

What can Resilience Theory do for (Aegean) Archaeology?

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This paper deals with the potential benefits of resilience theory for archaeology in general and for Aegean archaeology specifically. Resilience thinking plays a prominent part in the pursuit of an integrative framework that seeks 'to understand the source and role of change in systems – particularly the kinds of changes that are transforming, in systems that are adaptive. Such changes are economic, ecological, social, and evolutionary. They concern rapidly unfolding processes and slowly changing ones – gradual and episodic change, local and global change' (Holling et al. 2002:5).

Systemic approaches sit at the core of resilience theory and, having witnessed the reorientation of archaeological theory in the last decades, many scholars may feel that the history of processual archaeology is repeating itself, and may therefore have a hard time seeing any potential. Others may be wary of the adoption of yet another imported terminology, and that was also in part what Merrilee H. Salmon (1978) concluded in her article entitled 'What can systems theory do for archaeology'. Her conclusion was rather negative regarding the usefulness of systems theory and the systems theory of the 1960s and 1970s did meet with considerable critique. Salmon (1978:182), however, left the door open in stating that '[a] new language does sometimes enable us to look at things in new ways. And if it can do that it is not merely jargon.' In the present paper the reader will find me rather more positive and receptive to the systemic view offered within the resilience framework, which is also in many ways different from earlier systems theory, as I do feel that this conceptual framework may very well enable us to look at things in new ways. In an attempt to relate this 'new' framework to the 'older' systems theory, I will begin with a brief history of systemic

thinking in archaeology. The paper concludes with a perspective on the adaptive cycle based on a case study from the Greek Bronze Age and some ideas of what resilience theory can potentially do for Aegean archaeology.

Systems theory in archaeology – a brief history

Systemic thinking was brought into archaeological research in the 1960s and was one of the core ideas of the processual archaeology of the following decennia (Flannery 1968; Renfrew 1972). The critique of systems theory – and that of processual archaeology in general – were closely linked. Central for systems theory in archaeology was the visualization of a culture or a society as a functioning whole made up of a number of functionally defined subsystems, with the holistic view that the sum of the whole was greater than the sum of its parts. There was an emphasis on testability, predictability and law-like linearity of societal development. The main critique came in the 1980s when some problematic aspects with this model were pointed out: the ignorance of the individual within the systems, the passiveness of material culture, the focus on function (rather than meaning), and on economic, technological and environmental aspects, which generally made up the most prominent subsystems (rather than the social ramifications) (e.g. Hodder & Hutson 2003:20-33). The critical voices urged for a greater concern with meaning, history, agency, the social and the particular. In the years that followed, these concerns amalgamated and were met within post-processual and interpretative strands of archaeology, with a much increased focus on the micro-scale rather than the macro-scale and the contextuality of the archaeological material, giving voice to individuality, choice and on interpretation (rather than explanation).

In a 2005 review of key concepts in archaeology, Ian Hodder (2005:211) conceded that ‘the old processual/post-processual battlegrounds’ had now been largely given up in favour of a more case sensitive selection of useful tools for the problem at hand; a choice from a spectrum of archaeological arguments transgressing many former theoretical divides. The ways of thinking about systems has followed a similar trajectory and have come to include many of the strands of thought that were part of the critique of its original form. One development was the acknowledgement of non-linear processes

and the use of complex systems theory within archaeology (McGlade & van der Leeuw 1997; Bentley & Maschner 2003a; Beekman 2005; Kohler 2011). In contrast to early systems thinking when stability, or equilibrium, was the norm, complex systems theory and non-linear processes focus on change, and stress that the rate of change varies and cannot be generalized. Complex systems and non-linear processes are not in equilibrium, they are not predictable; rather, they are dynamic, adaptive, flexible and in constant renewal (van der Leeuw 2005; Meyer & Crumley 2012). In many senses, complex systems' thinking does provide room for much of what was deemed missing in early systems theory by the post-processual critique. Perhaps interpretative ideals of meaning, history, agency, the social and the particular are not often explicitly dealt with, but there seems to be nothing really to prevent it in future work (Bentley & Maschner 2003b; Kohler 2011; see also McGlade 2006 for a prominent inclusion of agency in a long-term narrative).

Most notably, complex systems' thinking promises that much more weight will be placed on historicity and the contextuality of processes and events. In the adaptive capacity of complex systems is embedded the learning capacity of agents in copying or dispelling practices of the past in order to increase potential for the future. Agency is inherent in the recognition that, for example, social interactions, rather than external factors (as was generally assumed within early systems theory), may be the prime drivers for change (Bentley & Maschner 2003b:2-3). Although modeling remains a core activity within much of complex systems theory, complex systems theory does not assume simple relationships between cause and effect. Modeling is furthermore increasingly agent-based, which in itself translates into a focus on the impact of the small upon the large and the communication between different parts of a system (Kohler 2011; for an Aegean application: Knappett et al. 2011). Complex systems are nested and all parts of the system are thus strongly interconnected on different spatial and temporal scales. The difference, then, between a complex system and a simple system is that in a complex system small scale change in the smallest component may have large scale effects. These complex systems are therefore highly relative and contextualized analyses of the particulars of each part of the system become a necessity to better understand their workings and interconnections through time and space.

Systems thinking in archaeology in its 1960s version, as well as later variations, owes much of its inspiration, models and vocabulary to ecology (other cited influences for the early forms of systems theory are cybernetics and 'General Systems Theory', cf. Kohler 2011). The systems under study are at least today also generally defined as socio-natural, socio-environmental, or social-ecological systems rather than an 'either/or' of the two components alone, in acknowledgement of the fact that neither human systems nor any ecosystems stand alone, but develop in close interaction with each other. This statement and the concept of non-linear processes within complex and dynamic systems is key within historical ecology (Balée 2006; Meyer & Crumley 2012) and to research programmes such as IHOPE (Integrated History and future of Peoples on Earth) (Costanza et al. 2007).

The face and pace of change are key concerns in much of the research on social-ecological systems today, and perhaps even more pressing: the various responses to change within different systems. The increasingly urgent environmental changes facing the world today are the biggest motivators for this line of questioning, in that they influence our options for the future. This has yet again called for interactions between the ecological and social sciences and the incorporation of further models and concepts from the former into the latter. Resilience is one such concept that is increasingly gaining ground within any discipline and discussion concerned with the abilities of different systems or agents to cope with change, learn and develop (i.e. their resilience). Resilience thinking has strong links to (complex) systems theory and similarly has its origin within the ecological sciences. Resilience was defined by ecologist C.S. Holling as a way to conceptualize the interplay between change and stability in ecological systems (Holling 1973). It was later also adapted to incorporate the human aspects, in coupled human-natural systems (Redman & Kinzig 2003; Folke 2006; Holling 2001). In humanized terms *social* resilience is defined as 'the ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval' and it is noted that '[r]esilience in societies and their life-supporting ecosystems is crucial in maintaining options for future human development' (Stockholm Resilience Centre: <http://www.stockholmresilience.org>: the Resilience Dictionary).

Collapse and resilience

The level of a system's inherent resilience becomes especially significant in crisis situations, and the concept is central to studies on sustainable development and in efforts to find ways to tackle and prevent serious climatic and environmental problems. More and more scholars emphasize this conceptual framework as something within which archaeology could take on a significant role (Holling 2001; Redman & Kinzig 2003; Redman 2005). It is also in relation to societal transformations that the resilience perspective has so far had the greatest impact on archaeology.

'Collapse' is a term often used when the extent of widespread societal transformations are defined and something of a standard was set by Joseph Tainter in his *The Collapse of Complex Societies* (Tainter 1988). Recently, the concept of collapse has been quite prominent in literature that relates to archaeology, but also with more general societal issues. One of the most recent of these is the Swedish book, *Kollaps. Livet vid civilisationens slut* (Jonstad 2012, my translation: *Collapse. Life at the end of civilization*), and the most high profile and hotly debated is definitely *Collapse: How Societies Choose to Fail or Succeed* (Diamond 2005; review by Tainter 2008). Collapse in these studies refers to the degree of societal success or failure, and the basis for the definition is generally to be found in the level of complexity which different societies at different times have achieved, or lost. This dichotomy is now being increasingly questioned.

The book *Questioning Collapse* (McAnany & Yoffee 2010) was published in early 2010 as a response to Diamond's *Collapse* with the stated aim to challenge scholars (such as Chew 2001; Diamond 2005) who use monolithic explanations and argue that societies break down as a result of overpopulation or unbridgeable environmental problems. In this and much 'collapse'-research today the focus is rather on the dynamics between the sustainability of communities and their resilience (Tainter 2006, 2008; McAnany & Yoffee 2010; Sinclair et al. 2010). These studies emphasize how the content of societal transformations can be better understood by focusing on the dynamic character of society, especially in relation to past periods of climatic and environmental stresses. The next question is how this historical understanding can help us relate to the problems we face today, for instance when it comes to building social resilience. To meet this challenge, more efforts are made to consciously integrate natural science analyses and historical

perspectives (Crumley 1994; McIntosh et al. 2000; Balée 2006; Fischer et al. 2009; Sinclair et al. 2010). Although American case studies dominate these analyses, prehistoric societies in the Mediterranean region, as well as the Near Eastern high cultures, have been awarded some room in the theory-building discussion (Tainter 1988; Chew 2001; Yoffee 2010). There are also many studies discussing direct connections between climate change and societal collapse in the histories of Mediterranean cultures (Dalfes et al. 1997; Weiss 2000; Weninger et al. 2009; Roberts et al. 2011).

So far, however, the discourse on complex systems and resilience has only been associated specifically with Aegean prehistory to a very limited degree (van der Leeuw 2000; Schoep & Knappett 2004; Weiberg et al. 2010). There has, however, been research on periods of intensified social change. The focus of this research has generally been on the causes for, and the content of, change, in the latter case specifically on what was lost (and much less commonly on what was gained). Most notably research has been directed towards the ‘collapse’ of the three main ‘high-civilizations’ in the Bronze Age Aegean: the periods around 2200 BCE, connected with the final phase of the Early Bronze Age (EBA); the end of the main palatial period on Minoan Crete around 1500/1450 BCE; and the end of the Mycenaean period at around 1200 BCE until the end of the Bronze Age. Some scholars have attempted large scale analyses (Drews 1993; Maran 1998; Robbins 2001). Other studies have concentrated more specifically on one particular factor and potential cause of change such as environmental change (van Andel et al. 1986; Bloedow 1995; Halstead & Frederick 2000), natural disasters (Driessen & MacDonald 2000; Nur & Cline 2000), and climate effects (Wiman & Faegersten 1998; Moody 2005; Tsonis et al. 2010).

The descriptive basis and the often generalized linkages made between specific factors such as climate change or environmental change and social change in many of these analyses are problematic and could be subjected to the same critique as launched by the authors of *Questioning Collapse*. The challenge for Aegean archaeology now is to move from such generalizations towards a greater degree of contextualization, and from the perspective of ‘societies’ towards a greater emphasis on the agency of people. Resilience as a concept describes the positive force of human flexibility and resolve in relation to changing prerequisites of life and seems thus to be a promising notion for better understandings of the roles of people in cultural transformations.

Adaptive cycles and panarchies

The adaptive cycle is a model often cited to visualize continuous reformation within systems and it is a key model for resilience theory. The model illustrated as a figure-of-eight was developed by Holling (1986, 2001) and consists of a cyclical development through four phases of equal value for the whole: exploitation and conservation in the so-called 'front loop', and release and reorganization in the 'back loop' (Fig. 1). These four functions of the adaptive cycle work on different temporal and spatial scales, with the trajectory from exploitation to conservation representing the major slow sequence of change including the accumulation of capital and system build up. During this phase, the connectedness and stability of a system increase.

According to the model, the potential for the future inherent in the system increases with the level of the accumulated resources. At the same time, however, the continuous increase in connectedness leads in the end to the system 'eventually becoming over-connected and increasingly rigid in its control. It becomes an accident waiting to

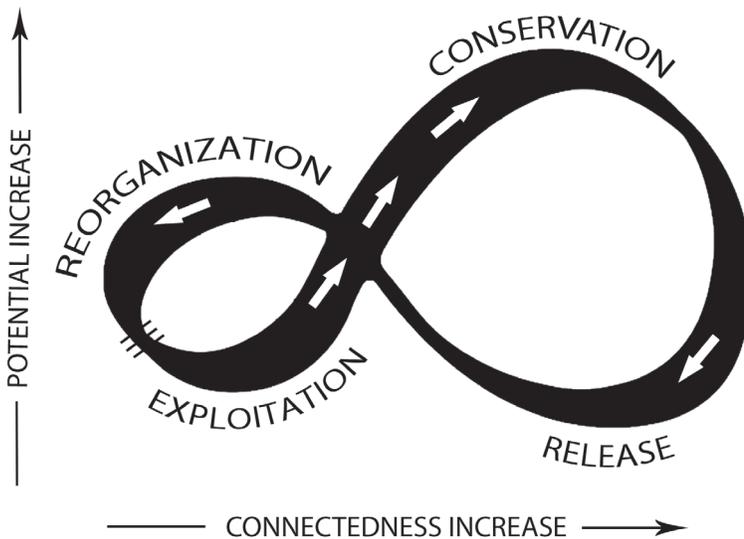


Fig. 1. Illustration of the four functions of the adaptive cycle and the variations in potential and connectedness within the cycle (modified from Holling 2001, fig. 4).

happen' (Holling 2001:394). The slow trajectory from exploitation to conservation is therefore continually intersected by shorter periods of rapid change, through the functions of release and reorganization. The resilience of the system fluctuates within the cycle, being at its highest in the 'back loop' of release and reorganization, when connectedness is low, and diminishing in the 'front loop' as connectedness extends within an increasingly 'brittle' system. According to this model all development will eventually come to a point when conservation measures can no longer be found to stabilize the system and a 'release' will be triggered. This means that the connectedness will be dissolved and the system will move into a phase of reorganization and reformation in dynamic set up processes eventually leading towards new a front loop which will keep some characteristics of the old, but in essence will be rearranged and have new characteristics for future development.

Furthermore, these adaptive cycles are not seen only as singular processes but as parts of a nested set of cycles, functioning at different levels of the system, at different speeds and thus variously extended in time and space. Short and fast processes meet large and slow processes and are perceived as linked to each other in hierarchical panarchies (Holling 2001; Holling et al. 2002). Panarchy is a concept that was developed to illustrate the presence and connectivity of many individual adaptive cycles within a larger system. Holling et al. (2002) emphasize two connections between cycles, labeled 'revolt' and 'remember'. The revolt connection is seen as a largely bottom-up function in which change in small and fast cycles may also trigger change at higher and slower levels. The remember connection is instead a top-down function in which renewal in one cycle may be facilitated by drawing from the accumulated potential in the buildup phase of a slower and larger cycle. With this perspective continuity and change always work in parallel, albeit on different levels and within varying time horizons. The panarchy concept is thus an elegant thought model for the combination of the macro-scale and the micro-scale. In historical studies, a panarchy could be equated with a cultural system consisting of internally linked processes (cycles) on different levels in the society, from family to worldview, which all have the potential to affect each other.

Adaptive cycles, panarchies and an emphasis on resilience may be seen as part of a conceptual toolbox that could be useful for researchers on most sides of former theoretical divides. The toolbox analogy stresses the inclusiveness of complex systems theory and resilience

theory. The idea of a conceptual toolbox was also recently used to position historical ecology as a research framework which was defined as a 'cluster of concepts that offers a holistic, practical perspective to the study of environmental change' (Meyer & Crumley 2011:109). Seen as a cluster of concepts, rather than a theory, the content of the toolbox lends itself to use by a variety of researchers with different theoretical backgrounds. Amongst the tools in the toolbox are listed: complex adaptive systems (CAS); resilience; diversity, region and scale; risk and vulnerability; change and causation; agency; and heterarchy (Meyer & Crumley 2011:112-21). The use of this toolbox may clearly be expanded beyond the framework of historical ecology and recent surveys of non-linear models and complex systems have tested their potentially wide applicability within archaeology by bringing together views from various disciplines and various theoretical points of departure (Beekman & Baden 2005).

A Greek Early Bronze Age perspective on the adaptive cycle

If we are to understand the human interactions in relation to societal change we need to include in the discussion an evaluation of active choices made by people under these circumstances. Change and not equilibrium defines complex adaptive systems and is a salient part of the adaptive cycle throughout all four phases. One significant issue with this view is to decide when the degree of change amounts to a 'release' and when the change is within the span of 'normal' perturbations. Another related question is how we position our knowledge of the content of societal processes in relation to the phases of the adaptive cycle? In discussing these issues Redman and Kinzig (2003) conclude that these determinations need to be made on a case-by-case basis 'that takes into account the specifics of the definitions, scales, and objectives of the research.' What may be called a state-flip on one time scale may be only a minor disruption in a longer time perspective. A dynasty can then be regarded as a completed adaptive cycle, or as a part of a longer trajectory and larger cycle in a broader view of civilizations.

Applied to the EBA of the south-central Greek mainland (c. 3100–2000 BCE; for further reading on EBA mainland Greece: e.g. Renfrew 1972; Maran 1998; Weiberg 2007), it is possible to view most of the third millennium as one long slow-moving cycle of societal development. This is an argument that will be published in more detail elsewhere

(Weiberg & Finné, in press, with extensive references) and the outline is given in the narrative below. It is a view that is applicable to material from the north-eastern Peloponnese, and it is proposed that one way to understand the events in this region is by outlining the history in the light of a regional identity (also Weiberg et al. 2010:154–60).

The beginning of this major cycle can thus be found in the Final Neolithic and earliest EBA when we see signs of an intensified exploration of the regional landscape and the beginnings of rain-fed agriculture, or agro-pastoralism, resulting in an upsurge of settlement numbers in the uplands. This change in land use was a notable break from the earlier pattern of small, few and scattered settlements in the spring-fed plains. With the increased usage of the landscape we can imagine came a growing awareness of both its potentials and limitations, and an increasing, probably individual as well as societal, identification with the landscape and the people within it. Notably, most of the known formal cemeteries were initiated during this phase. In all, this may have led to the conceptual creation of something similar to ‘home regions’ and this suggestion is supported by the next phase which entailed an intensification of activity to specific well-chosen spots in the landscape. These locales were to become regional centres within their topographical regions and this development may be regarded, using the adaptive cycle as a conceptual tool to interpret this, as the transition from the formative reorganization phase to the beginning of the phase of exploitation.

This phase of exploitation was a time when resources were accumulated, increasing the potentials and options for the future. In the EBA this process may be seen to be manifested from around 2600 BCE in the architectural definition of the regional centres, increased specialization as well as correspondences in material culture. The settlements grew in size and in articulation. The material culture repertoire was enlarged but was also increasingly standardized. These courses of events could all be seen as dependent, in part at least, on expanding social networks and the negotiation through time of social values connected to attained economic surplus and knowledge in an enhanced trading climate. The interregional correspondences would not have come into effect without actively engaged parties and the incentive on a local level to take part in this process.

Around two hundred years later some of these regional centres were abandoned. At the same time, however, the development towards increased societal complexity does not seem to be arrested but rather

enhanced on a larger regional level, manifested specifically at some coastal locations. Increased sedimentation rates are noted from some of these coastal locations at this time, likely triggered by nucleation and the impact of agriculture on a more intensified and localized scale. Some former regional centres seem to evolve into interregional centres. From these special locations at this point in time we have some of the most advanced forms of well-known EBA phenomena, such as specific types of monumental architecture and sealings for administrative purposes. All in all, there are signs that could be interpreted as an increased formalization and control, in parallel with adaptation to changing circumstances. These developments find parallels within the discourse on the conservation phases of the adaptive cycle with a focus on measures taken to uphold a certain societal status. The courses of events make sense when related to a geographically-based identity that evolved with societal development and which was increasingly tied up with the outcome of established contact networks that became, with the socio-political levels of society at large, progressively more inflexible, and in the end unsustainable.

At around 2200 BCE the sequences of events seem to have come together to trigger a significant cultural change. Disturbances in the trading networks are witnessed on an eastern Mediterranean level at this time with changes in the power balance as a result (Maran 1998:432-50). In an enhanced trading climate such as in the north-eastern Peloponnese, any disruptions could have had far-reaching effects in upsetting the balance between supply and demand and could have been more decisive than other disturbances suggested to have had an impact on the events, such as local erosional events and general climate change (e.g. van Andel et al. 1986; Maran 1998:255-9, 452-3; Weiberg & Finné in press, with further references). The societal changes at this time were highly noticeable throughout much of south-central Greek mainland, but it is at the interregional centres that they appear most conspicuous. The enhanced activity at these locations ceased. If these settlements are to be considered socio-political centres it seems likely that the focus of change lay on that level, signified by the disappearance of the most obvious administrative and political forms.

There are indications of a changed social pattern at this time with the social focus redirected from a fuller community level towards something more linked to the family or household, as suggested among other things by more loosely defined settlement plans and by a formaliza-

tion in the burial of infants within houses. A certain downscaling is also witnessed in many parts of society. In terms of architecture, this may be observed in a decrease in size and robustness, and in ceramics we see an increased focus on local choices in terms of techniques and decorative schemes that were given precedence at the same time as many of the earlier interregional correspondences cease. One effect of this is an upsurge in material culture diversity and an acceptance of forms of material culture, previously known but not incorporated. Interregional contacts thus continued, but the content, direction and outcome of these networks seem to have changed.

The sum of all changes during some generations around 2200 BCE display an 'abruptness' (this is obviously a highly relative term on a chronological scale) and perseverance at what seem to be an unprecedented level compared to the preceding almost one-thousand years. The sequence of events could very well be defined as a state-flip and may represent an example of the release phase of the adaptive cycle. The term 'release', however, is here very much to be preferred rather than the term 'collapse', commonly used to describe the events of this time. The idea of 'release' in itself brings added focus on the new circumstances a breakdown of some processes (cycles) may have promoted by the release of prior constrictions, rather than on the circumstances that were lost. The whole 'back loop' of the figure-of-eight model is regarded as unpredictable and uncertain but involves a low level of connectedness and thus a window for innovation and creative reformulation: 'It is a time of both crisis and opportunity' (Holling 2001:395). Thinking of the period around 2200 BCE as a 'release' rather than as a 'collapse' provides a novel way of interpreting this period, and opens up for a whole new set of questions.

It has been argued that people sustain what they value (Tainter 2006:92). So, what did change and what remained through these periods of cultural transformations, and what does this tell us of the social framework within which change occurred? What signs are there of the climate for innovation as visualized through the release concept? Much suggests that, indeed, in the EBA case above, we may talk of loosening traditions and regulations around 2200 BCE. The intensified regionality and material culture diversity are suggestive and are therefore interesting avenues for future research. The basis for this argument, then, is that while a cultural transformation may be an end of some old ways, it is also the beginnings of something new. This new

society that formed throughout the last two centuries of the EBA was in some respects distinctly different from what came before. It was a melting pot for what would come, and more micro-level analyses are needed to visualize the driving agents and the principal choices in this reformulation.

Summary and prospects

I have here attempted to summarize past and current applications of complex systems theory, with special reference to resilience theory and the conceptual model of the adaptive cycle. This has been undertaken with an eye to their potential use within the archaeology of the Aegean sphere, leaving the possible pitfalls aside for this time. The discussion has been drawn from ongoing research with the aim of bringing forth the contextuality and variability through time and space within this material. Resilience theory, with its sensitivity for complexity on different spatial and temporal scales, provides new tools that open up new avenues for research within prehistoric contexts, and which help to elucidate issues of scale and complexity in particular. An application of resilience theory probably will not produce concrete results that could not have been achieved without it, and this I believe could be said for most new theories and conceptual models, at least within the humanities. Instead, it is useful in inspiring us to reformulate or pose new questions that might inject new energy into stagnant research areas. They could in effect generate a 'release' of old research paradigms that may have constricted the view of the phenomena being studied.

One such stagnant area of research within Aegean archaeology is that of post-collapse societies. In this respect, resilience theory seems to be a promising avenue which might help to achieve a more nuanced view of these still rather neglected periods. This conceptual framework can help to balance the picture of what exactly a 'collapse' entailed and for whom (McAnany & Yoffe 2010; Schwartz & Nichols 2010). In the model of the adaptive cycle, all functions are of equal value for the whole. The back loop of the adaptive cycle enables 'post-collapse' processes to be viewed as dynamic and rich in innovation rather than being dismissed as 'Dark Ages' that in previous research have often been outshone by the grandeur of what came before or after. For example, a heightened emphasis on the *opportunities* for renewal (Folke 2006:7-8) coming from disintegrating social structures may stimulate

interesting discussions on human choice. A focus on resilience is a focus on human flexibility and the learning capacity of people within their socio-ecological systems in dealing with the varying circumstances of life. A resilience perspective in an archaeological context allows for the study of human capacities and pinpoints the need for analyses of the content and motivators for both continuity and change.

The concept of panarchies assists analyses of the complexity of systems and allows for diverging developments at different scales and levels. The Greek EBA perspective on the adaptive cycle sketched above is a rather generalized one even if downscaled to the north-eastern Peloponnese. There are many further scales of complexity to be added: geographical, chronological, social as well as conceptual. For instance, there is good potential in *comparative analyses* between different times and spaces based on categorizations using the metaphor of the adaptive cycle but informed by contextual analyses. This would allow us to study the practical and cognitive essences of change during transitional periods, question our definitions of societal success and failure, the intentionality of change (and ways to assess this), as well as any external and internal forces stimulating change. In the end, in comparative analyses, it is the contrasts that are the most interesting and which will bring forth a better understanding of the element of choice influencing the futures of societies in different times and spaces.

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