

Systematic Comparative Approaches to the Archaeological Record

Laura Fortunato

SFI WORKING PAPER: 2016-11-025

SFI Working Papers contain accounts of scientific work of the author(s) and do not necessarily represent the views of the Santa Fe Institute. We accept papers intended for publication in peer-reviewed journals or proceedings volumes, but not papers that have already appeared in print. Except for papers by our external faculty, papers must be based on work done at SFI, inspired by an invited visit to or collaboration at SFI, or funded by an SFI grant.

©NOTICE: This working paper is included by permission of the contributing author(s) as a means to ensure timely distribution of the scholarly and technical work on a non-commercial basis. Copyright and all rights therein are maintained by the author(s). It is understood that all persons copying this information will adhere to the terms and constraints invoked by each author's copyright. These works may be reposted only with the explicit permission of the copyright holder.

www.santafe.edu



SANTA FE INSTITUTE

Systematic comparative approaches to the archaeological record

Laura Fortunato

Institute of Cognitive and Evolutionary Anthropology

University of Oxford

64 Banbury Road, Oxford OX2 6PN, UK

`laura.fortunato@anthro.ox.ac.uk`

+44 (0)1865 284971

Santa Fe Institute

1399 Hyde Park Road

Santa Fe, NM 87501, USA

Chapter submitted in July 2015 for Sabloff, J.A. (ed.) *Complexity and Society: an Introduction to Complex Adaptive Systems and Human Society*. Princeton: Princeton University Press.

1 Increasingly, interdisciplinary research teams come together to seek to establish regularities,
2 over space and time, in the complex system that is the human phenomenon. While vocabulary
3 and tools have changed, the questions that animate this research programme bear striking
4 similarity with those pursued by nineteenth century intellectuals, in a quest to establish universal
5 laws shaping human affairs. In fact, that very quest provided the impetus for the emergence
6 of what would later become distinct disciplines in the social and historical sciences, including
7 anthropology¹ and sociology (see Carneiro 2003; Harris 2001; Trigger 2006).

8 Why, then, is this interdisciplinary research programme often met with skepticism, or even
9 outright resistance, within anthropology?

10 In this chapter we provide a brief outline of developments in the history of anthropology
11 leading to this state of affairs, in the hope of alleviating misunderstanding between those who
12 support the interdisciplinary research programme and those who oppose it. As a practical
13 contribution towards this end, we then provide an overview of key established resources for
14 systematic comparative approaches to the archaeological record. We conclude by discussing
15 challenges and opportunities in this area at the interface with recent developments in related
16 archaeological practice.

17 **1 Historical sketch**

18 In large part, the current state of affairs in anthropology can be attributed to the prevailing
19 theoretical paradigm of the late nineteenth century, now known as evolutionism.² Broadly,
20 its aim was the reconstruction of human cultural development, understood as the self-evident
21 trajectory from “simple” to “complex” forms of social organization documented in the archae-
22 ological and historical records. The ethnographic record contributed evidence of “primitive”
23 contemporary populations, taken to represent earlier stages along the way from “savagery” to
24 “civilization”, with “advanced” European society as the endpoint. This use of the ethnographic
25 data, known as the comparative method, was intended as the objective collection and sorting

¹We refer to anthropology as traditionally practiced in North-American universities, encompassing archaeology as a sub-field.

²The paradigm is sometimes referred to more specifically as “classical evolutionism” or “social/cultural/socio-cultural evolutionism”, to emphasise the distinction, both historical and conceptual, with contemporary approaches to the study of our species in the light of principles derived from evolutionary biology, including evolutionary anthropology and Darwinian archaeology. The branch of contemporary approaches focusing on the process of cultural evolution (defined as change over time in the distribution of cultural traits) is also distinct from evolutionism (e.g. Boyd and Richerson 1985; Cavalli-Sforza and Feldman 1981).

26 of facts; any form of moral value-judgment was explicitly rejected — in principle at least. In
27 practice, many self-proclaimed intellectuals with no other credentials but wealth and status
28 used this approach to validate stereotypes, often biased by nationalistic interests. The myth
29 of European superiority, with the inferiority of “primitive” societies it implied, was elevated to
30 the status of scientific truth, typically on the basis of dubious information collected by amateur
31 ethnologists, and equally dubious standards of proof masquerading as accurate methodology
32 (Carneiro 2003, chapters 2–5; Trigger 2006, chapters 5–7).

33 What started as a critique of this abuse of the ethnographic record (e.g. Boas 1896) even-
34 tually led to a reconsideration of the assumptions on which the paradigm rested, for example
35 the preeminence of cultural parallelism over other processes and the existence of universal stan-
36 dards of progress (see chapters 9–10 in Harris 2001, for discussion). Within a few decades the
37 paradigm had been rejected, with long-lasting repercussions for the disciplines it had given
38 birth to. For example, key features of contemporary sociocultural anthropology can be traced
39 back to the reaction against evolutionism in the formative decades straddling the 19th and
40 20th centuries. These include the antipathy towards quantitative approaches and the focus on
41 field-based, site-specific investigation as the hallmark of training and practice. Comparative ap-
42 proaches are viewed with suspicion, even when they are completely detached, conceptually and
43 methodologically, from the comparative method of evolutionism. More broadly, context-heavy
44 description is preferred, and valued, over systematic explanation. Combined, these features set
45 anthropology apart from cognate disciplines such as sociology, political science, and economics.

46 If indeed there are regularities over space and time in the human phenomenon, then they
47 must be documented in the ethnographic and archaeological records. Naturally, anthropologists
48 are best qualified to guide attempts to extract information from these sources. Yet the relative
49 minority of anthropologists willing to engage with this research programme tend to be cautious
50 in their approach, aware that the odious excesses of evolutionism stemmed from 19th-century
51 scientism. Furthermore, this minority operates among a majority who reject the research pro-
52 gramme on ideological grounds couched as methodological criticism, dismissing any scientific
53 approach as reductionist.

54 Interdisciplinary research efforts continue to be hampered by this unfortunate state of affairs.
55 Our reading of the developments that led to it suggests that some caution is indeed justified,

56 if past mistakes are to be avoided. Yet this attitude tends to frustrate researchers not familiar
57 with the history of anthropology. As a result, the two “sides” often operate in opposition to
58 each other, rather than in concert. We hope that, in exposing the root cause of the tension,
59 this brief historical sketch can lead to more productive exchange between them.

60 **2 Systematic comparison in anthropology**

61 Approaches to comparative analysis in the social and historical sciences can be classified along a
62 continuum from intensive to systematic. Intensive approaches typically involve many variables
63 across few cases, while systematic approaches typically focus on few variables across many cases
64 (Smith and Peregrine 2012, pp. 7–9).

65 To varying degrees, anthropologists are comfortable with intensive comparative approaches,
66 generally applied informally (Trigger 2003, chapter 2). For example, it is common practice to
67 compare and contrast societies on subsistence regime, form of social organization, etc. to aid
68 in interpretation of patterns and phenomena documented in the ethnographic and archaeologi-
69 cal records. Systematic comparative approaches are more contentious, especially when coupled
70 with formal treatment of the data (i.e. statistical analysis and/or mathematical modelling).
71 Inevitably, there tends to be a trade-off between the number of cases and variables, and the
72 amount of context (e.g. historical, ethnographic, etc.). Consequently, systematic approaches
73 typically involve the sacrifice of detail for larger samples which, in turn, are amenable to quan-
74 titative analysis. To many anthropologists the trade-off bears echoes of the comparative method
75 of evolutionism.¹

76 This attitude has stifled the application of systematic comparative approaches in anthro-
77 pology throughout the twentieth century (Murdock 1971). At the same time, it has spurred
78 methodological developments to address specific criticisms raised (see discussions of the key
79 issues in Burton and White 1987; Ember and Ember 2009). One such development is the
80 production of standard samples of cases, drawn from the ethnographic record, specifically for
81 systematic comparative analysis. For example, Murdock and White (1969) collated the *Stan-*
82 *dard Cross-Cultural Sample* with the aim to adequately represent the range of cultural variation

¹Indeed, the application of statistical thinking to cross-cultural samples drawn from the ethnographic record was pioneered in this context, with a paper presented by Tylor to the Royal Anthropological Institute in 1888 (Tylor 1889) — according to Harris (2001, p. 158), “[p]erhaps the greatest anthropological paper of the nineteenth century”.

83 documented in the ethnographic record (i.e. avoiding biases towards regions that are overrep-
84 resented), while minimizing the effects of the non-independence of human societies (the result
85 of processes such as descent from a common ancestor and diffusion through contact)¹ (Mur-
86 dock 1977). Further, by establishing a standard sample, Murdock and White (1969) sought
87 to facilitate integration of data and findings across studies. This strategy proved successful:
88 currently, the *Standard Cross-Cultural Sample* codebook includes coded data on approximately
89 2000 variables for the 186 societies in the sample (White et al. nd).

90 In addition to these “endogenous” developments, systematic comparative analysis of the
91 ethnographic record has benefitted from exchanges with other disciplines. For example, since
92 the 1970s researchers interested in the evolution of human social behaviour have used this
93 approach to seek to uncover patterns in behavioural diversity across groups. In turn, they have
94 contributed hypotheses (e.g. Alexander et al. 1979) and methods (e.g. Mace and Pagel 1994)
95 from the biological sciences.

96 Analogous developments for systematic comparative analysis of the archaeological record
97 have lagged behind (see discussion in Peregrine 2004). As a result, the available resources
98 are less known, and used, than their ethnographic counterparts. We briefly outline the key
99 established resources below before reviewing some challenges associated with their use. We
100 conclude by discussing the interface with recent developments in related archaeological practice.
101 More general overviews of comparative approaches in archaeology can be found in Peregrine
102 (2001a, 2004).

103 **2.1 Resources for systematic comparison in archaeology**

104 The major established tool for systematic comparative analysis of the archaeological record
105 encompasses two resources developed by the Human Relations Area Files, Inc. (*HRAF*) begin-
106 ning in the late 1990s (<http://hraf.yale.edu/>): its online archaeological database, *eHRAF*
107 *Archaeology*, and the *Encyclopedia of Prehistory* (Peregrine and Ember 2002). Both resources,
108 described below, are used extensively across chapters in this volume.

¹The issue of the non-independence of sample units in comparative analysis was first recognized by Galton in response to Tylor’s 1888 paper (Tylor 1889). To this day, the issue is known in anthropology as “Galton’s problem”.

109 **2.1.1 The “archaeological tradition” as unit of analysis**

110 In an effort to address the shortcomings of previous research, development of the *HRAF* re-
111 sources focused on the production of a standard sample of cases drawn from the archaeological
112 record, large enough to allow for formal treatment of the data (Peregrine 2004). A key issue
113 was definition of an appropriate unit of analysis. Comparative research hinges on definition of
114 comparable units, allowing for both generality and specificity. In archaeology, generality ensures
115 that the definition is applicable to data from any region and time period, while specificity en-
116 sures that distinct cases remain readily distinguishable (Peregrine and Ember 2001–2002, vol. 9,
117 p. 2).

118 The *HRAF* resources use the “archaeological tradition” as unit of analysis, defined as “a
119 group of populations sharing similar subsistence practices, technology, and forms of socio-
120 political organization, which are spatially contiguous over a relatively large area and which
121 endure temporally for a relatively long period” (Peregrine 2001b, p. ii).

122 Archaeological traditions have both a spatial and a temporal dimension: as a rule of thumb,
123 minimal areal coverage is on the order of 100,000 km^2 and minimal temporal duration on the
124 order of five centuries. The focus is on information that can be recovered from the archaeological
125 record (e.g. subsistence practices and socio-political organization), as opposed to more “labile”
126 traits typically used in the definition of “cultures” in ethnography (e.g. language or ideology).
127 Consequently, an archaeological tradition may or may not correspond to a “culture” as defined
128 for the purpose of comparative analysis of the ethnographic record (Peregrine and Ember 2001–
129 2002, vol. 9, p. 2).

130 **2.1.2 The *Outline of Archaeological Traditions (OAT)***

131 Based on the above definition Peregrine (2001b) developed the *Outline of Archaeological Tra-*
132 *ditions (OAT)* as a catalogue of all known archaeological traditions documenting human pre-
133 history.

134 The main focus in development of the *OAT* was on extracting units roughly equivalent across
135 areas (Peregrine and Ember 2001–2002, vol. 9, pp. 2–3), covering the entire period from the
136 origin of the genus *Homo* in Africa approximately 2 million years ago to European exploration
137 and colonization of Oceania, the Americas, and sub-Saharan Africa approximately 500 years

138 ago. The current version includes 289 entries (Peregrine 2001b, revised 2010).

139 **2.1.3 *eHRAF Archaeology***

140 The *OAT* is the sampling frame for *eHRAF Archaeology*, *HRAF*'s online archaeological database
141 (<http://hraf.yale.edu/online-databases/ehraf-archaeology/>). To the extent that the
142 *OAT* is a comprehensive list of all prehistoric human societies known archaeologically (Pere-
143 grine 2004) — an assumption we discuss below — then a random sample drawn from it will be
144 a representative “snapshot” of human prehistory. Based on this reasoning, *eHRAF Archaeology*
145 provides information for a simple random sample of archaeological traditions in the *OAT*.

146 In addition to the random sample, *eHRAF Archaeology* provides information for complete
147 sequences of archaeological traditions for selected world regions, including to date (July 2015):
148 Egypt, Mesopotamia, the Highland and Coastal Andes, Highland Mesoamerica, the Maya area,
149 the Mississippi River Valley, and the U.S. Southwest.

150 *eHRAF Archaeology* is continually expanding and updated annually; as of June 2015 it cov-
151 ered 94 archaeological traditions overall, 46 of which are included in the random sample. In
152 addition to a general summary for each tradition the database provides full-text source doc-
153 uments, including books, journal articles, dissertations, and manuscripts. The documents are
154 numerically subject-indexed, paragraph by paragraph, following the *Outline of Cultural Materi-*
155 *als* (Murdock et al. 2008), a vast compendium of indexing terms that seeks to cover all aspects
156 of human social and cultural life. This indexing system, unique to *HRAF* databases¹, allows
157 users to search for and connect related anthropological concepts across documents, irrespective
158 of the language of the documents, the specific terms used, and spelling conventions. For ex-
159 ample, a simple keyword search for “metalworking” or “smithing” would fail to retrieve related
160 information expressed with different terms or in a language other than English. A search based
161 on relevant subjects in the *Outline of Cultural Materials* (325: metallurgy; 326: smiths and their
162 crafts; 327: iron and steel industry; 328: nonferrous metal industries) would instead retrieve all
163 related information available across all documents in the database.

¹In addition to *eHRAF Archaeology*, *HRAF* develops and maintains an online ethnographic database, *eHRAF World Cultures* (<http://hraf.yale.edu/online-databases/ehraf-world-cultures/>).

164 **2.1.4 The *Encyclopedia of Prehistory***

165 Peregrine and Ember’s (2001–2002) nine-volume *Encyclopedia of Prehistory* provides descriptive
166 information and references for 286 of the 289 archaeological traditions in the *OAT*, i.e. the 286
167 traditions unanimously deemed “prehistoric” (Peregrine and Ember 2001–2002, vol. 9, p. 3).

168 In addition to details of the archaeological record and the environment pertaining to each
169 tradition, topics covered include the tradition’s settlement pattern, economy, socio-political
170 organization, religion and expressive culture (Peregrine and Ember 2001–2002, vol. 1, p. x).
171 Also included is a list of the descendants for each tradition, as determined from time and
172 location (Peregrine and Ember 2001–2002, vol. 9).

173 **2.2 Outstanding issues**

174 Development of a working draft of the *OAT* involved some 30 scholars over two years, called to
175 revise and refine successive iterations of the list. Compilation of the *Encyclopedia of Prehistory*
176 involved 200 scholars from 20 nations over four years (Peregrine and Ember 2001–2002, vol. 9,
177 pp. 2–3). *eHRAF Archaeology* is a work in progress started in the late 1990s. These figures
178 point to the impressive scale of the projects and, more generally, to the benefits of collaborative
179 work in systematic comparative archaeology. The range of applications of the resources across
180 chapters in the volume illustrates how they can be used to help uncover trends and patterns in
181 human prehistory.

182 At the same time, awareness of the challenges encountered in using these resources can
183 prove useful in guiding future efforts (see discussion in Peregrine and Ember 2001–2002, vol. 9,
184 pp. 1–4). We limit discussion to two issues as they apply specifically to systematic comparative
185 analysis of the archaeological record: derivation of a sampling frame and the statistical non-
186 independence of sample units.

187 The *OAT* is, effectively, an attempt to catalogue all known prehistoric human societies
188 (Peregrine 2004), intended as a “statistically-valid sample of cases for comparative archaeological
189 research” (Peregrine 2001a, p. 12). But is it? One practical consideration is that, just like
190 the ethnographic record, the archaeological record is biased. In archaeology, the bias will be
191 towards wealthier areas and/or those with greater political stability — factors that facilitate
192 archaeological field-work (Peregrine and Ember 2001–2002, vol. 9, p. 3). Thus, to the extent

193 that the *OAT* and the *Encyclopedia of Prehistory* provide “a snapshot of our current knowledge
194 of the archaeological record” (Peregrine and Ember 2001–2002, vol. 9, p. 3), they will reflect
195 these biases, as will the random sample in *eHRAF Archaeology*.

196 Further, any sample drawn from these resources will comprise units that are statistically
197 non-independent. This can result from contact between the populations captured by different
198 archaeological traditions, or because the populations shared a common ancestor. Both processes
199 may lead to greater similarity between archaeological traditions that are closer geographically,
200 for example, compared to others. Additionally, because the *OAT* is diachronic, two traditions
201 in a sample drawn from it may represent populations that are one the direct descendant of the
202 other. So, for example, if the earliest of these traditions developed metalworking, then it is likely
203 that its descendant will also display metalworking. This would have to be taken into account
204 in determining trends in, or correlates of, the acquisition of metalworking over the course of
205 prehistory based on the sample (see discussion in Peregrine 2003).

206 Accounting for the effects of all the processes described above poses non-trivial methodologi-
207 cal challenges. Some of the issues have been discussed extensively in the ethnographic literature,
208 as they also apply to systematic comparative analysis of the ethnographic record (see discussions
209 in Ember and Ember 2009; Levinson and Malone 1980). For example, the issue of the statisti-
210 cal non-independence of units in synchronic samples due to contact between populations or to
211 descent from a common ancestor (i.e. Galton’s problem) has attracted considerable attention,
212 with possible recent “solutions” including the application of phylogenetic comparative methods
213 (Mace and Pagel 1994) or of network autocorrelation analysis (Dow 2007). Efforts to explore
214 how these approaches can be extended to systematic comparative analysis of the archaeological
215 record are ongoing (P. Peregrine, pers. comm., July 2015).

216 **2.3 Future directions**

217 It is becoming increasingly clear that collaboration between anthropologists and data scientists
218 will be crucial in addressing the underlying methodological issues. For example, as discussed
219 above the *OAT* and related resources rest on definition of a “fixed” unit of analysis (the ar-
220 chaeological tradition) and a “fixed” set of units (the 289 traditions in Peregrine 2001b). With
221 the adoption of flexible digital tools for the crowd-sourcing of data, researchers will instead be

222 able to refine the unit they use to reflect the question at hand (see e.g. Turchin et al. 2015, for
223 an application to historical data).

224 Better still, in the future researchers may be able to bypass the *a priori* definition of the
225 unit of analysis altogether. Rather, the most appropriate unit for the question at hand will be
226 “extracted” computationally from the data. For example, data mining and machine learning
227 techniques may be used to establish comparable foci of social interaction across sites based
228 on statistical patterns in the frequency distributions of unearthed artifacts. These techniques
229 have been fruitfully employed in the study of other cultural domains (e.g. Michel et al. 2011),
230 following the digitization of large bodies of data. Their application now seems within reach also
231 in archaeology, in light of recent efforts to establish digital repositories for the preservation and
232 some forms of integration of primary data (including the raw data and contextual information)
233 from archaeological investigations (e.g. *tDAR: the Digital Archaeological Record*, [http://www.
234 tdar.org/](http://www.tdar.org/)).

235 The aggregation and integration of both legacy and newly-generated data in dedicated repos-
236 itories and databanks promises an ever-changing picture of the archaeological record — a picture
237 that will become more and more focused as the data accumulate. While several challenges re-
238 main (Kintigh 2015; Kintigh et al. 2015), the further development of digital infrastructure in this
239 direction is likely to transform how systematic comparative archaeology is conducted, for exam-
240 ple extending its scope from prehistory to history (recall that the *OAT* and related resources
241 are restricted to prehistory). Perhaps the most important transformation will rest with how the
242 data themselves are used. By necessity, the typical mode of synthesis in archaeology (including
243 any form of comparative analysis) relies on interpretations of the primary data by the original
244 investigators, or even summaries of these interpretations by others (Kintigh et al. 2015). Inter-
245 pretations and summaries several steps removed from the data can become entrenched in the
246 literature as “facts”, serving as the basis for subsequent work by archaeologists and researchers
247 in other disciplines. However, they cannot be refined as more data or improved inferential
248 procedures become available. By contrast, the ability to access and analyse the primary data
249 directly will remove the need to rely on often outdated, or even flawed, interpretations and sum-
250 maries, eventually leading to reassessment of erroneous “facts” in the literature. Additionally,
251 the data will be more readily shared with researchers in other disciplines and combined with

252 complementary sources of information, such as ecological data (Kintigh 2006).

253 More broadly, discipline-wide efforts towards the development of digital infrastructure will
254 be a crucial step in addressing archaeology’s grand challenges — fundamental questions about
255 the human phenomenon whose answers require information on “facts of the past”, such as long-
256 term cultural dynamics or the interplay between ecological and social factors (Kintigh et al.
257 2014). For example, why, and how, do leaders emerge in some societies, and what sustains
258 inequality in the long term? What drives the decline and eventual collapse of societies? And
259 how do societies respond to rapid environmental change? Tackling these and related questions
260 will involve both synthetic work within archaeology and interdisciplinary collaboration, entailing
261 substantial practical and intellectual challenges (Kintigh et al. 2015). The reward will be the
262 ability to contribute to contemporary scientific and societal debates.

263 Acknowledgements

264 I thank Peter Peregrine for feedback.

265 References

- 266 Alexander, R. D., Hoogland, J. L., Howard, R. D., Noonan, K. M., and Sherman, P. W. (1979).
267 Sexual dimorphisms and breeding systems in pinnipeds, ungulates, primates, and humans. In
268 Chagnon, N. A. and Irons, W., editors, *Evolutionary biology and human social behavior: an*
269 *anthropological perspective*, chapter 15, pages 402–435. Duxbury Press, North Scituate, MA.
- 270 Boas, F. (1896). The limitations of the comparative method of anthropology. *Science*,
271 4(103):901–908.
- 272 Boyd, R. and Richerson, P. J. (1985). *Culture and the evolutionary process*. The University of
273 Chicago Press, Chicago, IL.
- 274 Burton, M. L. and White, D. R. (1987). Cross-cultural surveys today. *Annual Review of*
275 *Anthropology*, 16(1):143–160.
- 276 Carneiro, R. L. (2003). *Evolutionism in cultural anthropology: a critical history*. Westview
277 Press, Boulder, CO.

- 278 Cavalli-Sforza, L. L. and Feldman, M. W. (1981). *Cultural transmission and evolution: a*
279 *quantitative approach*. Princeton University Press, Princeton, NJ.
- 280 Digital Antiquity (2015). The digital archaeological record. Accessed 2015-07-31.
- 281 Dow, M. M. (2007). Galton's problem as multiple network autocorrelation effects: cultural trait
282 transmission and ecological constraint. *Cross-Cultural Research*, 41(4):336–363.
- 283 Ember, C. R. and Ember, M. (2009). *Cross-cultural research methods*. AltaMira Press, Lanham,
284 MD, 2nd edition.
- 285 Harris, M. (2001). *The rise of anthropological theory: a history of theories of culture*. AltaMira
286 Press, Walnut Creek, CA, updated edition.
- 287 Kintigh, K. W. (2006). The promise and challenge of archaeological data integration. *American*
288 *Antiquity*, 71(3):567–578.
- 289 Kintigh, K. W. (2015). Extracting information from archaeological texts. *Open Archaeology*,
290 1(1). <http://dx.doi.org/10.1515/opar-2015-0004>.
- 291 Kintigh, K. W., Altschul, J. H., Beaudry, M. C., Drennan, R. D., Kinzig, A. P., Kohler, T. A.,
292 Limp, W. F., Maschner, H. D. G., Michener, W. K., Pauketat, T. R., Peregrine, P. N.,
293 Sabloff, J. A., Wilkinson, T. J., Wright, H. T., and Zeder, M. A. (2014). Grand challenges
294 for archaeology. *American Antiquity*, 79(1):5–24.
- 295 Kintigh, K. W., Altschul, J. H., Kinzig, A. P., Limp, W. F., Michener, W. K., Sabloff, J. A.,
296 Hackett, E. J., Kohler, T. A., Ludäscher, B., and Lynch, C. A. (2015). Cultural dynamics,
297 deep time, and data: planning cyberinfrastructure investments for archaeology. *Advances in*
298 *Archaeological Practice*, 3(1):1–15.
- 299 Levinson, D. and Malone, M. J. (1980). *Toward explaining human culture: a critical review of*
300 *the findings of worldwide cross-cultural research*. HRAF Press, New Haven, CT.
- 301 Mace, R. and Pagel, M. (1994). The comparative method in anthropology. *Current Anthropol-*
302 *ogy*, 35(5):549–564.
- 303 Michel, J.-B., Shen, Y. K., Aiden, A. P., Veres, A., Gray, M. K., The Google Books Team,
304 Pickett, J. P., Hoiberg, D., Clancy, D., Norvig, P., Orwant, J., Pinker, S., Nowak, M. A.,

305 and Aiden, E. L. (2011). Quantitative analysis of culture using millions of digitized books.
306 *Science*, 331(6014):176–182.

307 Murdock, G. P. (1971). Anthropology’s mythology. *Proceedings of the Royal Anthropological*
308 *Institute of Great Britain and Ireland*, (1971):17–24.

309 Murdock, G. P. (1977). Major emphases in my comparative research. *Cross-Cultural Research*,
310 12(4):217–221.

311 Murdock, G. P., Ford, C. S., Hudson, A. E., Kennedy, R., Simmons, L. W., and Whiting, J.
312 W. M. (2008). *Outline of cultural materials*. HRAF Press, New Haven, CT, 6th edition.
313 revised with modifications.

314 Murdock, G. P. and White, D. R. (1969). Standard cross-cultural sample. *Ethnology*, 8(4):329–
315 369.

316 Peregrine, P. N. (2001a). Cross-cultural comparative approaches in archaeology. *Annual Review*
317 *of Anthropology*, 30(1):1–18.

318 Peregrine, P. N. (2001b). *Outline of archaeological traditions*. HRAF Press, New Haven, CT.
319 Revised September 2010.

320 Peregrine, P. N. (2003). *Atlas of Cultural Evolution*. *World Cultures*, 14(1):2–88.

321 Peregrine, P. N. (2004). Cross-cultural approaches in archaeology: comparative ethnology, com-
322 parative archaeology, and archaeoethnology. *Journal of Archaeological Research*, 12(3):281–
323 309.

324 Peregrine, P. N. and Ember, M., editors (2001–2002). *Encyclopedia of prehistory*. Kluwer
325 Academic/Plenum Publishers, New York, NY.

326 Smith, M. E. and Peregrine, P. (2012). Approaches to comparative analysis in archaeology.
327 In Smith, M. E., editor, *The comparative archaeology of complex societies*, chapter 2, pages
328 4–20. Cambridge University Press, Cambridge.

329 Trigger, B. G. (2003). *Understanding early civilizations: a comparative study*. Cambridge
330 University Press, Cambridge.

- 331 Trigger, B. G. (2006). *A history of archaeological thought*. Cambridge University Press, Cam-
332 bridge, 2nd edition.
- 333 Turchin, P., Brennan, R., Currie, T. E., Feeney, K. C., François, P., Hoyer, D., Manning,
334 J. G., Marciniak, A., Mullins, D., Palmisano, A., Peregrine, P. N., Turner, E. A. L., and
335 Whitehouse, H. (2015). Seshat: The Global History Databank. *Cliodynamics*, 6(1). [http:](http://www.escholarship.org/uc/item/9qx38718)
336 [//www.escholarship.org/uc/item/9qx38718](http://www.escholarship.org/uc/item/9qx38718).
- 337 Tylor, E. B. (1889). On a method of investigating the development of institutions; applied to
338 laws of marriage and descent. *The Journal of the Anthropological Institute of Great Britain*
339 *and Ireland*, 18:245–272.
- 340 White, D. R., Burton, M. L., Divale, W. T., Gray, J. P., Korotayev, A., and Khaltourina, D.
341 (n.d.). Standard cross-cultural codes. Retrieved August 31, 2007, from [http://eclectic.](http://eclectic.ss.uci.edu/~drwhite/courses/SCCCodes.htm)
342 [ss.uci.edu/~drwhite/courses/SCCCodes.htm](http://eclectic.ss.uci.edu/~drwhite/courses/SCCCodes.htm).