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What is it all for? Archaeology and Global Change Research

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There are a great many good reasons to do archaeology, ranging from simple curiosity about the unknown past to the equally simple basic pleasure of finding cool old stuff while camping out with friends. However, this century has seen many of us engaging with the big questions and grand challenges of using archaeology to collaborate with a growing range of people, institutions, disciplines, and nationalities in the acronym-rich world of Global Change research.

Grand Challenges and Broader Significance

Our initial challenge in the last century has been to get anyone outside of archaeology to listen to us, but an oncoming challenge in this century will be to deliver on our claims as we work with real-world practitioners responsible for human and non-human lives and the health of ecosystems. Many in the SAA have made major contributions to getting archaeology into the sustainability debates through years of hard work, and many of the excellent early career scholars now active are passionate about using our discipline to make a real difference in combining sustainability with human progress in a rapidly changing planet.

Beginning in 2011, a diverse and distinguished group of archaeologists held a series of workshops and conducted a broad crowd-sourcing polling exercise aimed at identifying “problems of broad scientific and social interest that could drive cutting edge research in archaeology for the next decade and beyond” (Kintigh et al. 2014). Many of the grand challenges (A. *Emergence, communities, and complexity*; B. *Resilience, persistence, transformation, and collapse*; C. *Movement, mobility, and migration*; D. *Cognition, behavior, and identity*; E. *Human–environment interactions*.) reflect engagement with Historical Ecology, the Integrated History and Future of Humans on Earth (IHOF, <http://ihopenet.org/>) and the Resilience Alliance (<https://www.resalliance.org/>), as well as the experience of participating in NSF programs like Biocomplexity, Coupled Natural and Human Systems, and the Arctic Social Sciences Program. Archaeology has done well in these new competitions, which often play to our long-term strengths in interdisciplinary collaboration and coordination of teams of multi-disciplinary investigators.

A similar multi-staged crowdsourced review process begun in 2014 led by early career researchers active in the Historical Ecology movement flags up 50 questions for new and ongoing research projects in this century (Armstrong et al. 2017). These questions also center around issues of human-environment interactions and the need to build structures for co-production of knowledge with other academic disciplines, heritage and land management practitioners, and local and indigenous communities. This essay is not intended to provide any comprehensive review of all this hard work and solid scholarship but is a personal perspective of lessons learned in nearly four decades of attempting interdisciplinary archaeology among the big science acronyms active in the North Atlantic quadrant of the circumpolar north.

North Atlantic & Human Ecodynamics

Working in the North Atlantic, with a doctoral thesis (1979) on the zooarchaeology of Norse Greenland, issues of climatic determinism, human impact on island ecosystems, proto-world system effects, and a now classic (if still controversial) case of complete societal “collapse”, it was hard to avoid a research focus on what much later became called coupled human and natural systems, SESs, or long term human ecodynamics. The islands of the North Atlantic were not the scene of human origins, Neolithic transitions, or the rise of pristine states but they were among the “last settled places on earth” and like other offshore islands have been characterized as “laboratories of culture change” and scale models for island earth. It is not an accident that island archaeologists have been often at the forefront of the effort to get long term human ecodynamics on the radar of other disciplines and (critically) of funding agencies (Fitzhugh et al 2018).

In the 1970's a wide range of researchers from multiple nations and archaeological traditions ventured into the lovely if damp islands of the North Atlantic, armed with a host of new tools and techniques and fired up by the then New Archaeology that promised simple and easy to understand universal rules for human – environment interactions. By 1992 a critical mass of researchers and new findings prompted the formation of the North Atlantic Biocultural Organization (NABO, www.nabohome.org) with help from the US National Science Foundation's new *Arctic Social Sciences Program* (then led by Noel Broadbent). NABO has since operated as an informal international and multi-disciplinary research and education cooperative, pooling resources (Land Rovers, boats, transits, and now drones and sub-meter GPS) and long running field schools (Iceland, Faroes, Shetland, and currently Orkney and Greenland). We have together produced masses of new data, forged multi-generational collaborative projects that include local communities, and learned a great deal we did not anticipate about those simple and easy to understand universal rules (compare for example McGovern 1981 with Dugmore et al. 2013 or McGovern et al 1988 with Hartman et al. 2017).

Three interlocking research foci have helped to pull together NABO researchers and have had resonance with modern global change and sustainability concerns that may be useful elsewhere:

- **Human impact on environment:** creation of cultural landscapes, planned and unanticipated outcomes of introductions and local extinctions, development (sustainable and catastrophic) of Natural Capital resources and creation of intergenerational landscape heritages.
- **Climate impacts upon humans and landscapes:** As climatologists and modelers deliver paleo-climate data on the temporal human scale of years and seasons and the geographic scale of hectares we have been given powerful tools for understanding conjunctures between human economic strategies and changing resource productivity. Fortunately, we are increasingly getting past deterministic simplicity (“it got cold and they died”) to make sophisticated use of human scale environmental data sets to investigate conjunctures between human intentions and climate fluctuation.
- **Humans Impact on Each Other:** Culture contact, migration, warfare, changing degrees of social and economic stratification and hierarchy, local impacts of early globalization and imperialism all are part of the ecodynamics mix and have profound influence on adaptive capacities and pathway dependence in the North Atlantic and beyond.

Historical Ecology as Theory and Tool Kit

The *School of American Research Advanced Seminar* in Santa Fe held in 1990 that produced the initial edited volume *Historical Ecology: Cultural Knowledge and Changing Landscapes* (Crumley 1994) included a short “Santa Fe Statement” that reads as a manifesto for archaeological engagement with global change issues. Historical Ecology is now a mature and flourishing research program involving environmental humanities, local and traditional knowledge, archaeology, history, paleoecology, and modern resource managers. It forms a key element of the IGBP/*Future Earth* core program IHOPE (*Integrated History and Future of People on Earth*,) based in Uppsala Sweden and still led by Carole Crumley. A blog post by Crumley provides a useful summary of the Historical Ecology program:

“Historical ecology is a practical framework of concepts and methods for studying the past and future of the relationship between people and their environment. While historical ecology may be applied to spatial and temporal frames at any resolution, it finds particularly rich sources of data at the “landscape” scale, where human activity and cognition interact with biophysical systems, and where archaeological, historical, ethnographic, environmental, and other records are plentiful....

... It is not a new discipline so much as a cluster of mutually compatible questions, concepts, methods, and values that are germane to diverse challenges. It is a rich environment within which to find common cause with other initiatives. Such communities are taking shape and broadening their inclusivity.”

(Carole Crumley 24 July 2014, Blog post http://www.hercules-landscapes.eu/blog.php?what_is_historical_ecology&id=10)

Historical Ecology is thus a tool kit for successful interdisciplinary research more than an ideologically driven theoretical paradigm. In practice, HE archaeology integrates both core processual and post-processual perspectives and bridges the science/humanities divide by connecting human intentionality, stores of traditional knowledge, politics, and bounded rationality with environmental science in place-based research with the fundamental realization that landscapes are product of humans, climate, geology, and time. HE has served to effectively connect the perspectives of the French Historical *Annales* school (*Longue durée*, conjunctures, cross-scale interactions, human landscape creation) with the influential formulations of the *Resilience Alliance* (panarchy, fast and slow variables, cross-scale and cross-temporal interactions, resilience, vulnerability, robustness, trade-offs, pathway dependence). Significantly, Historical Ecology is now a bridge to practitioners in adaptive landscape management projects, fisheries and marine mammal management, and several strains of Environmental History and Environmental Humanities (see <http://oceanspast.org/> ; <https://hfe-observatories.org/>).

Engaging with GEC Research: Some Take Away Suggestions

While there is no one size fits all approach to engaging with the broader global change community (which includes many “big science” acronyms, governmental and inter-governmental agencies, science reporters and the green media, and local and traditional knowledge holders) a few principles may be worth emphasizing:

- **Finding Allies**
 - Connect widely with other academic disciplines on the full spectrum of hard science- social science- humanities- arts. Environmental History, Environmental Humanities, Ecocriticism, Arts for Environment are all growing fields who want to engage with human scale climate and natural sciences. We are the natural bridging discipline.
 - Continue to engage with hard science (climatology, oceanography, biosciences) and give papers at their meetings. These acronymic groups have long term experience in organizing large projects and getting funding we can only dream about, and we have data and resources they find valuable (see Future Earth <http://www.futureearth.org/>)
 - Build connections with Cultural Heritage groups and local and indigenous communities. The SAA *Climate Change Strategies and the Archaeological Record* committee has discovered the power of a combination of concern with loss of scientific data and the loss of local and global heritage in engaging widely on issues of climate change threats. The integration of science, heritage, and community concern is a key to advancing our common agendas and making clear that archaeology is hugely relevant to present and future (see SCAPE <http://www.scapetrust.org/index.html>)
- **Digital Skills**
 - Data Management and Discoverability: We want our data sets used, but they can't use it if they can't find it. We all have much work to do with digitization to enhance access and discoverability of our data (e.g. <https://www.data-arc.org/>). We also need to employ digital tools to engage with non-academic knowledge holders and experts to aid genuine co-production of knowledge (see ELOKA, <https://eloka-arctic.org/>)
 - Models as the third leg of the archaeology school (thanks to Tim Kohler)- modeling provides many benefits, not the least in fostering focused conversations with natural scientists and resource managers.
 - Professionalizing visualization and outreach: we need to use the skills of professionals in developing media that can be used for education, dissemination, and broadening public awareness of our work. Working with environmental arts teams is highly worthwhile (see BIFROST: <https://bifrostonline.org/>)
- **Three Level Engagement** Offer both broad theoretical AND immediate and practical support to the objectives of GEC researchers by engaging on three levels of professional competence:
 - Completed long term human ecodynamics experiments of the past (cases of sustainability and collapse) need full and nuanced presentation. We can do better than Jared Diamond, and there is great need for new large scale syntheses that make full use of our data stores and professional interests.
 - Specific “lessons learned” on what works and what doesn't in human resource management over the *longue durée* – how to manage ducks sustainably for 1,000 years or garden with clams? (Jackley et al 2016, Hicks et al 2016, see:

<http://www.futureearth.org/blog/2015-jun-3/walking-eggshells-millennial-scale-sustainable-community-management>)

- Data sets we have that they need. Archaeological sites are effectively “distributed observing networks of the past” (DONOP) that hold stores of information about past ecosystems and human exploitation that are not available from any other source—especially as new isotopic and aDNA research expands our capacities to look at food webs and genetic change through time (Hambrecht et al 2018).

We have lots to do together as archaeologists to use the past to change the world for the better. If we go on doing what we do well (creating and sustaining interdisciplinary networks) and explore what we should be doing anyway (enhancing digital resources and capacities, engaging more effectively with stakeholders and the wider public) we have some grand challenges ahead that are worth meeting.

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