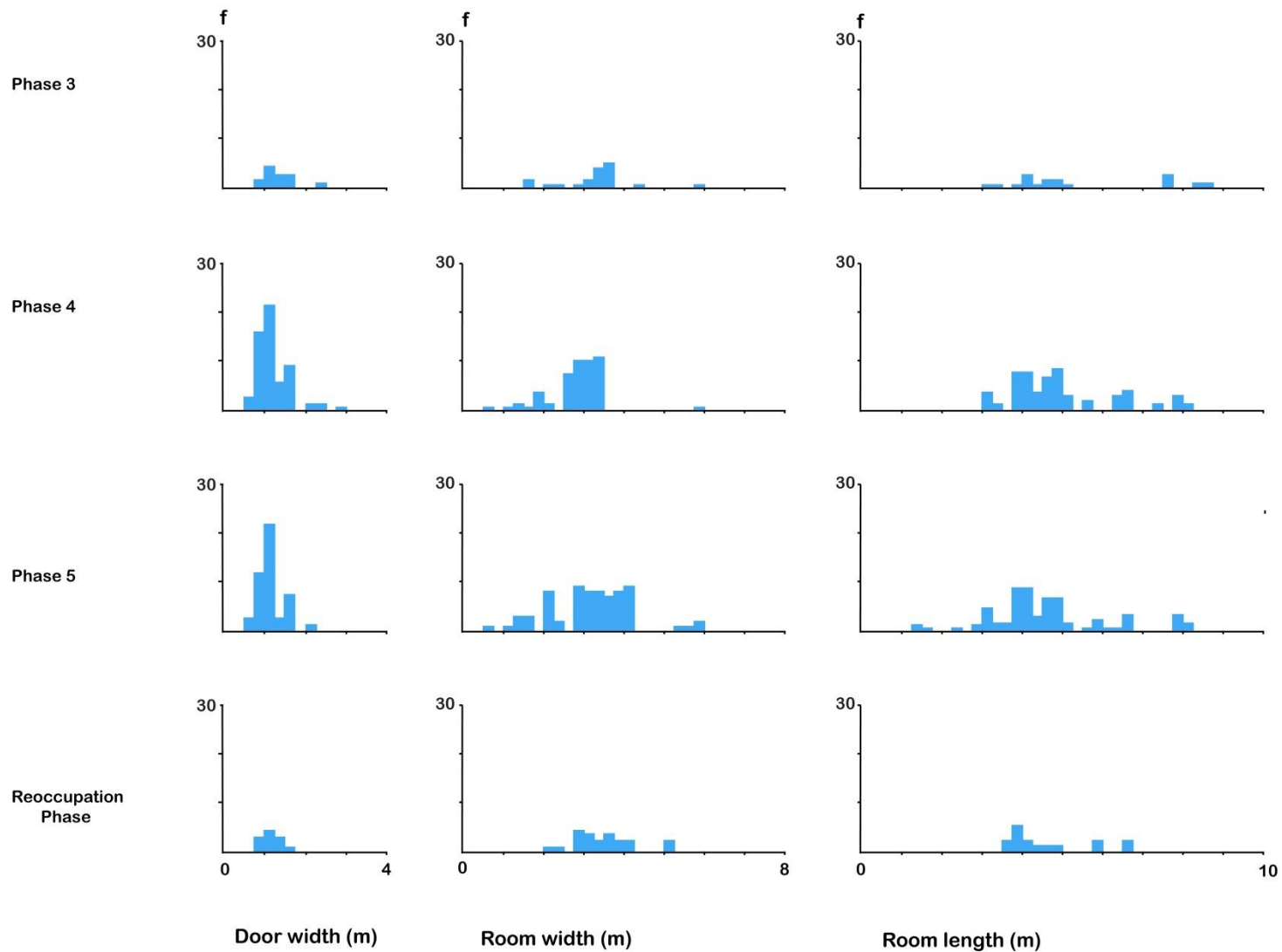
Pueblo

AWATOVI 17<sup>th</sup> century

Fletcher



Pueblo



Mission

# **SIGNAL CODES and NON-CORRESPONDENCE**

**REPLICATION RATE GENERATES RATE OF PRODUCTION OF VARIATION**

**EACH SIGNAL CODE GENERATES VARIATION AT VARYING RATES**

**THE DIFFERENT AMOUNTS OF VARIATION ARE INCOMMENSURABLE**

*Key Issue – the triple code is unlike the single biological code*

# **SELECTION**

## **BEHAVIOURAL BOUNDARY LIMITS**

**A selection effect internal to behaviour**

**Generates phase changes from diverse ranges of behavioural variation**

# **OPERATIONAL LIMITS ON VIABLE INTERACTION & COMMUNICATION**

**Limit on interaction due to finite capacity of brain to manage input**

*Index is an upper limit on high-density occupation*

**Limit on transmission due to finite capacity of a mode of communication**

*Index is the finite extent of settlement area for a mode of communication*

DENSITY in P/HA

High



Community not viable above this density

Community not viable beyond this area



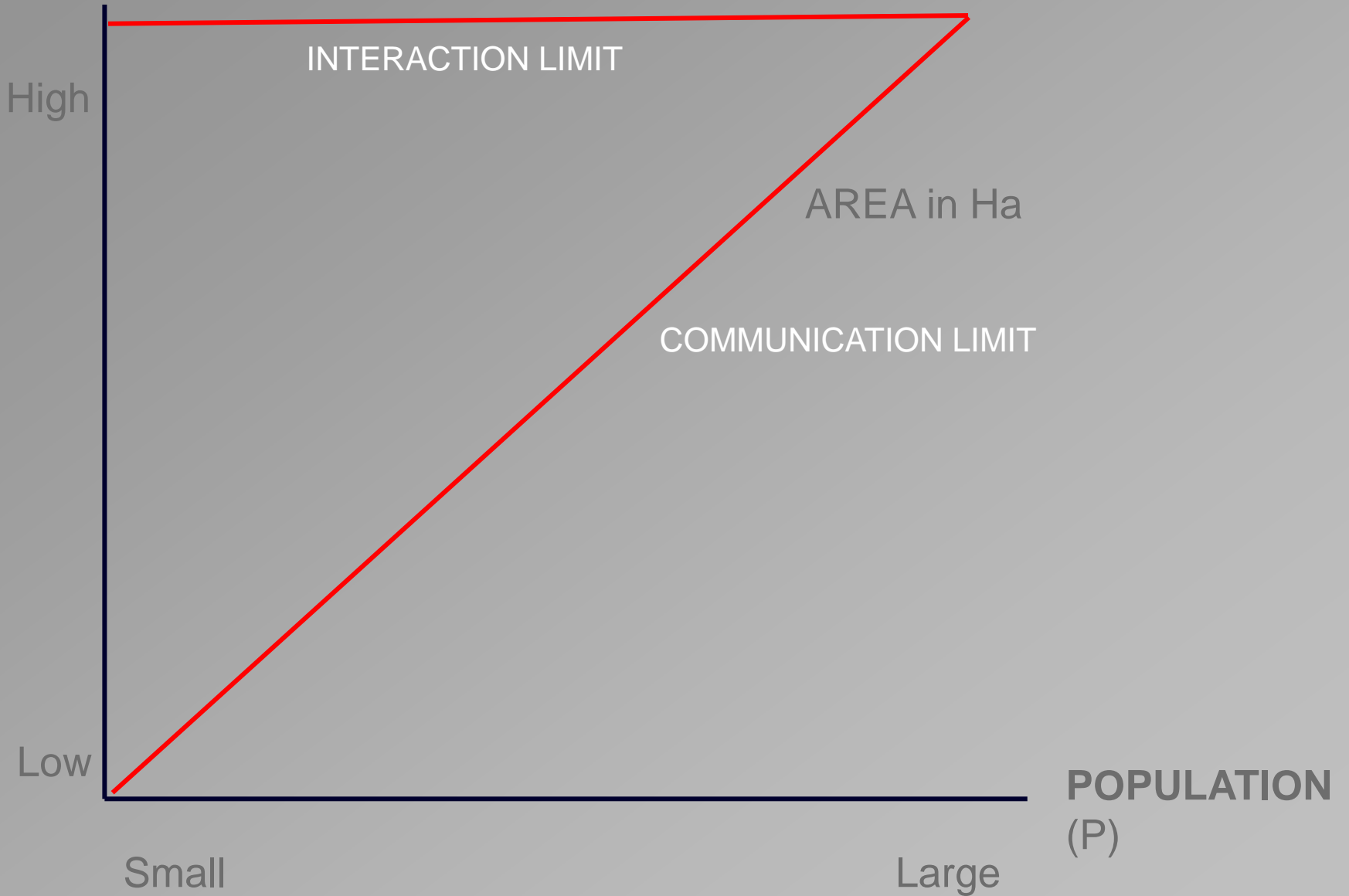
Low

AREA in Ha

Small

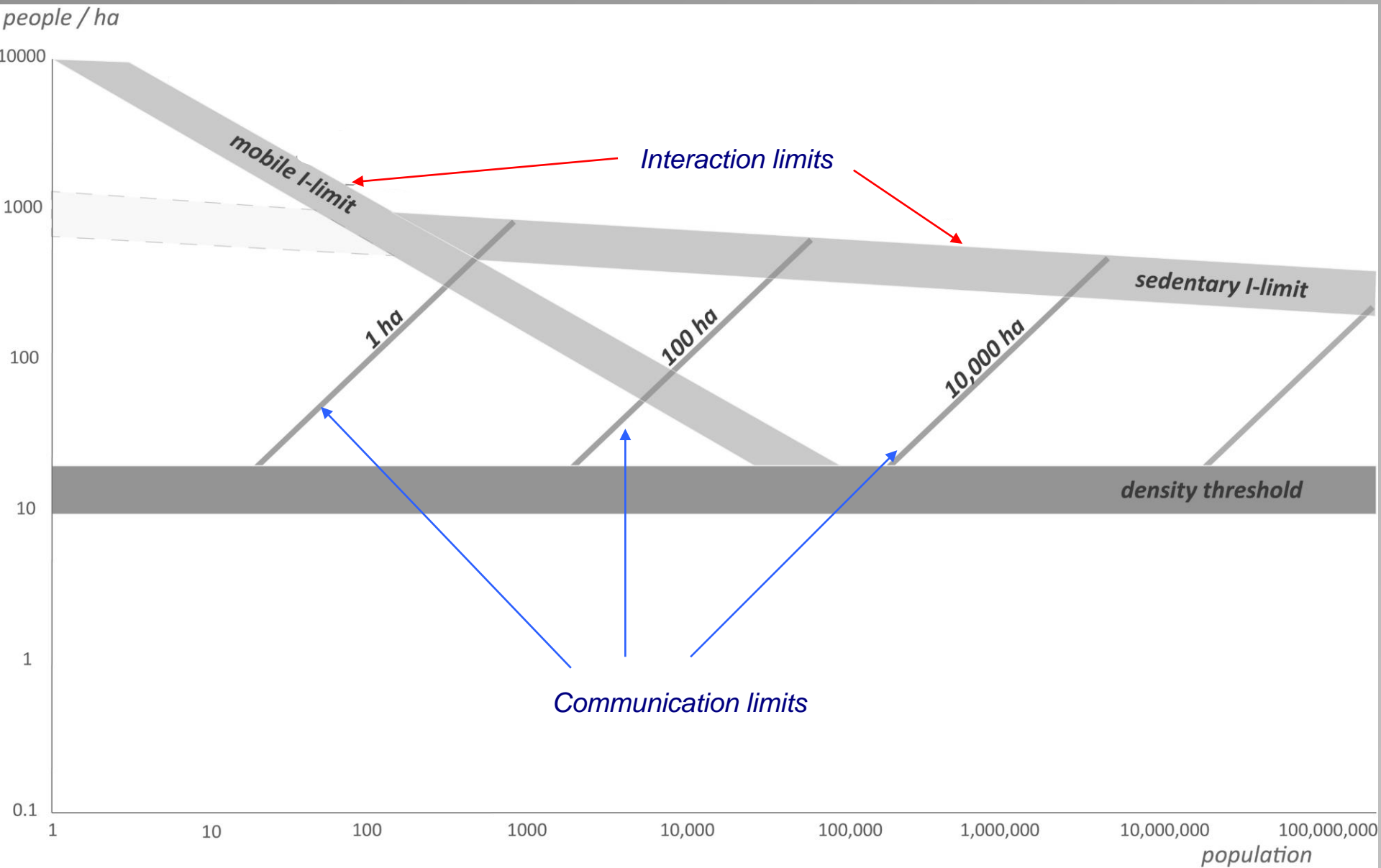
Large

DENSITY in P/HA

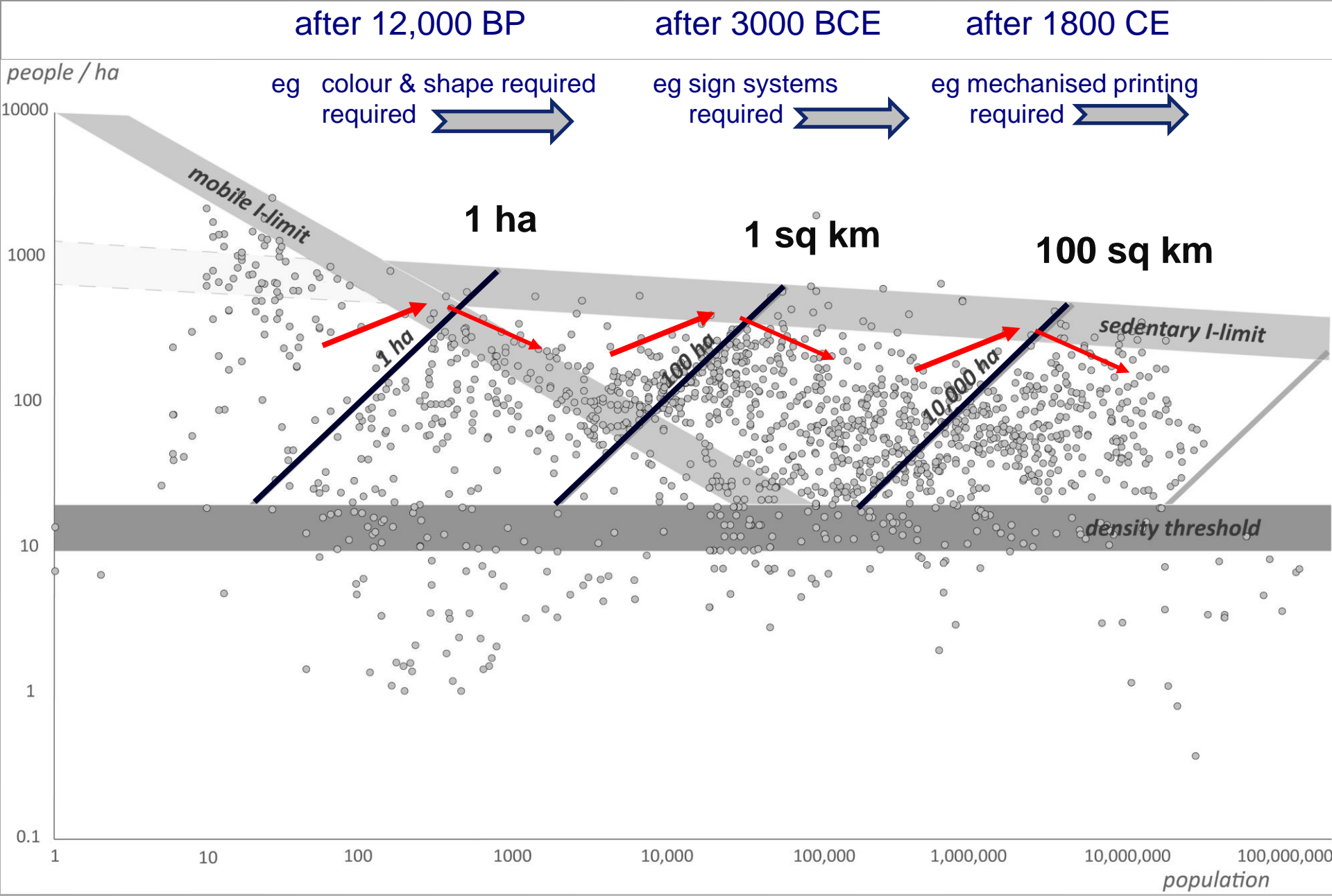




# THE MATRIX THROUGH WHICH SELECTION OPERATES



# TRANSITION PHASE CHANGES ACROSS COMMUNICATION LIMITS



# WHAT TRANSITIONS LOOK LIKE

**Transitions are punctuated accelerating spatial phase changes**

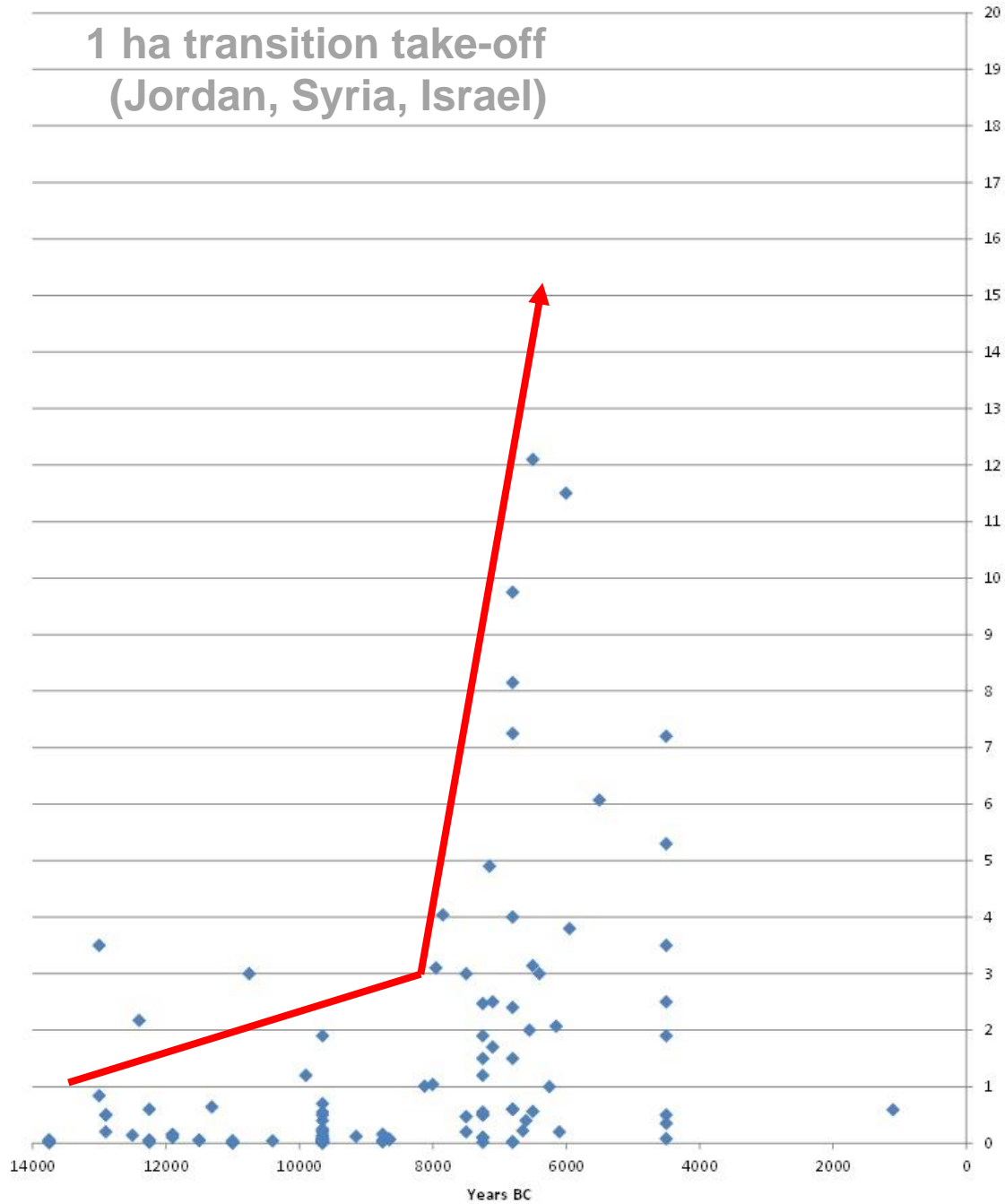
**Rapid initial take-off in settlement size.**

**Each transition occurs for compact settlements approx. 100 times larger than the previous transition.**

**Each initial transition take-off occurs approx. 1000 times faster.**

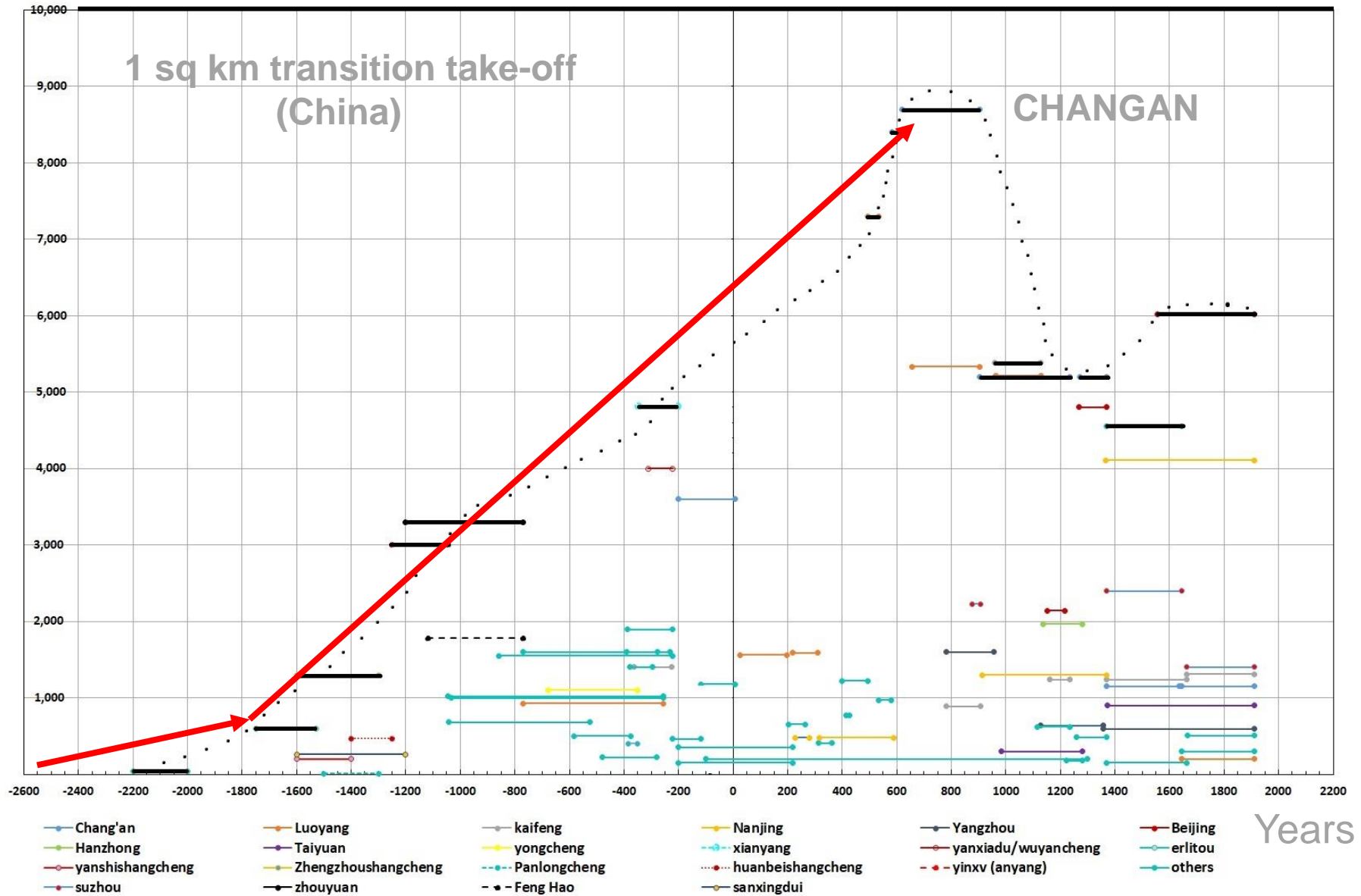
**Time-lag between successive transitions is approx. 10 time shorter.**

# 1 ha transition take-off (Jordan, Syria, Israel)



Hectares

100 SQ KM LIMIT

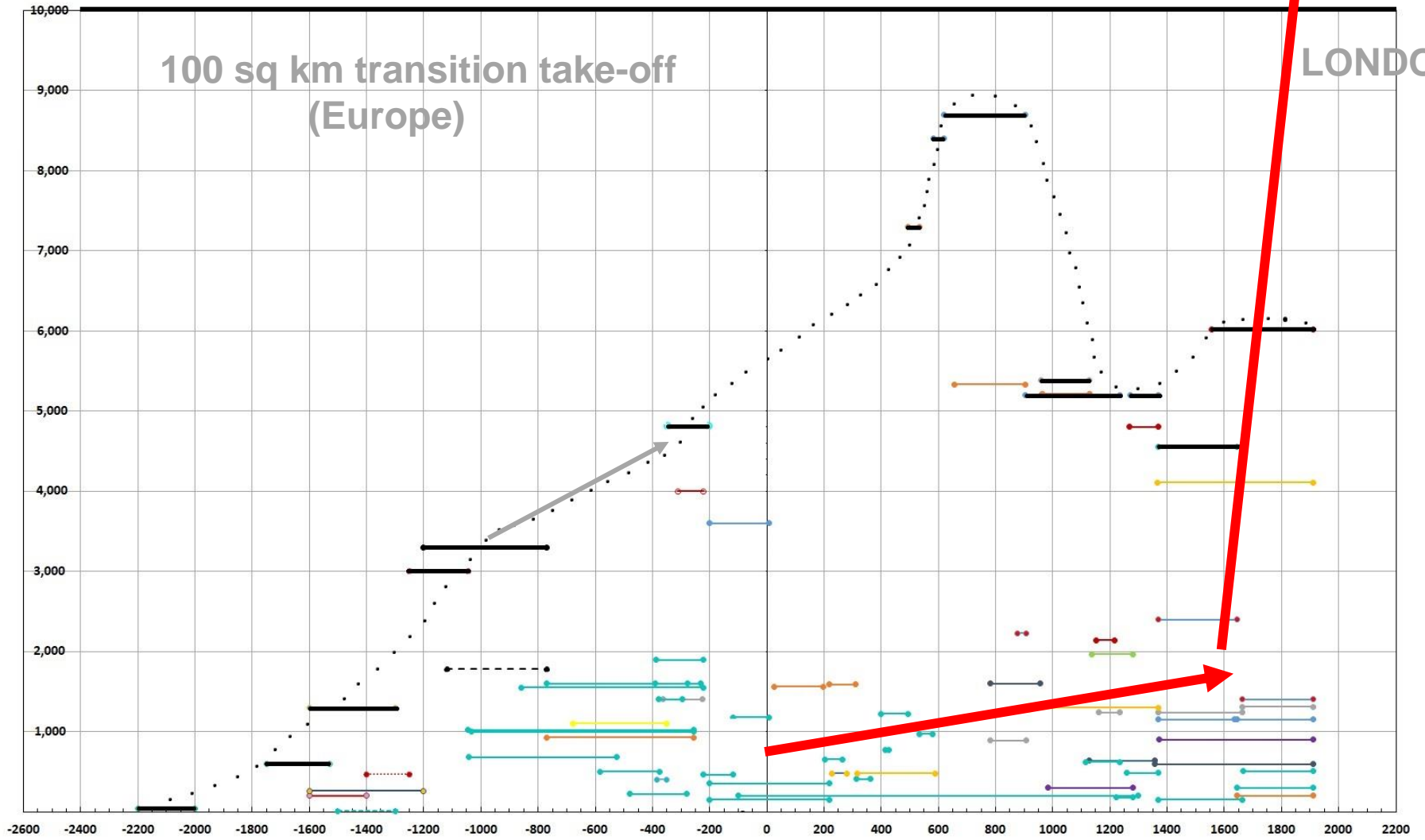


Hectares

100 SQ KM LIMIT

100 sq km transition take-off  
(Europe)

LONDON



- Chang'an
- Luoyang
- kaifeng
- Nanjing
- Yangzhou
- Beijing
- Hanzhong
- Taiyuan
- yongcheng
- xianyang
- yanxiadu/wuyancheng
- erlitou
- yanshishangcheng
- Zhengzhoushangcheng
- Panlongcheng
- yinxv (anyang)
- others
- suzhou
- zhouyuan
- Feng Hao
- sanxingdui

Years

## WHAT PRECIPITATES A TRANSITION ?

Transitions occur when new combinations of material features that manage interaction and facilitate communication come together – at random – in an assemblage.

These are the necessary *material prerequisites* to manage space, time and sight and sound.

Transitions are sustained *if* the assemblage also coincides with a new way to produce energy.

In combination the new assemblage and the new energy production are a new mode of operation.

*eg the “Industrial Revolution” was a new mode of operation.*

**The new prerequisites occur, after a transition, at random eg on their own or with other material entities, in the lower third of the settlement size range in a region.**

**For example: the 1 sq km transition in China circa 1800 BCE**

**In settlements less than 30 ha in extent, antecedents to the assemblage of material prerequisites for the transition had been developing for millennia all over central and eastern China.**

**Sign and notation systems**

**Calendrics**

**Differentiated access**

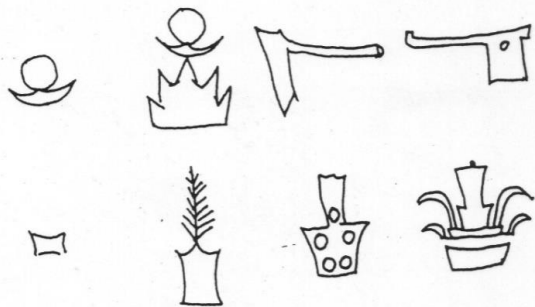
**Multi-room, rectilinear structures**

**Durable walling**

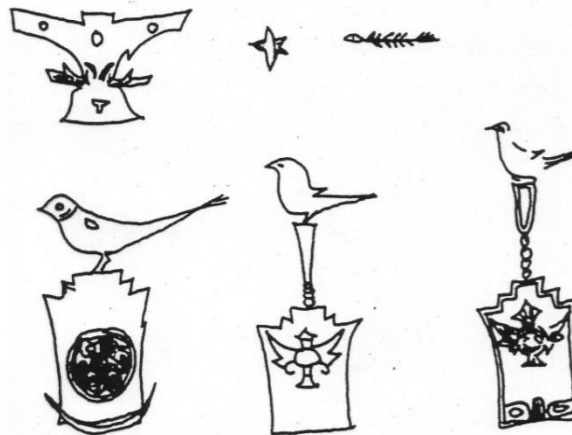
**Large structures**

**Internal segregation of settlement space**





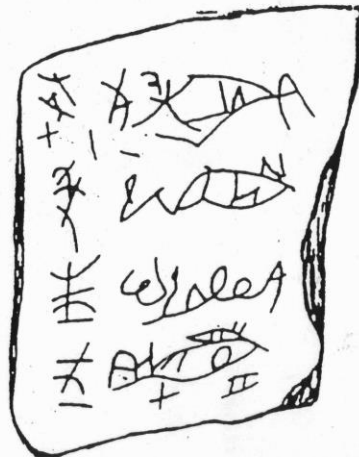
Dawenkou (4000-2500 BC)



Signs incised on a jade of the Liangzhu Culture (c. 3300-2200 BC).



Inscription of 11 characters found incised on a pot sherd of the Longshan culture (c. 2400-1900 BC), discovered in Dinggong, Juxian, Shandong (L. 7.7-4.6 cm, W. 3.0-3.4 cm) (after Shandong daxue lishixi kaogu zhuan 1993: plate 1).



Potsherd from Longqiu (after Zhongguo wenwu bao 14 November 1993).

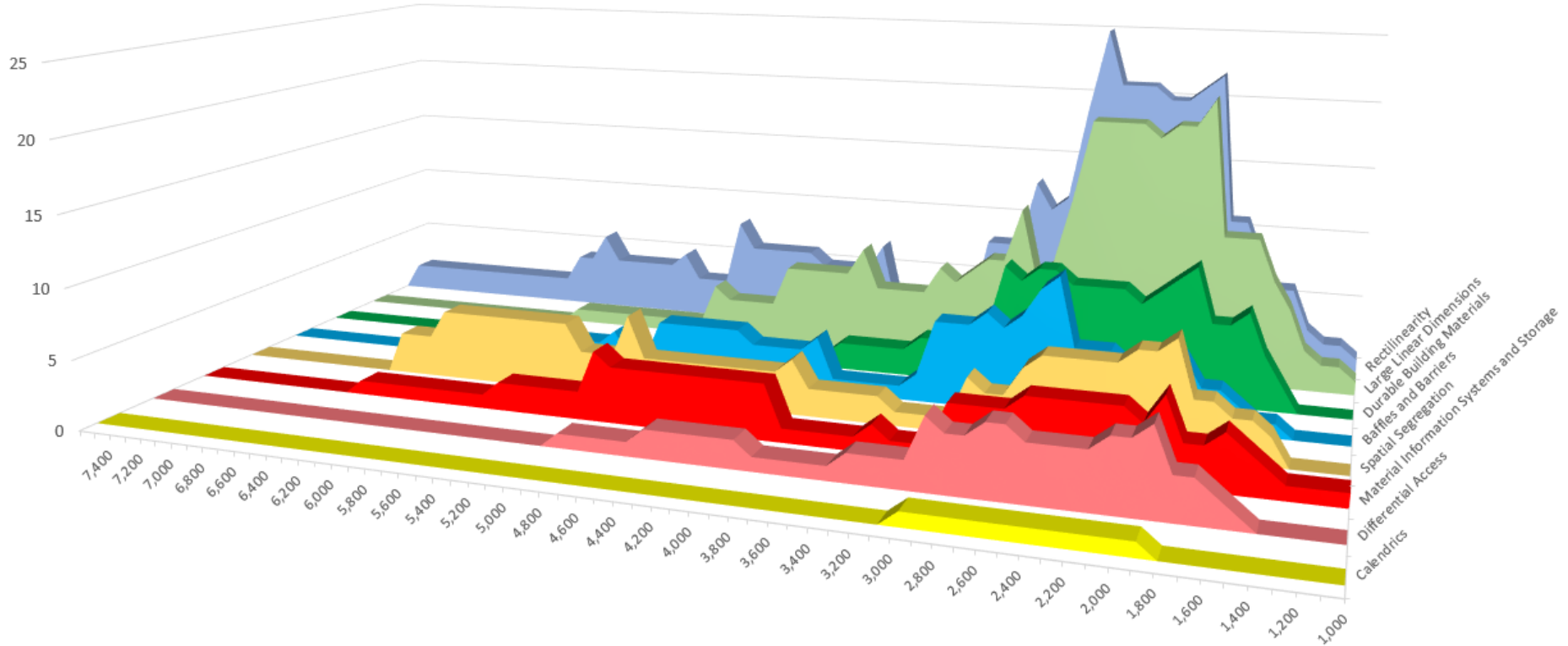


Jiahu 6600 BC

Eight symbols from a black pottery basin of the Liangzhu culture (after He 1937: 8).



# ANTECEDENTS TO THE MATERIAL PREREQUISITES



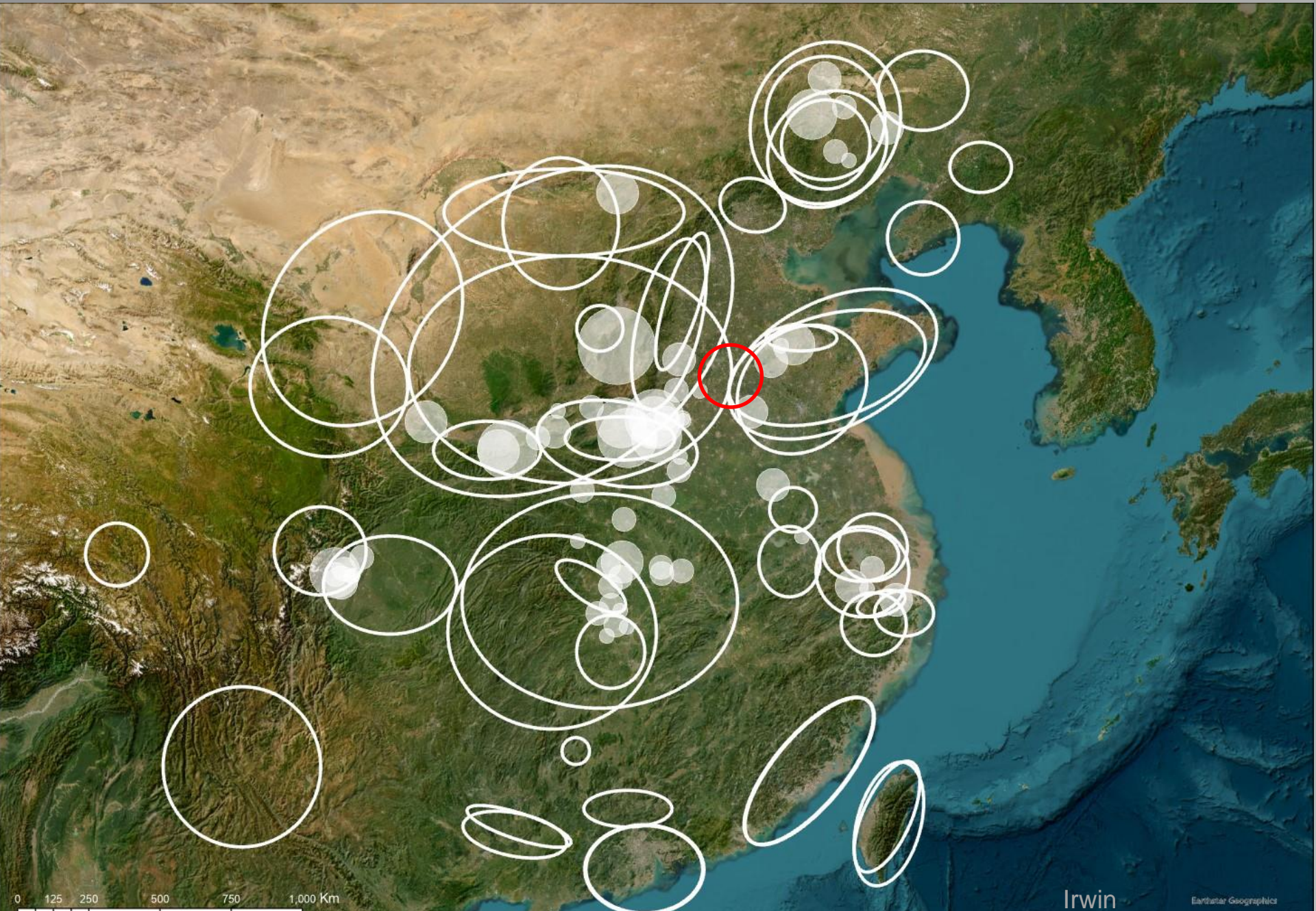
CHINA from 7500 – 1800 BC temporal distribution of prerequisites

After the 1 ha transition and before the 1 sq km transition





Initial area where compact settlements larger than 1 sq km developed after 1800 BC



0 125 250 500 750 1,000 Km

**The antecedents of the individual material prerequisites occur long before a transition.**

**They occur in isolation, in varying combinations and with other material features that are not antecedent to the material prerequisites of the transition assemblage.**

**They can arise and then never combine to produce a transition assemblage.**

**They arise with diverse functions which may be unrelated to the eventual function they will have in a later transition.**

**The material features have no specific correlation to particular forms of sociality and occur in diverse and very different social contexts and societies.**

***The material features and their combination are a myriad “adjacent possibles”.***



# **INTERNALLY GENERATED SUCCESSIVE CHANGE**

**Internal selection due to behavioural boundary limits.**

**Impacting on new material variants being produced at increasingly rapid rates.**

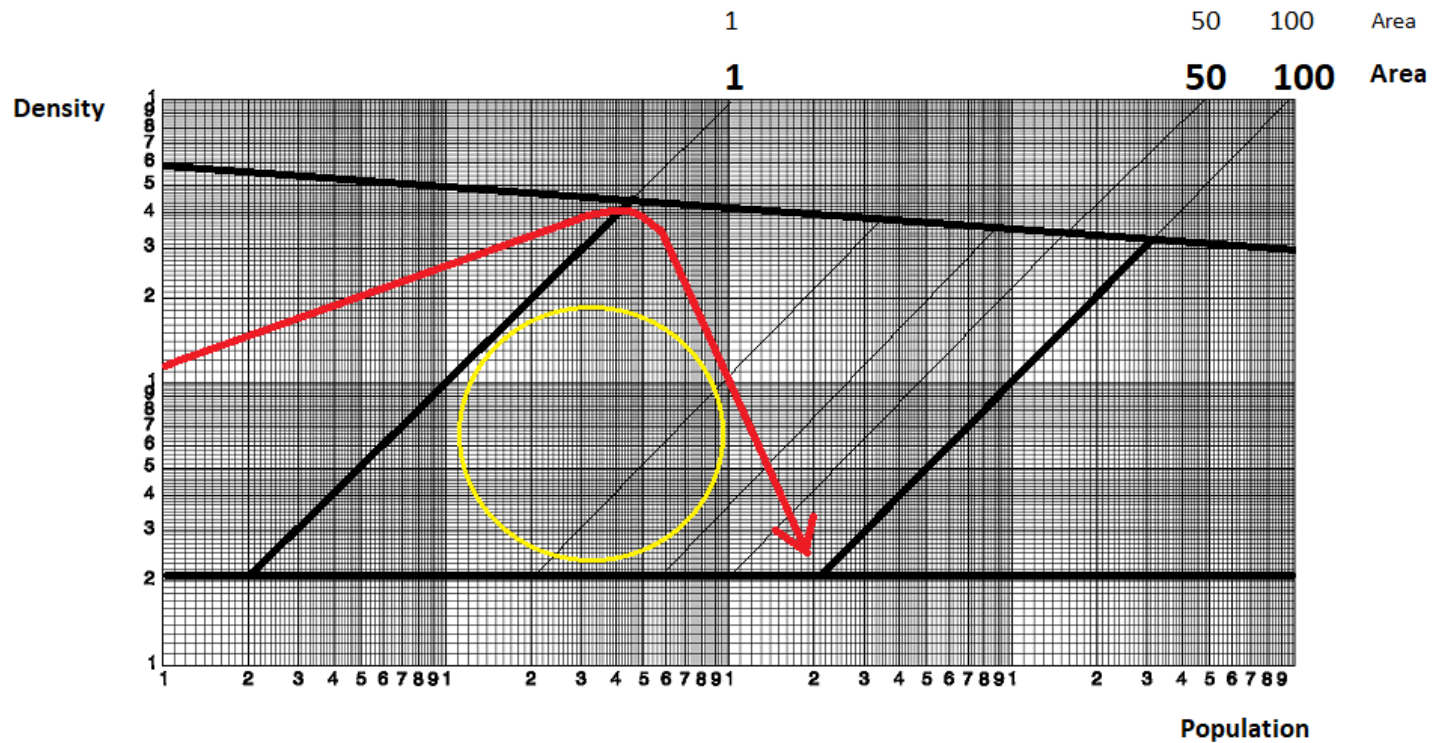
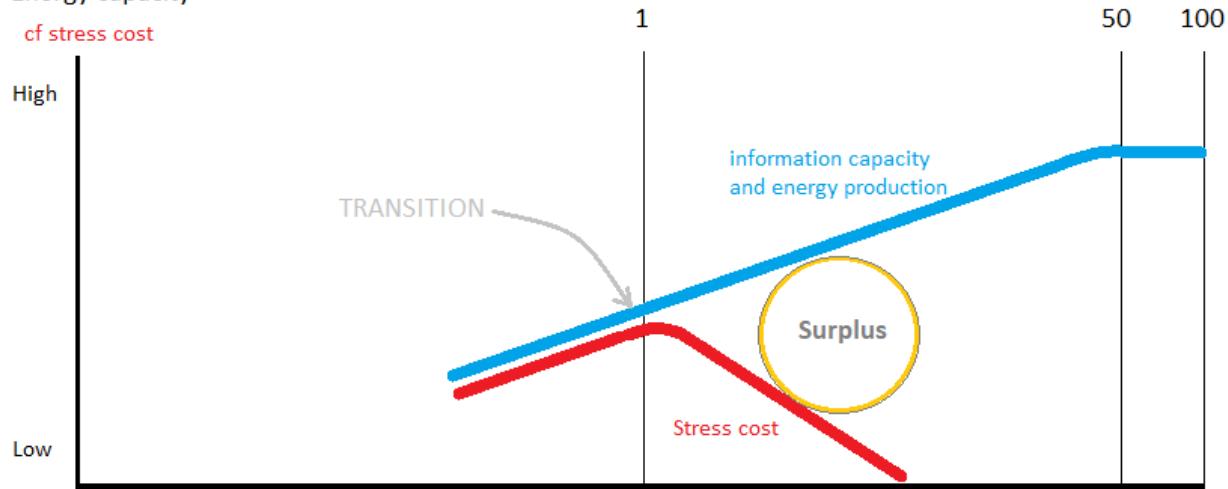
**Due to non-correspondence between behavioral signal codes.**

**Generates the increasingly rapid occurrence of the antecedents to the material prerequisites required for transitions.**

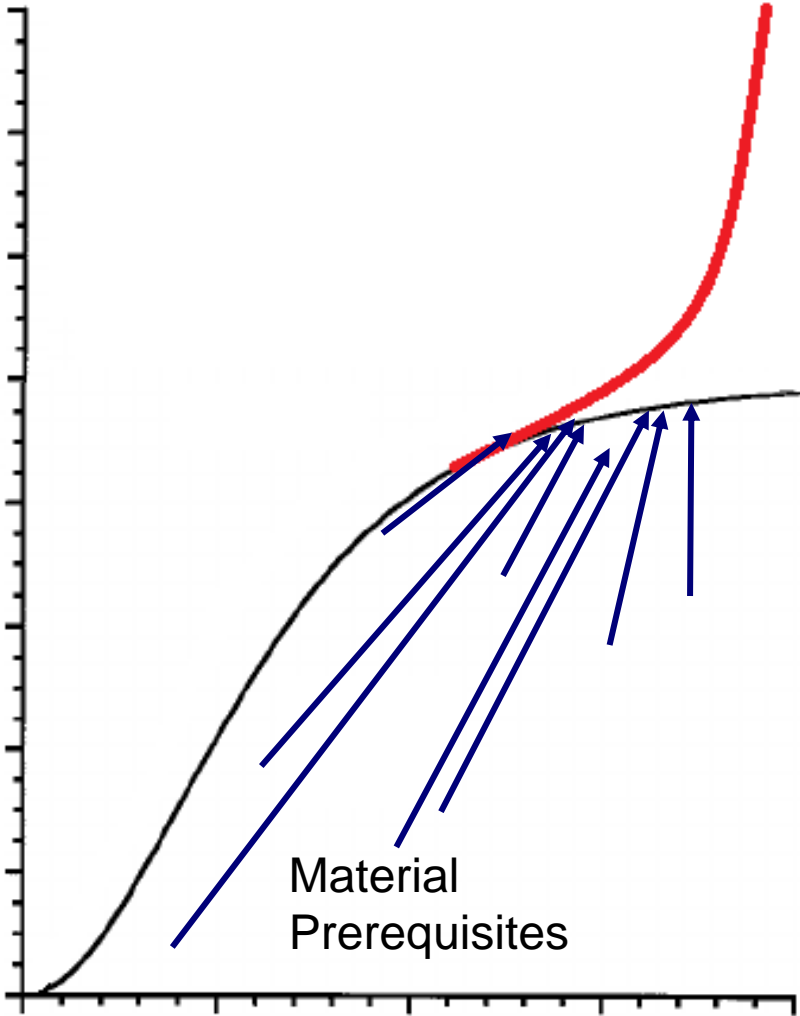
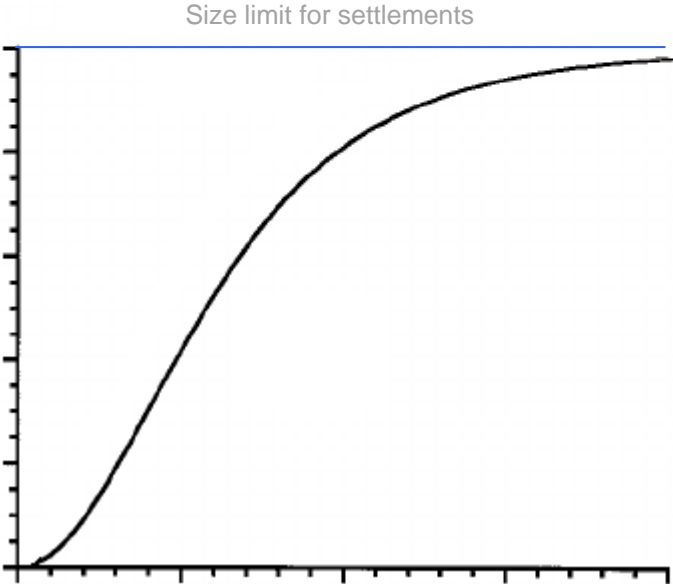
***The effect is produce inertial override of the size constraints inherent to a preceding transition.***

Information and Energy capacity

cf stress cost



# INERTIAL OVER-RIDE



The effect is that a transition produces the effects which lead to the next transition

# **AGGREGATE ACCELERATION OF CHANGE**

**Incessant selection from within behaviour, occurs due to stresses inherent to interaction and communication.**

**The selection effects impact the entire spectrum of behaviour.**

**Selection impacts the use of durable materials - which can manage interaction and facilitate communication and produce new energy**

**The triple code creates inherent non-correspondence which continually triggers selection effects.**

**Successive transitions require further enhancement of information management and increased energy production.**

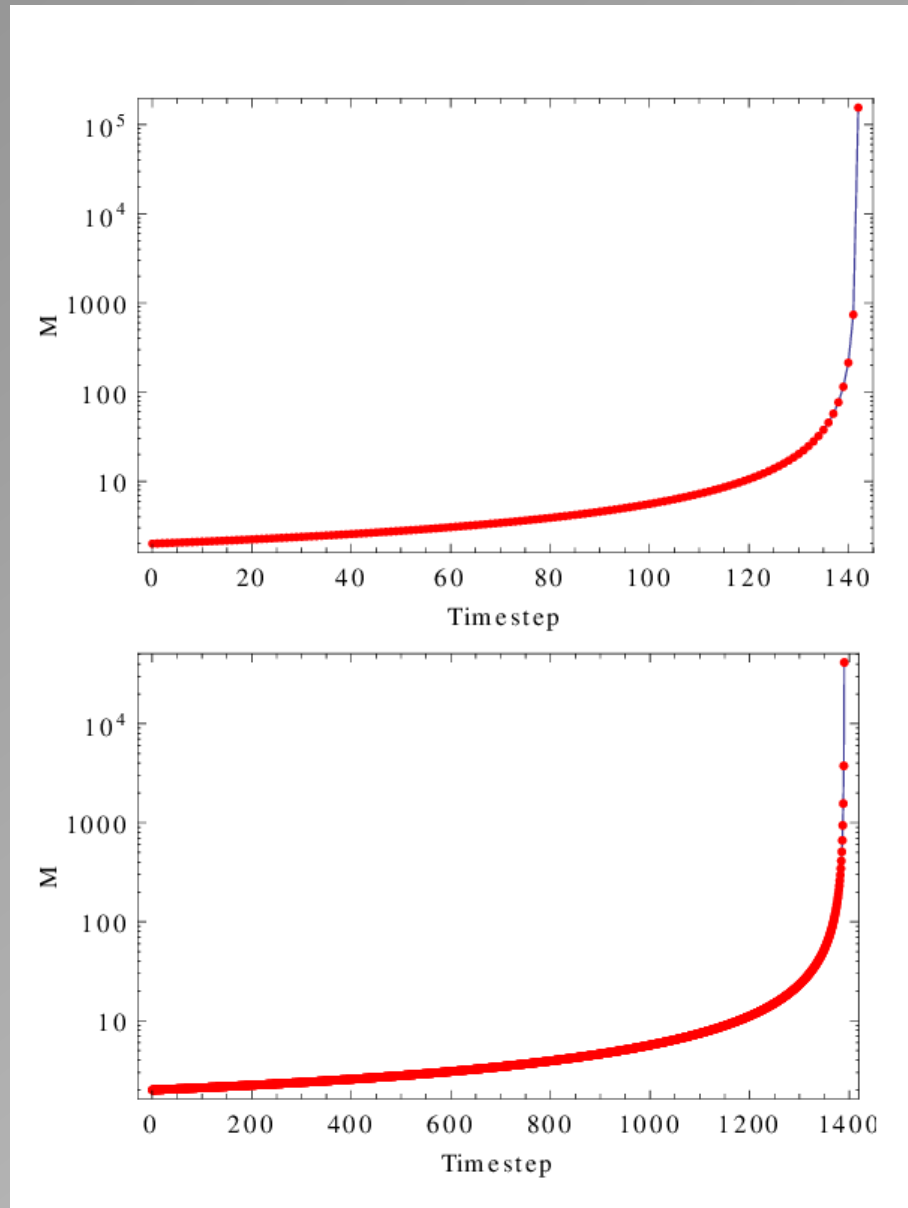
**Each successive transition generates the antecedents of the material prerequisite required for the next transition to occur.**

***This is a chaotic dynamic process, material variants arise arbitrarily.***



# Biological recombinations from “adjacent possibles”

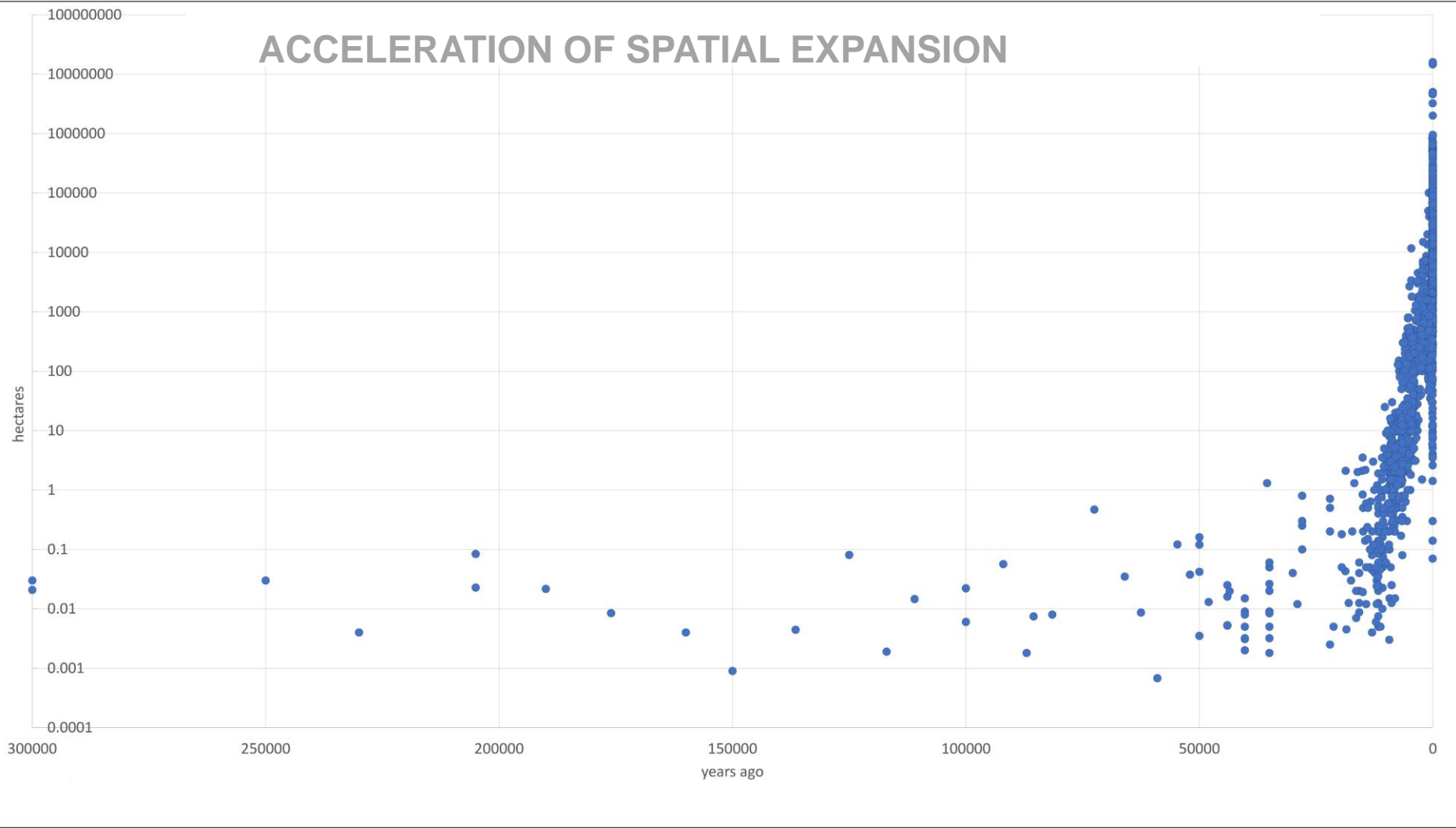
Took 4 billion years – most change over circa 600-500 million years



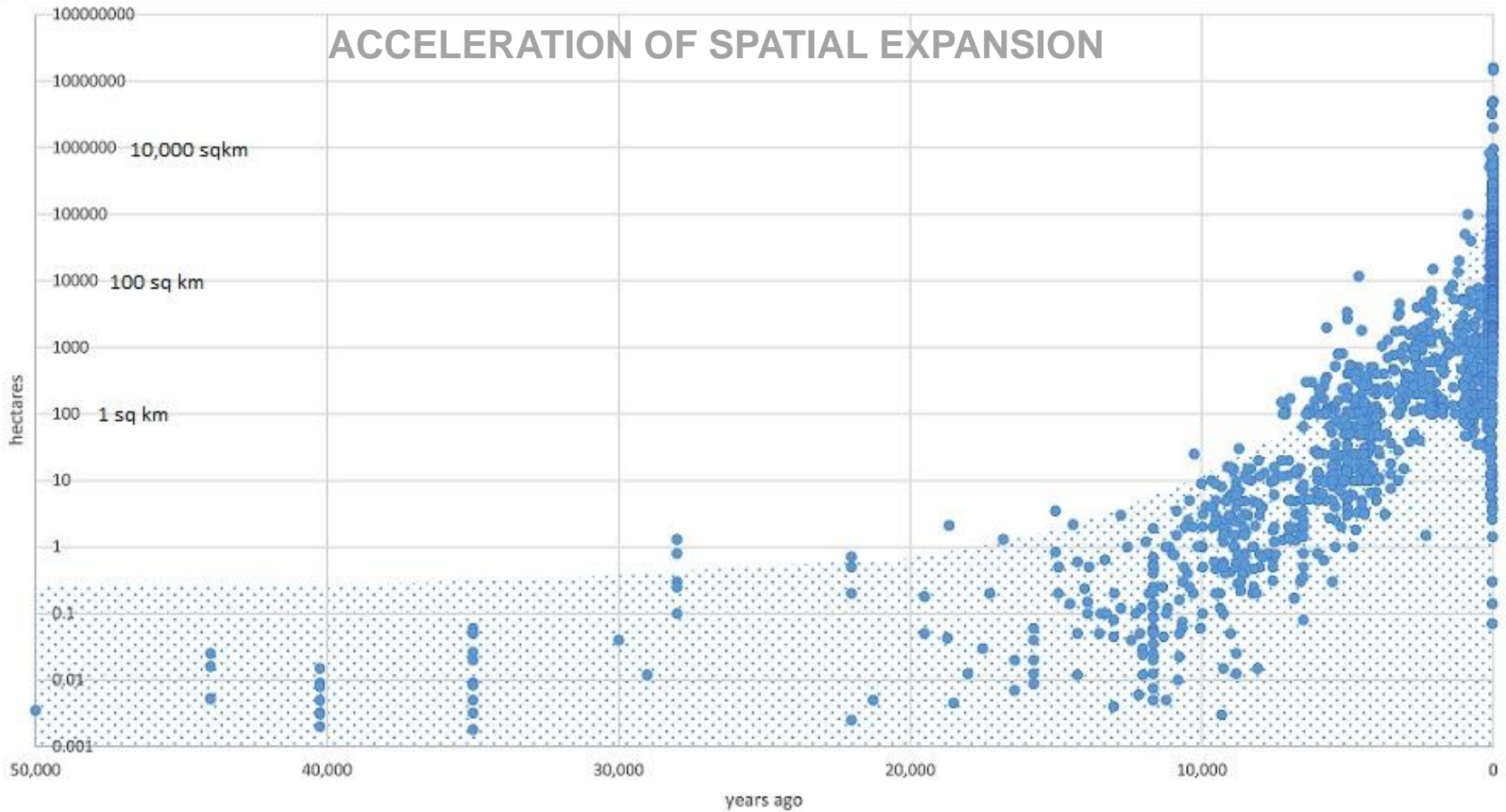
Cortes, Kauffman,  
Liddle and Smolin

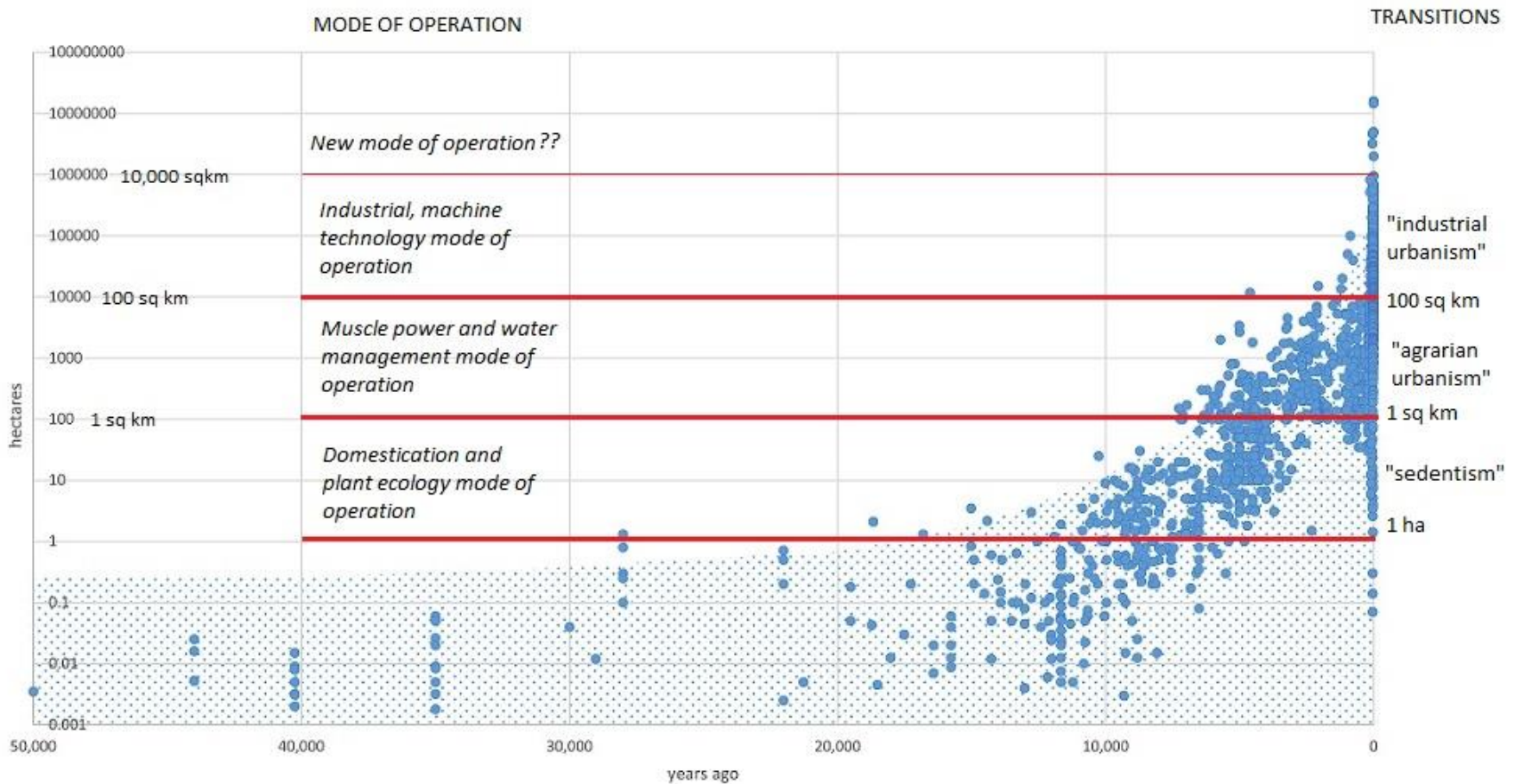
Behavioural recombinations of “adjacent possibles”  
Took 4 million years with most change after 50-40,000 BP

## ACCELERATION OF SPATIAL EXPANSION



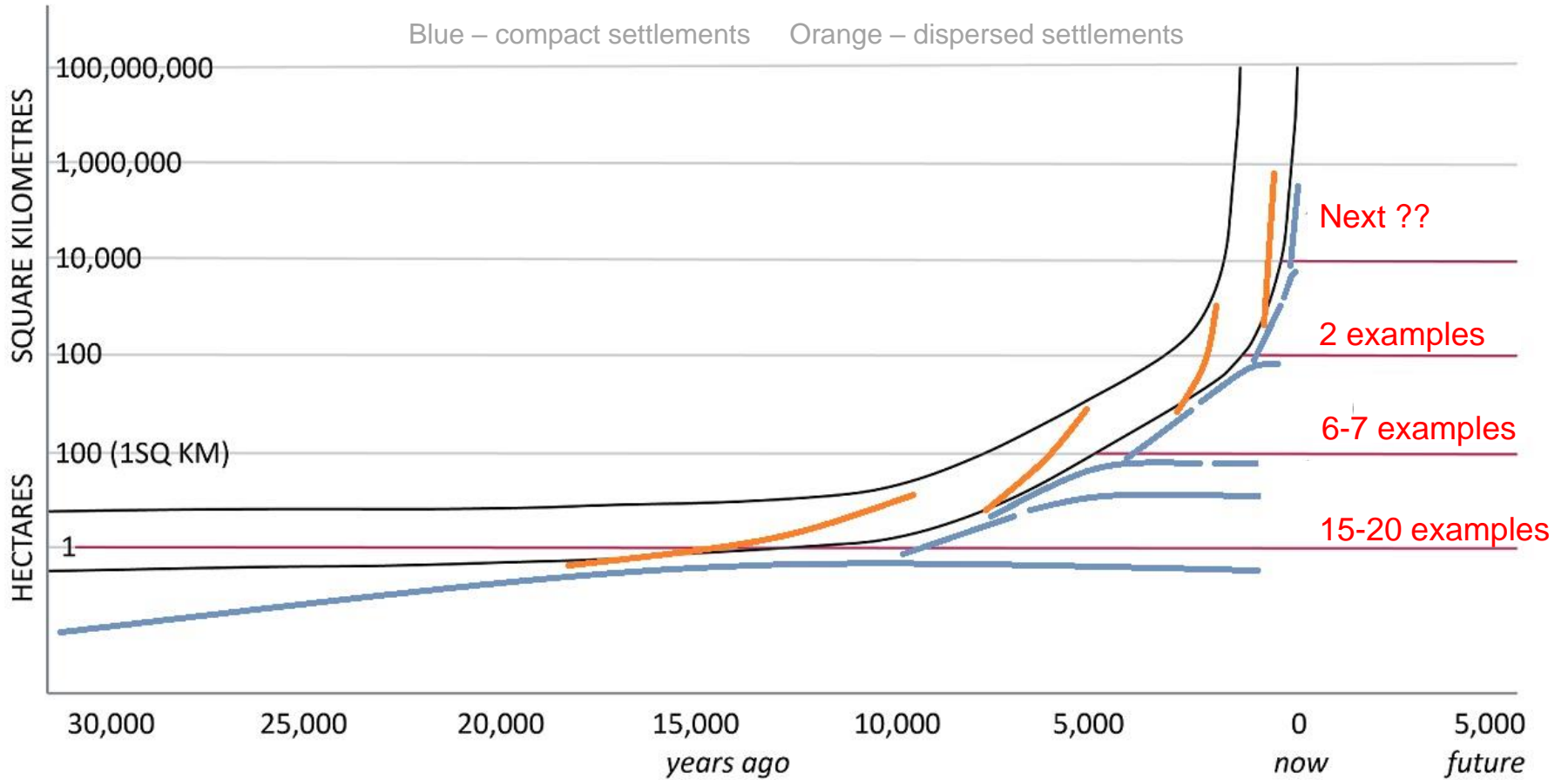
# ACCELERATION OF SPATIAL EXPANSION



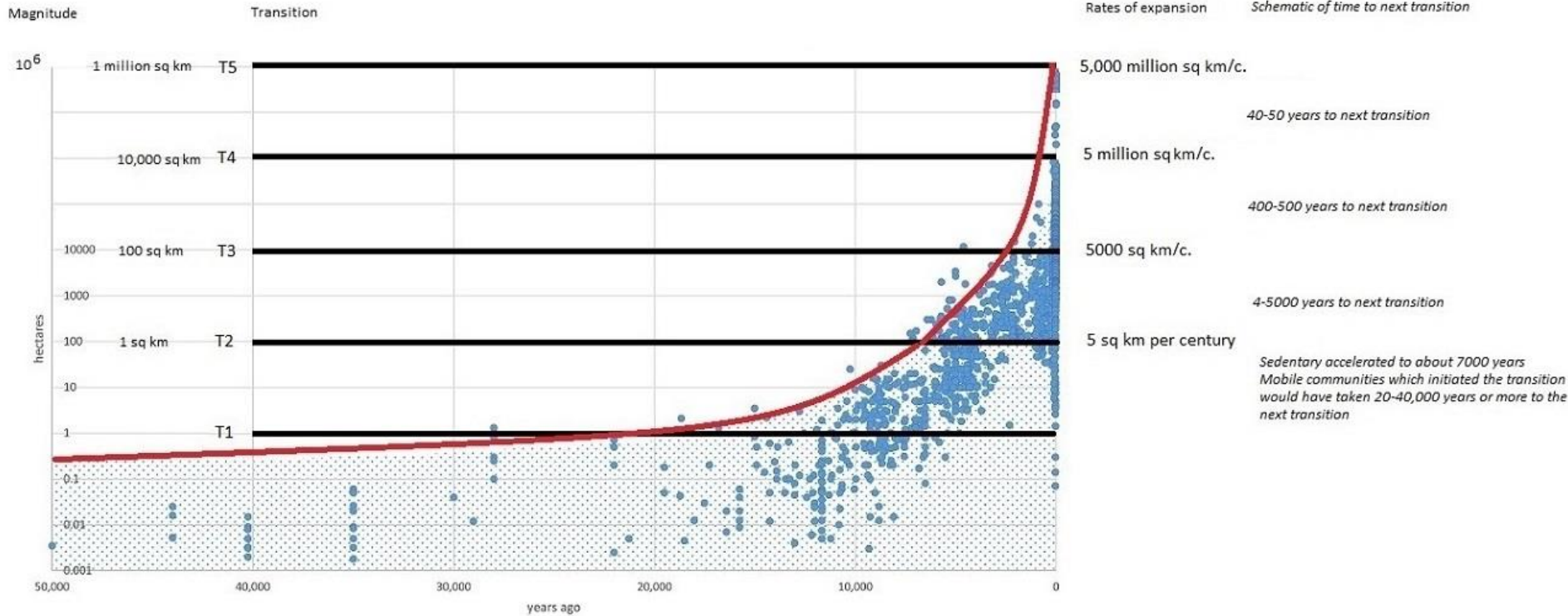


Relationship between transition phase changes and the formation of new modes of operation

# Punctuated acceleration through successive transitions



# Time between transitions becomes shorter





## **THE NEXT TRANSITION –beyond 10,000 sq km**

**Transition successions occur inexorably and at shorter intervals.**

**The next would occur for *compact* settlement areas larger than about 10,000 sq km.**

**This is likely to happen within the remaining 200-300 years of the “ballpark” 400-500 year period after the previous 100 sq km transition which began around 1800 CE.**

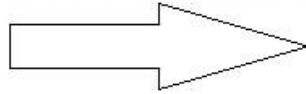
**Material antecedents for the next transition are already in existence.**

# Examples of antecedents to previous material prerequisites

Antecedents to material prerequisites



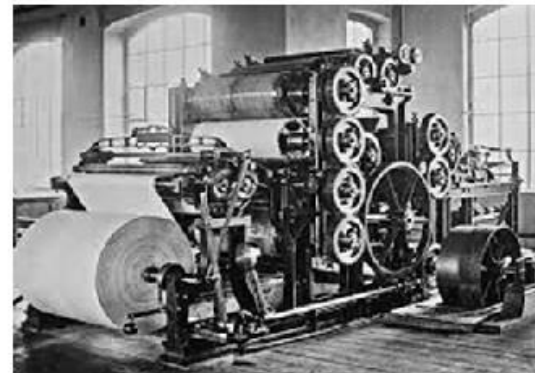
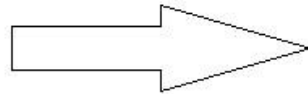
1 sq km transition



Material Prerequisites



100 sq km transition



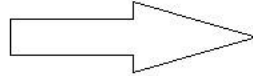


# Current antecedents to future material prerequisites of 100 sq km examples

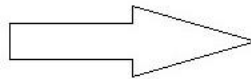
## Antecedents to material prerequisites



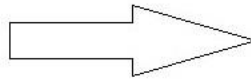
100 sq km transition



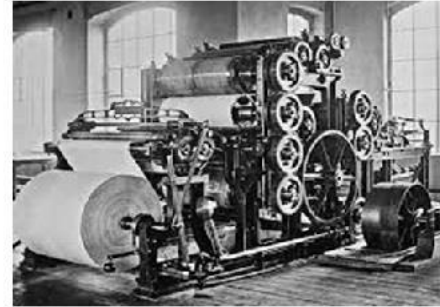
10,000 sq km transition



10,000 sq km transition



## Material Prerequisites



FUTURE MODE OF TRANSPORT??

ARTIFICIAL ORGANIC INTELLIGENCE

# THE NEXT TRANSITION – WHEN??

**Material antecedents for the next transition are already in existence.**

**The material prerequisites derived from them are of great economic and strategic value.**

**Those prerequisites can be predicted because what they will do behaviourally is known.**

**Once entrepreneurs, innovators and national governments know what the prerequisites might be then the development of the new material prerequisite assemblage will occur more rapidly.**

**That will provide a massive enhancement of information management capacity.**

**And the new energy source - fusion power – is already known.**

***Therefore the next transition is likely to occur sooner not later.***

# THE 10,000 SQ KM TRANSITION

Immediately the abrupt transition occurs, rapidly divergent trajectories will begin - creating a chaotic, destabilizing milieu.

The transition will occur in association with a major transformation of the “mode of operation”.

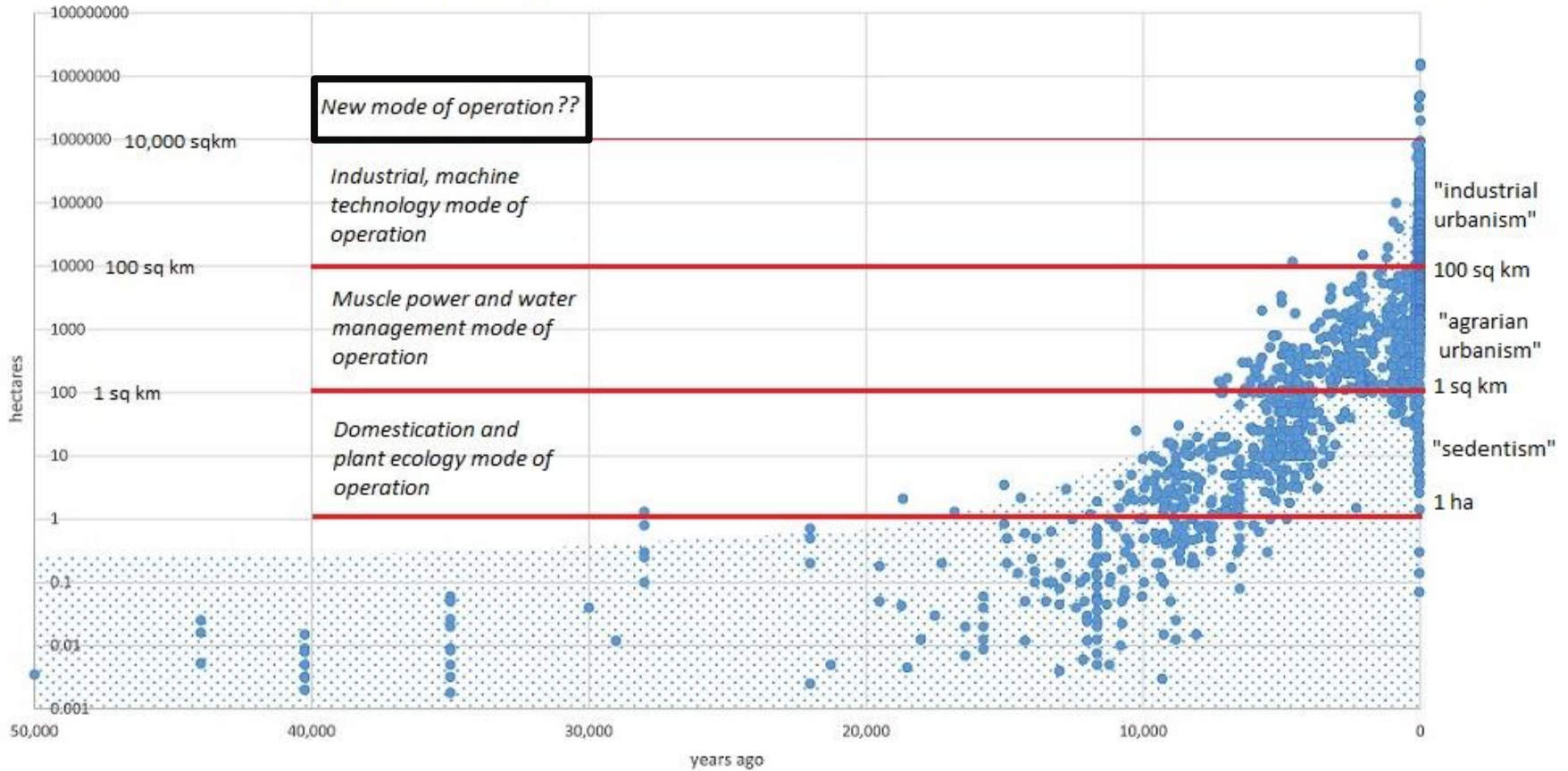
This happens because of the combined effects of enhanced information management capacity and increased energy supply.

The next transition will involve change at a rate circa 1000 times faster than the 19<sup>th</sup> century 100 sq km transition.

*ie circa 5 million sq km per century cf circa 5000 sq km per century*

MODE OF OPERATION

TRANSITIONS



**Therefore, the difference between the new mode operation and the one we now use - metal-based mechanical technology - will be as great as the difference between that mode of operation in the 19<sup>th</sup> century CE and the preceding mode of operation in the 17<sup>th</sup> -18<sup>th</sup> century CE.**

**The implication is that metal-based, machine technology will become redundant in 200-330 years time just as wood-based, machine technologies became redundant in the 19<sup>th</sup> century.**

**Our assumptions about a long future of metal-based machine technology have**

- a) ignored evolutionary specifications**
- b) neglected the reality of punctuated accelerating rates of change**

**Mechanical artificial intelligence is therefore merely antecedent.**

**The disjunctions between different rates of replication in machines and organics and the consequent non-correspondence mean that no “superhuman” bio-mech combine can be viable.**

**By contrast, collaborative alliances between naturally reproduced intelligence and artificial organic intelligence will be negotiable and engaging.**

**Once artificial organic intelligence is produced, machine artificial intelligence will have no future. What, therefore, to invest in??**

***Our universe contains no evidence that MAI has ever got out of a planetary system.***

## Acknowledgements

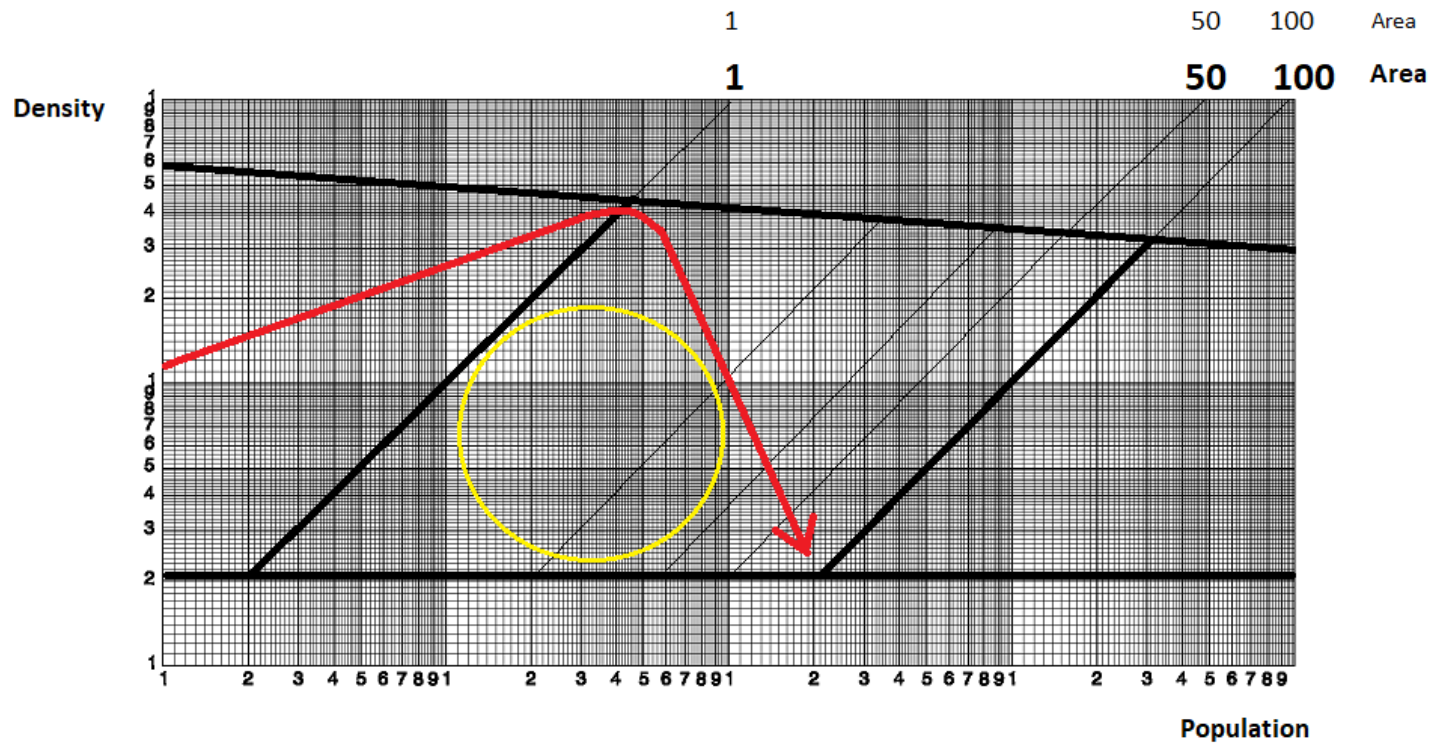
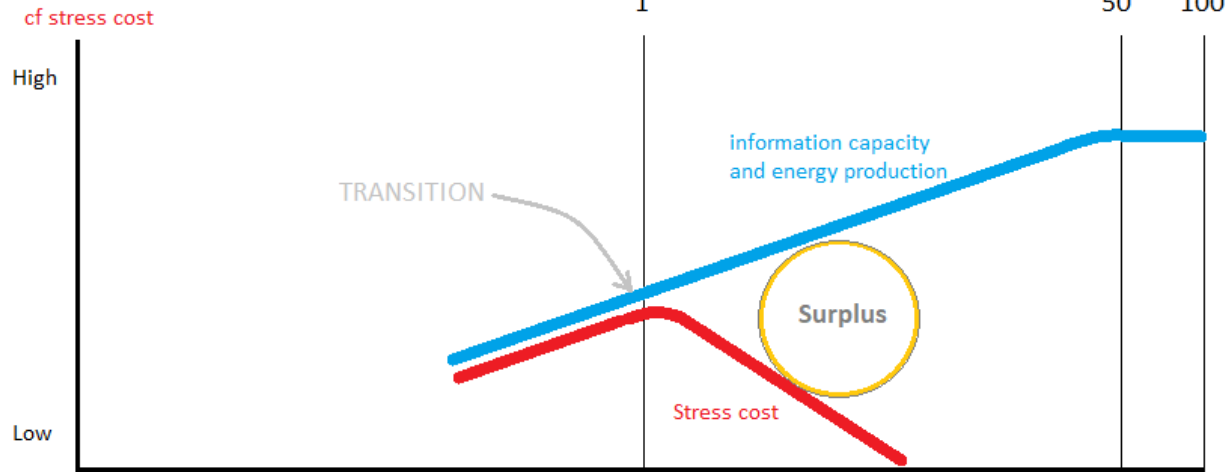
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Information and Energy capacity





There has been one change in the mode of operation of our societies since the late 18<sup>th</sup>- early 19<sup>th</sup> century *not four progressive industrial revolutions as per Schwab.*

Social media is not a progression, is doing much that was not anticipated and is being used to do much that is not apparent to its numerous users.

The misperception of modes of operation, their durations and rates of change is also clearly apparent in the unwarranted assumption that despite the current known-context of unprecedented change, mechanical-technology will just go on forever and that futures are to be envisaged in terms of variant of that assumption eg mechanical technology will populate the universe.

Evolution is not about progress and variation is neither generated to serve some future purpose which it might eventually facilitate nor is a variant which becomes prevalent anything other than the product of circumstantial conditions.

A succession of changes is not a progress though it may produce more complexity – more info processing capacity, more energy, greater scale etc .

The four industrial revolutions of Swabe are an attempt to presume direction in a myriad of varying paths which are in turn interacting with each other and producing new and unexpected circumstances.