Conceptualising social complexity and inequality in urban networks.

TAG 2019 – S22: Archaeology of Inequality – Themes, Debates, Methodologies

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LETTER

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Greater post–Neolithic wealth disparities in Eurasia than in North America and Mesoamerica

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1. Small differences in initial conditions → 2. Positive feedback loops → 3. Pathways of development

The farming-inequality nexus: new insights from ancient Western Eurasia

Amy Bogaard[1,*], Mattia Fochesato[2] & Samuel Bowles[3]

Research

This article advances the hypothesis that the transformation of farming from a labour-limited form to a land-limited form facilitated the emergence of substantial and sustained wealth inequalities in many ancient agricultural societies. Using bioarchaeological and other relevant evidence for the nature of ancient agrosystems, the authors characterise 90 Western Eurasian site-phases as labour- vs land-limited. Their estimates of wealth inequality (the Gini coefficient), which incorporate data on house and household storage size and individual grave goods—adjusted for comparability using new methods—indicate that land-limited farming systems were significantly more unequal than labour-limited ones.

Keywords: Eurasia, wealth inequality, farming, labour, land, traction

Labour

↓

Ownership

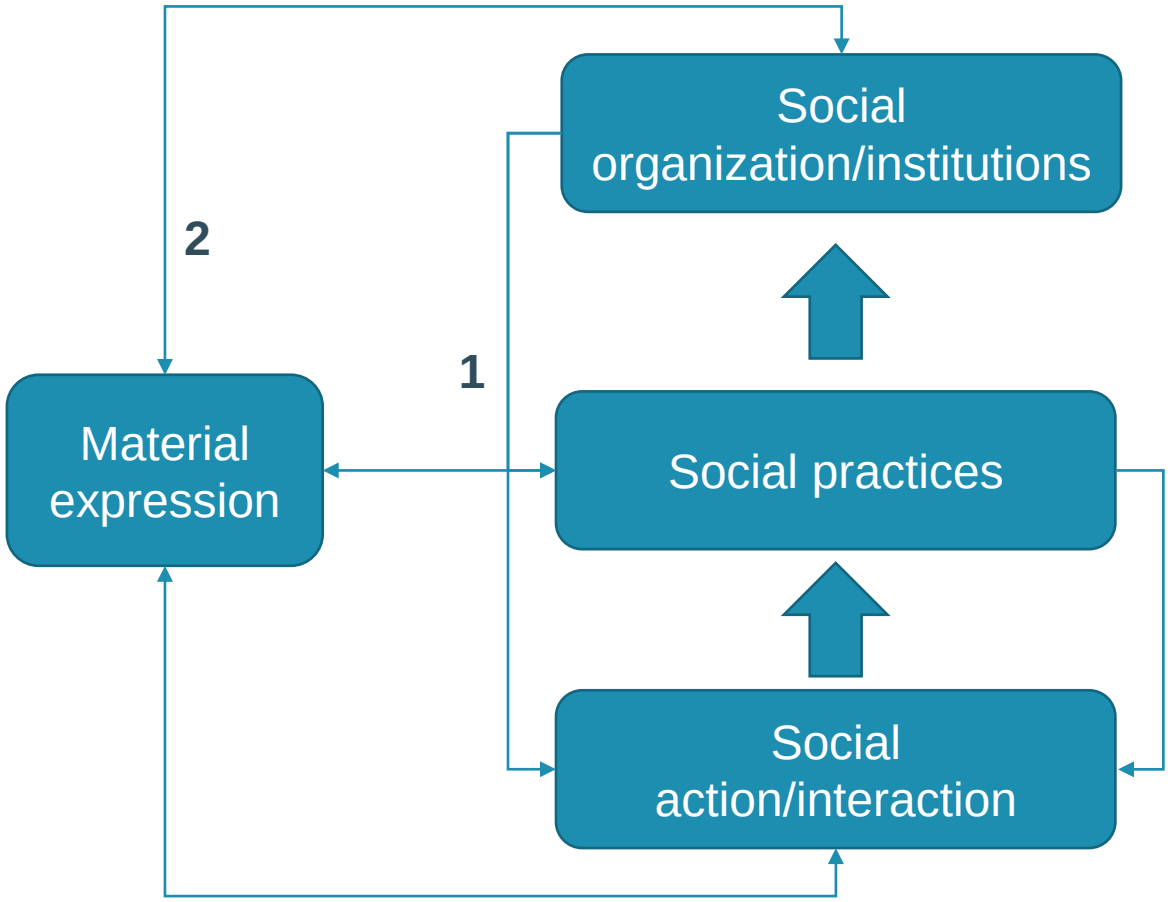
↓

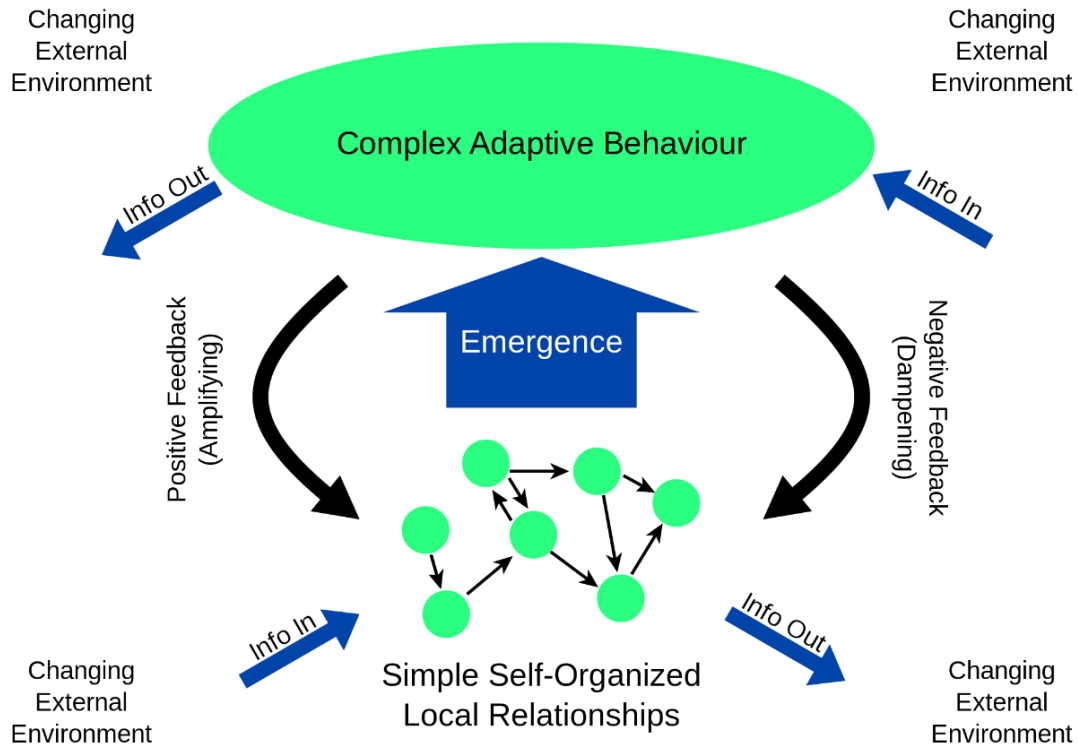
Inheritance

Social complexity and inequality

- (Implicit) assumption of correspondence between complexity and inequality
- Different forms of inequality
  - Social, economic, political,…
- Different scales of inequality
  - Individual, groups, societal,…
- Different mechanisms of inequality
  - Status, division of labour, inheritance,…

Social complexity and complex systems

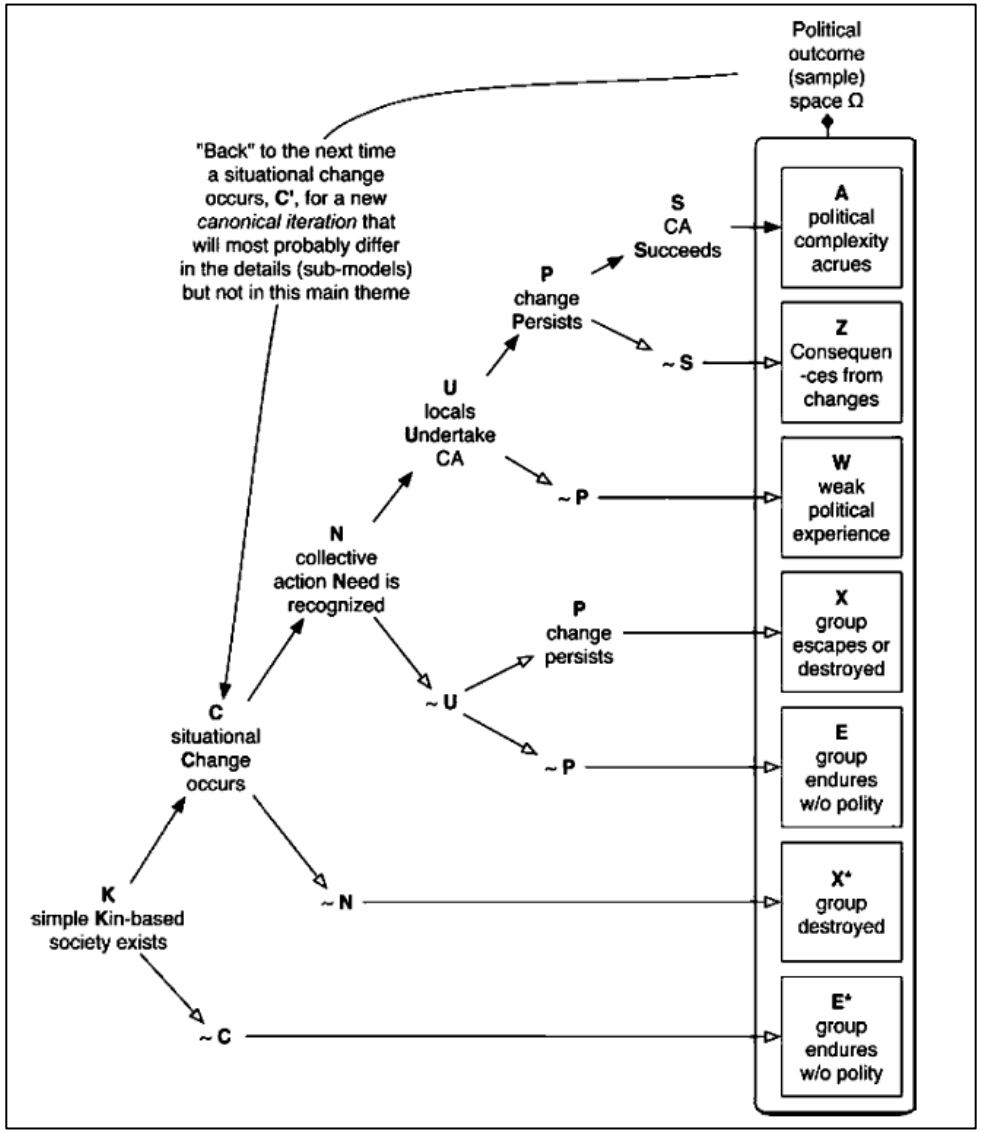




1) Temporal, spatial and social structuration
2) Archaeological reflection: Material expression of social interactions, practices and institutions

Social complexity trajectories

- How did social complexity develop through decision-making strategies?
- Dual loop of signal detection, information-processing, and problem-solving strategies:
  - ‘Fast’ process of decision-making processes
  - ‘Slow’ process of socio-political complexity



Cioffi-Revilla 2005

Complexity and inequality in cities: social entropy

- Overload in high-information environments
- Uncertainty in transition from individual to collective systems of interaction
- Selection of interaction
  - Influencing probabilities of interaction
- Development of inequality inevitable
- What information selected and why?
- Purpose? Or emergent coordination of actions between agents with differing goals?

Credit to artist
Joan M. Mas

Netto, V., Meirelles, J., & Ribeiro, F. (2017) Social Interaction and the City: The Effect of Space on the Reduction of Entropy. *Complexity*.
Netto, V. et al. (2018) Cities, from Information to Interaction. *Entropy*, *20*(11), 834.

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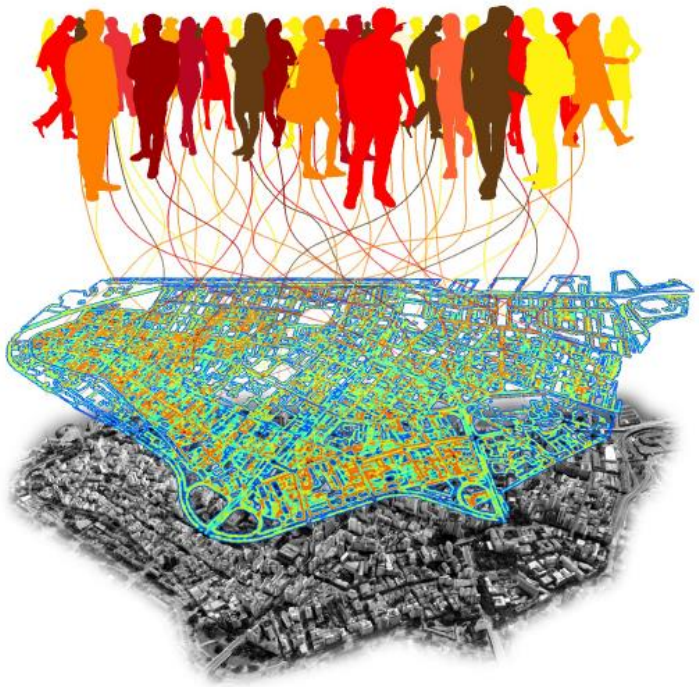
Complexity and inequality in cities: social structuration

- Recurrent needs and goals requiring recurrent actions creates order
- Structuration = increasing complexity & reduction of entropy
- Use of space and material environment
  - Create difference
  - Shape interaction possibilities



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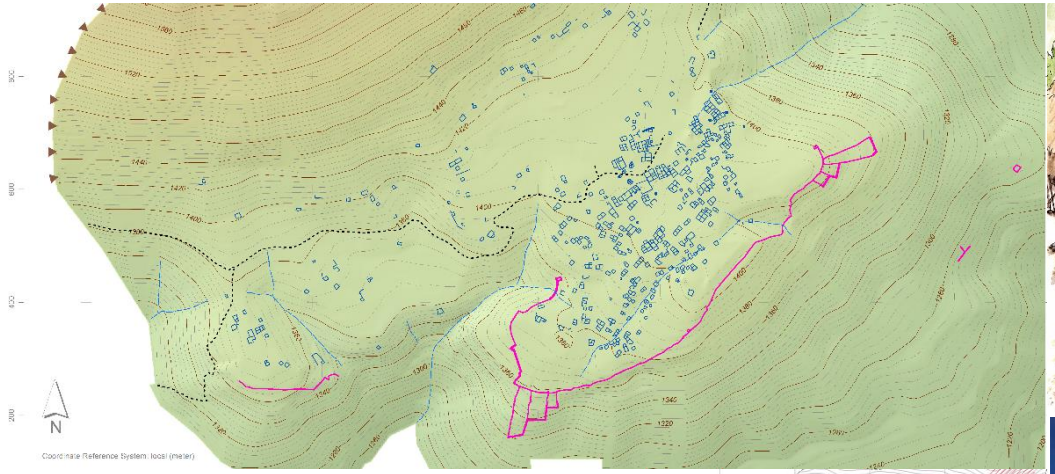
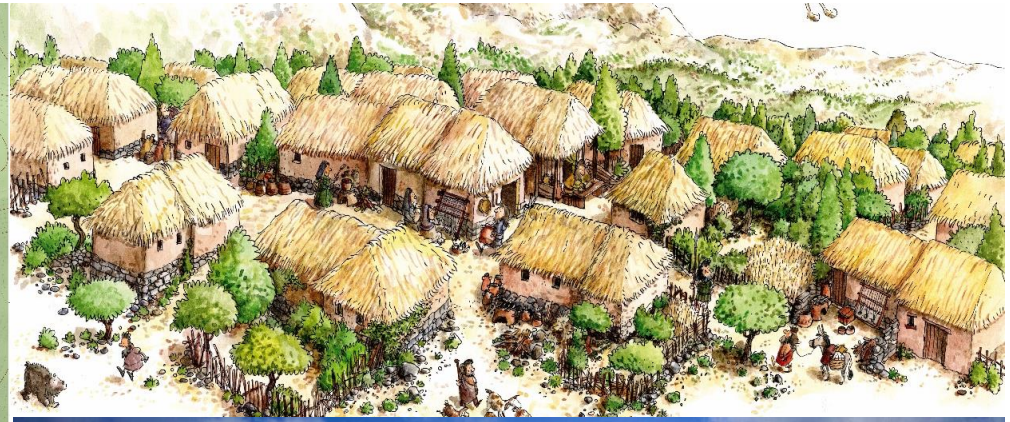
Cities as mechanisms of structuration

Düzen Tepe





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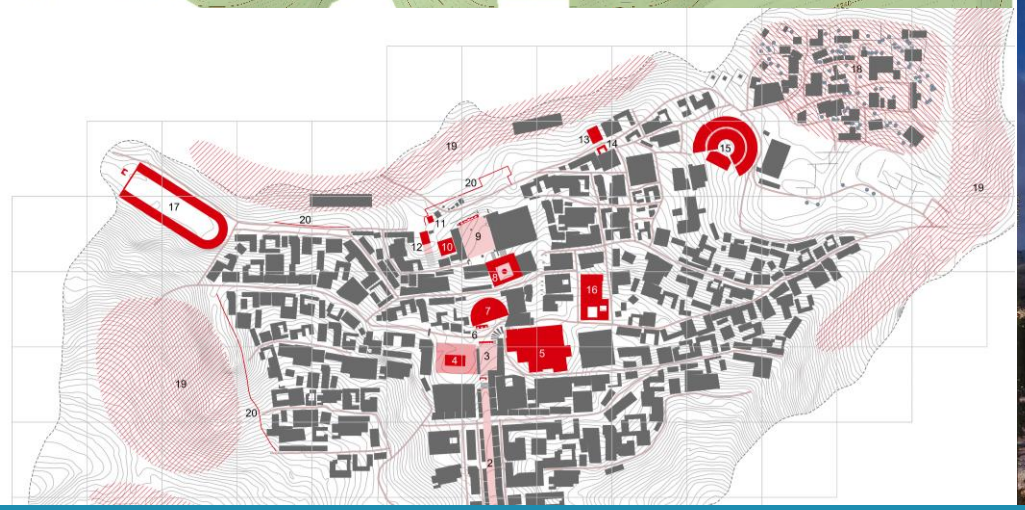
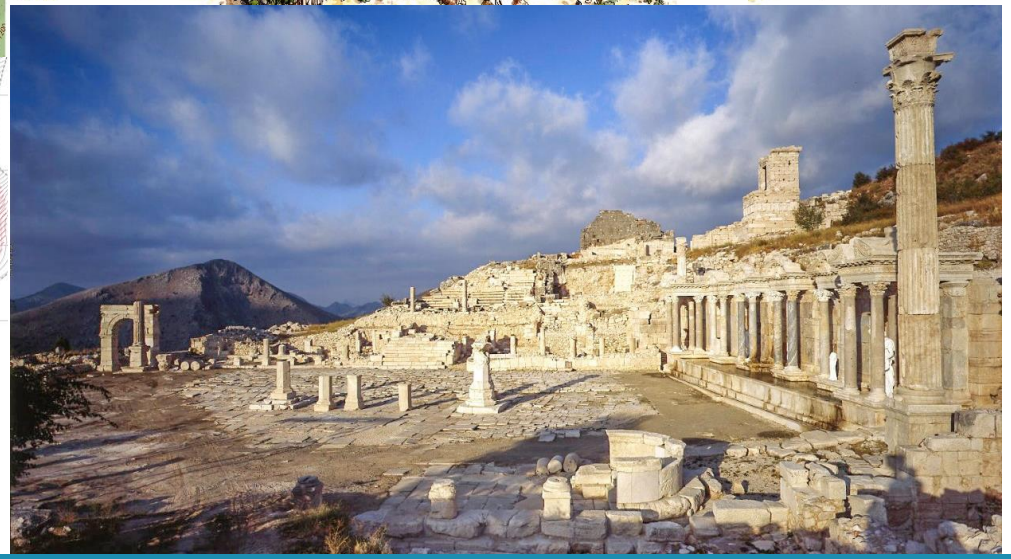
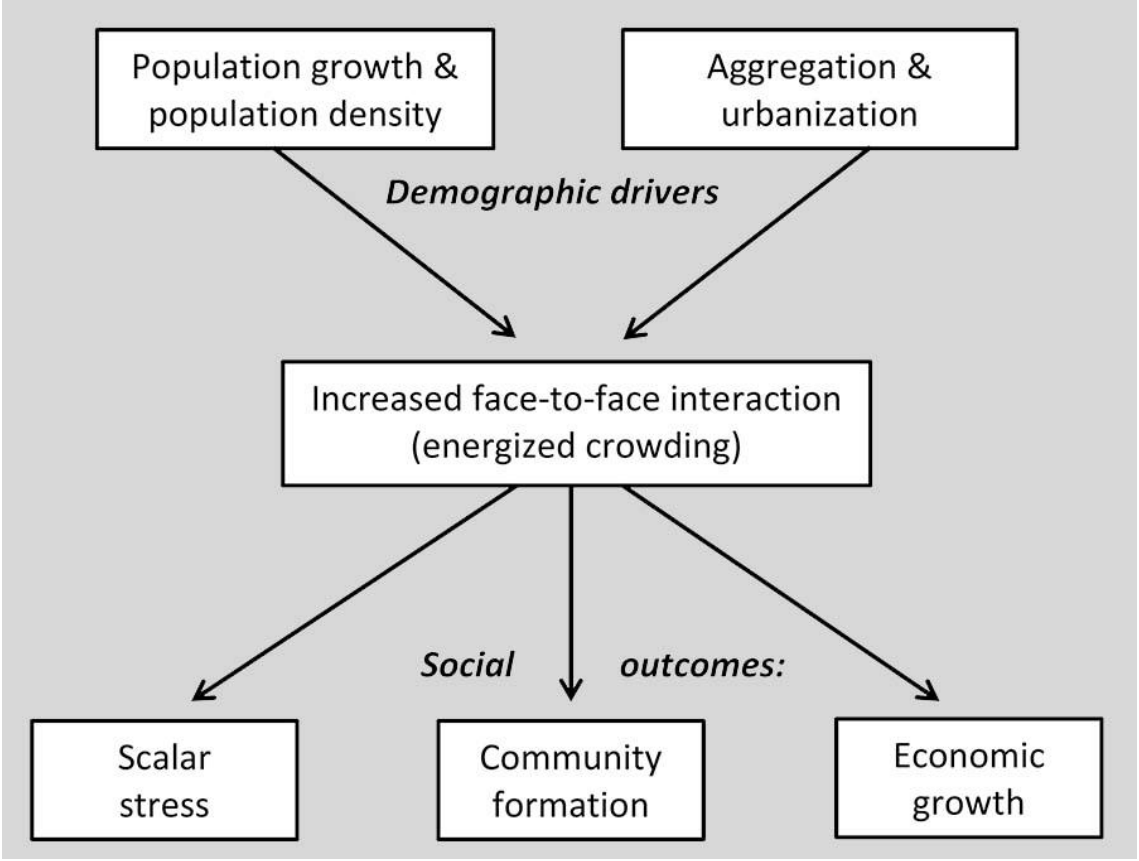




Cities as information amplifiers

- Cities as pockets of social interaction and information exchange
- Positive and negative effects of growing communities and increasing interactions
- Intra-community (settlement)
- Inter-community (settlement pattern)

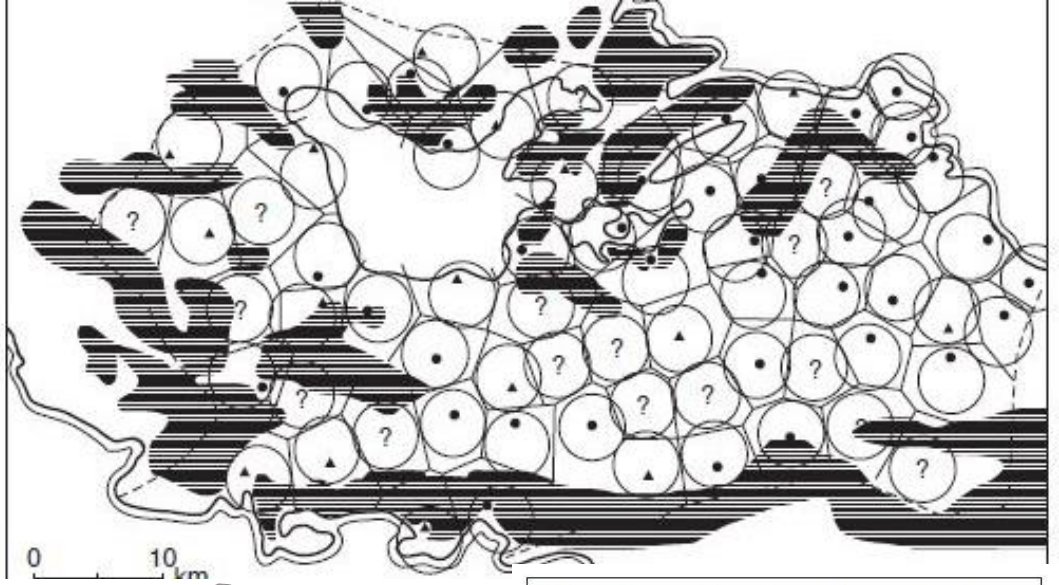


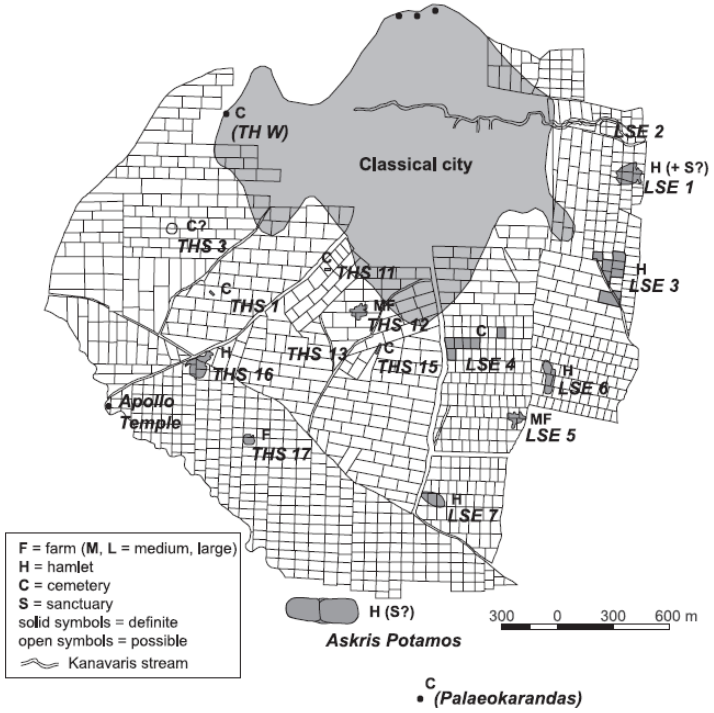
Smith 2019

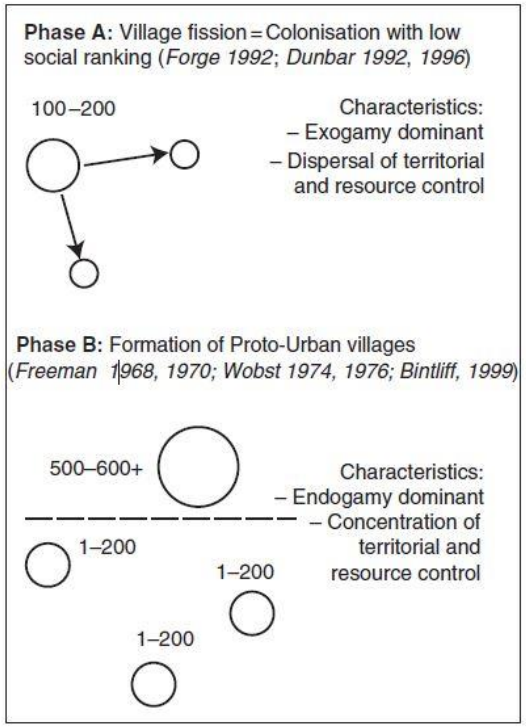
Smith (2019) Energized Crowding and the Generative Role of Settlement Aggregation and Urbanization; In Gyucha (ed.) Coming Together.
Bettencourt (2013) The Origins of Scaling in Cities

Cities as information amplifiers: Central place formation

- Settlement patterns as material and informational expressions of information systems
- Manifestation of inequality on an inter-community level
- Urban formation:
  - New forms of social organization, socio-political structures and institutions
  - Development of social, political and economic elite
  - Territorialisation
  - New forms of material culture and monumental architecture







Bintliff et al. (2007) Emergent complexity in settlement systems and urban transformations.
Bintliff (1994) Territorial behaviour and the natural history of the Greek polis. *Stuttgarter Kolloq. Hist. Geogr. D. Altertums*

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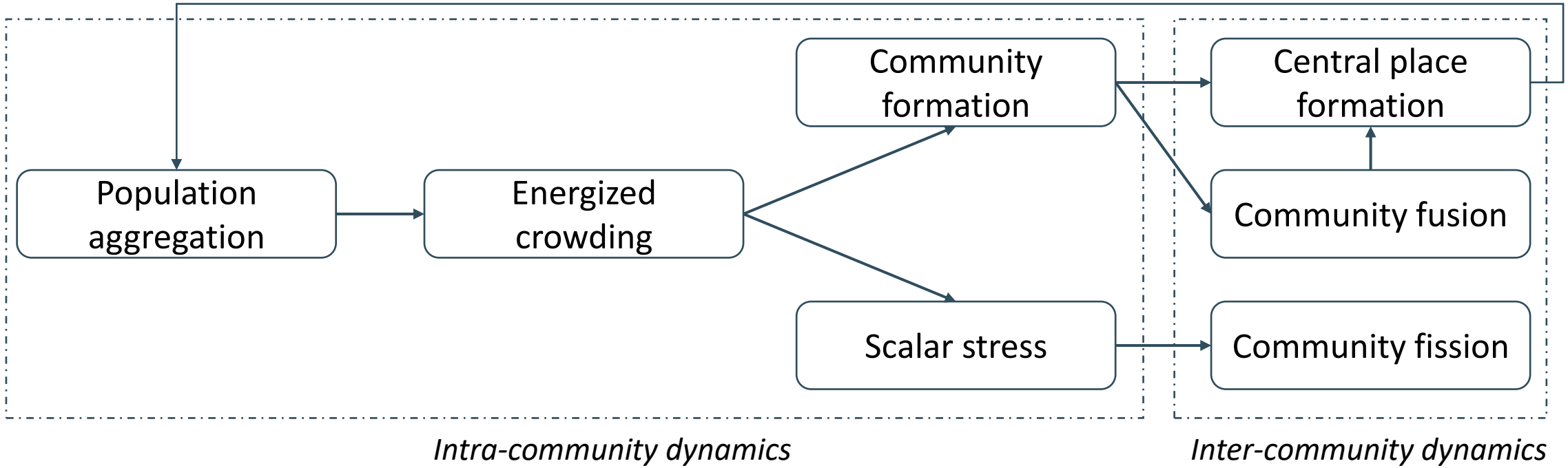
Conclusion: Model of social complexity trajectories



Thank you for your attention!

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Argument:
Wealth disparities generally increased with the domestication of plants and animals and with increased socio-political scale, using Gini coefficients computed over the single consistent proxy of house-size distributions. But: unexpected differences in the responses of societies to these factors in North America and Mesoamerica, and in Eurasia, due to the greater availability of large mammals that could be domesticated, because they allowed more profitable agricultural extensification, and also eventually led to the development of a mounted warrior elite able to expand polities (political units that cohere via identity, ability to mobilize resources, or governance) to sizes that were not possible in North America and Mesoamerica

→ **Different pathways of development starting from different initial conditions + positive feedback loops**
  → **Availability of large animals for domestication → multiplier for human labour → agricultural extensification beyond needs of households → exacerbation of initial socio-economic inequality (richer households better able to maintain drat animals) → 1) higher production + income from renting out animals; 2) increased agricultural surpluses → 1) higher maximal attainable inequality; 2) extended land ownership; 3) mounted warrior elite → larger political-military expansion → state formation**
→ **On a micro-scale: Saga vs. Düzen!**

The farming-inequality nexus: new insights from ancient Western Eurasia

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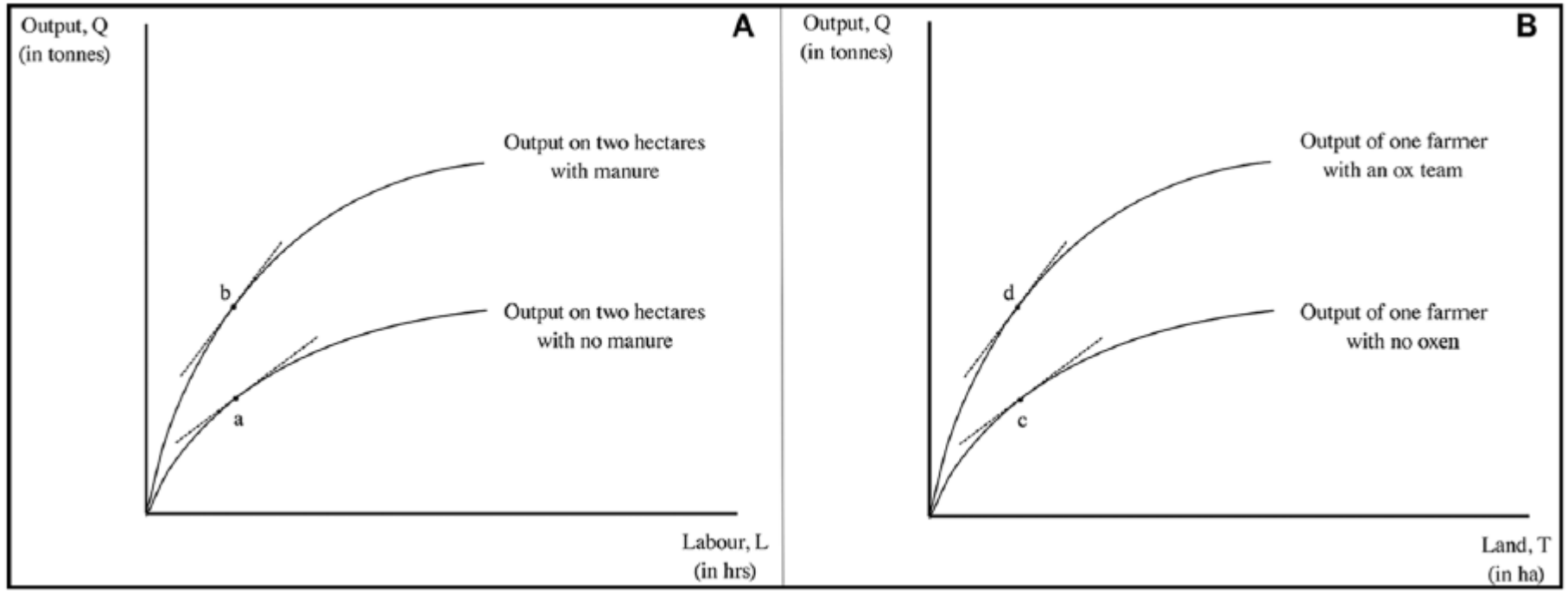
This article advances the hypothesis that the transformation of farming from a labour-limited form to a land-limited form facilitated the emergence of substantial and sustained wealth inequalities in many ancient agricultural societies. Using bioarchaeological and other relevant evidence for the nature of ancient agrosystems, the authors characterise 90 Western Eurasian site-phases as labour- vs land-limited. Their estimates of wealth inequality (the Gini coefficient), which incorporate data on house and household storage size and individual grave goods—adjusted for comparability using new methods—indicate that land-limited farming systems were significantly more unequal than labour-limited ones.

Keywords: Eurasia, wealth inequality, farming, labour, land, traction

Research

Transformation of farming from a labour-limited form to a land-limited form facilitated the emergence of substantial and sustained wealth inequalities in many ancient agricultural societies.

- Clumped-resources logic to demonstrate how a transformation of farming could support the novel emergence of elevated levels of inequality
- different possibilities for accumulating, storing and transmitting wealth across generations
- By substantially increasing the productivity of land and animals, food production made land and other concentrated, defensible forms of wealth far more common than the rich resource concentrations upon which hunter-gatherer wealth inequality was sometimes based



→ **Diminishing returns to investment (labour); BUT: innovation inducing leaps of productivity**
→ **Manure = land-augmenting; animal traction = labour-augmenting**

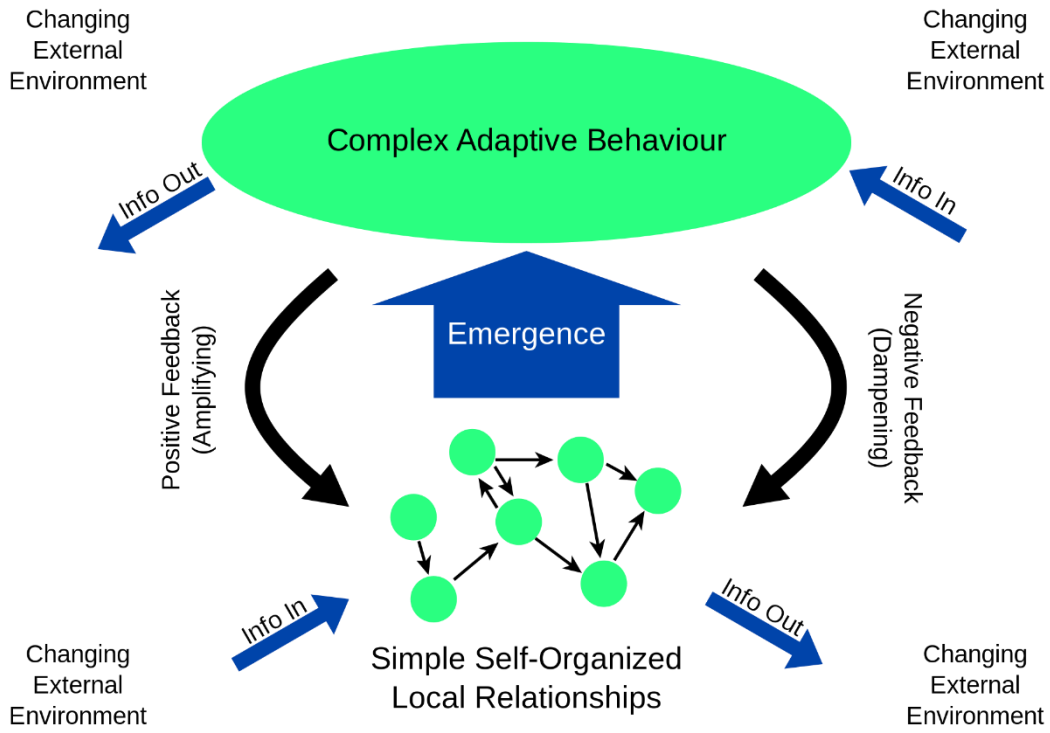
→ **Negative and positive feedback loops!**

Mechanisms of complexity

- Diversification
- Connectivity
- Specialization

Complexity in social systems

- Fundamental unit of complexity = social interactions between people
- Micro-macro transition: Emergent social organization out of social interactions
- Focus on information-processing and decision-making strategies



How does this work?

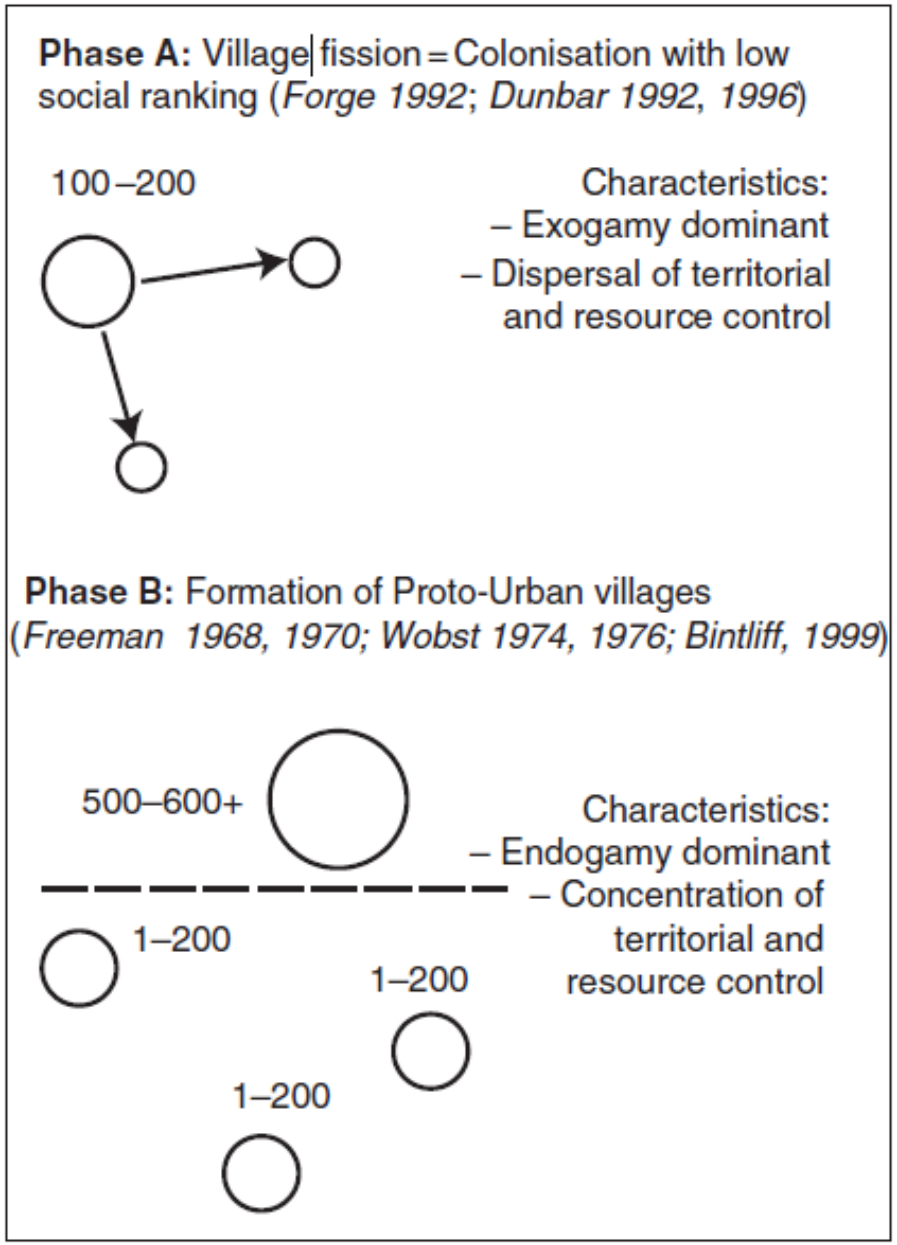
- Social entropy in information systems and inequality?
- Entropy (cfr. Boltzmann) characterizes each macroscopic state in terms of the number of (microscopic) ways of achieving this state
- Structuration = increasing organizational complexity & reduction of entropy

→Inequality develops!

→THOUGHT: Model presented here is built on social interactions, presupposing (or at least implying) to a certain degree the exchange of information between equal partners → what about inequality cfr. above in exchange partners?

Structuration: complexity thresholds

- Types of community organisation with population thresholds
  - Villages: 100-200 people
  - Proto-urban (corporate communities): 500-600 people
  - Urban: > 1500 people
- HOW TO OPERATIONALISE?



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