A Cross-Cultural Index of Assemblage Homogeneity
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Abstract

One of the barriers to rigorous cross-cultural comparison in archaeology is the lack of methods to compare assemblages and assemblage complexity. Archaeological statistics of complexity measure diversity within assemblages, not among assemblages. The Brainerd-Robinson coefficient of similarity offers an approach to comparing inter-assemblage diversity, as it may be extended by taking the similarity coefficients as data points and computing a mean and standard deviation: an index of assemblage homogeneity. I use data from Western Kentucky Mississippian, Jamaican Taino, North Carolina Siouan, and historic Central Mississippi Valley and North Carolina sites to compare assemblage homogeneity at several levels of cultural complexity.

I start this discussion with a basic principle: to paraphrase Lewis Binford, archaeology is the investigation and explanation of the archaeological record. To me, this means that all of the subfields have, or should have, common concepts, approaches, and problems that link them into an integrative discipline. Specifically, historical archaeology and prehistory are not separate fields. I take historical archaeology to be the archaeology of literate societies, and a constituent of the archaeology of complex societies.

Depending on our geographic interests, we can define complex societies as states or as chiefdoms. In Eastern North America, for example, the complex societies are the Mississippian chiefdoms of the late prehistoric period. We never bother to think of the succeeding historic societies as complex societies, because historical archaeologists and prehistorians rarely cross into each others’ domains, and we take for granted that historic North American sites represent state-level societies.

Among the problems of the archaeology of complex societies is that we base the taxonomy on the ethnographic record. We have difficulties in applying the typology. For one thing, it’s not easy to specify archaeological correlates to the ethnographic models. For another, we strongly suspect that the ethnographic record does not fairly represent the full range of
past societies. We need archaeological models to define and compare complex societies.

One of the promises of historical archaeology as it emerged as a discipline was that we could use the documentary record to test models of more general archaeological relevance against an independent data base. Dethlefsen and Deetz’s demonstration of the horizon concept in New England cemeteries is a classic case. Other methods in widespread use, notably mean ceramic dating and the pipestem dating formula, are based on and affirm the sound archaeological principles of horizon and tradition and the practice of seriation, which were in fact developed by archaeologists working in other subfields. It appears, therefore, that such techniques developed in historical archaeology should be generalizable to other complex societies.

Let me suggest that we can use the complexity of an archaeological assemblage of a well-sampled community as a proxy for the complexity of the society. Can we find a measure of assemblage complexity that allows us to compare two unrelated societies — say, a Mississippian village with another village of a society we also interpret as a chiefdom, for instance, a Taino village in the Caribbean? Or even a Mississippian village with a medieval European village or a historic EuroAmerican town?
Problem one: how do we organize archaeological assemblages so that we can compare them cross-culturally? Problem two, how do we measure the comparison?

For problem one, I turn to historical archaeology, and to Stanley South’s method of functional group patterning. South’s pattern technique was based on a functional categorization of assemblages into artifact groups: Kitchen, Architecture, Furniture, Arms, Clothing, Personal, Tobacco Pipes, and Activities (and sometimes Faunal but faunal remains are subject to a different set of preservation processes so we often leave them out). To quote South, the "basic assumption is that each household... represents a system within a much larger system of complex variables, with the larger system imposing on each household a degree of uniformity in the relationships among its behavioral parts." "The basic postulate here is the assumption that there was a patterned casting off of behavioral by-products around an occupation site that might be viewed as a per capita, per year contribution to the archaeological record" (South 1977:86-87). These basic assumptions need not apply only to European and American sites of the last five centuries.

South showed that the percentages of artifacts in each of his artifact groups were fairly regular across a number of eighteenth-century British colonial sites, and suggested that there was a pattern, which he named the Carolina artifact
pattern. He also derived the Architecture pattern from frontier and military sites, which had much less of a domestic occupation and whose assemblages were dominated by Architectural artifacts.

Historical archaeologists have used South’s pattern as a standard for comparison: either a site fit the Carolina or Architecture pattern, or it didn’t. What we never did was to try to measure how much of a deviation from the pattern was significant. How similar are any two assemblages?

There are of course a number of papers that approach the problem of “Quantifying Diversity in Archaeology,” to quote the title of a 1989 book edited by Leonard and Jones. There are various techniques, borrowed from ecology, that measure something the archaeologists who use them call heterogeneity. Measures of heterogeneity combine measures of richness, having to do with the number of categories in the assemblage, and evenness, which has to do with to what extent the categories are equally represented within the assemblage. Evenness is a horror in archaeological pattern studies, where a few artifact categories – like Mississippian plain wares, or South’s Kitchen group – tend to dominate assemblages and the real action is in small variations in low-count, low-percentage categories.

To these “concepts related to diversity” George Cowgill also added the notions of range, standardization, and uniformity of standardization. All of this can get pretty involved
statistically, but I tend to agree with Dunnell, who called these a set of measures in search of an application. For one thing, they haven't been applied to anything that really makes them look useful. More important for my current problem, they measure heterogeneity within assemblages, not among assemblages. What we want to measure is similarity between assemblages, and homogeneity or heterogeneity within groups of assemblages.

We do have the Brainerd-Robinson coefficient of similarity, which was derived specifically as a measure of similarity between assemblages where artifact counts are expressed as percentages. It measures on a scale of 200, with 200 signifying identical assemblages and 0 signifying completely different assemblages.

The Brainerd-Robinson coefficient was defined some time ago, but hit a wall in terms of application. It was proposed as a seriation device, but there are easier ways to do seriation, and we tend to think of seriation as an application to chronology. Seriation may reflect other dimensions than time, and a coefficient of similarity doesn’t specify what dimension of time, space or assemblage content is being measured, but the coefficient was typecast as a seriation device.

So Brainerd-Robinson coefficients are a technique in search of an application also, something that a few people seem to dust
off now and then for heuristic purposes but haven’t applied very usefully.

Recently, Michael O’Brien and Greg Fox used Brainerd-Robinson to measure relationships between assemblages in order to define groups of more- and less-like assemblages. I like the approach, but I don’t see a discussion of what’s a significant level of similarity.

I think we can define significant similarity. If we have comparable data collection techniques, we can use Brainerd-Robinson to measure assemblage similarity. We can then use very simple statistics to look at the distributions of similarity coefficients among groups of assemblages: this becomes an index of homogeneity, a way to assess whether a single or a group of assemblages is different from others, and to measure whether one group of assemblages is more homogeneous than another group.

I constructed a Brainerd-Robinson matrix for the artifact group assemblages of South’s five sites. For the five Carolina sites, the mean coefficient of similarity is 163.72, with a standard deviation of 10.60. That seems to be a high degree of similarity and a fairly tight variation. Provisionally, then, sites of comparable statistics might be said to be homogeneous, but a set of sites with a mean coefficient of similarity (that is, index of homogeneity) less than 153 could be said to be
significantly more variable than the Carolina sites. But — how does that compare to other sets of samples?

I have eight sites in western Kentucky and Southeast Missouri that I can use as a comparative sample. All of the sites belong to middle- to upper middle-class EuroAmerican families, and all were occupied after 1840, into the mid-to-late 20th century (with one exception: there’s a feature in Ste. Genevieve that has a fill dating mainly to ca. 1790-1830). I’ll call these the Confluence area sites, for the Ohio-Mississippi Rivers confluence region. The data are recorded in the same functional assemblage groups as the Carolina pattern sites.

The index of homogeneity for the eight sites is $162.14 \pm 22.08$. This measure suggests, then, that the Confluence sites form a community about as internally similar as, but somewhat more variable than, the sites that defined the Carolina pattern.

Crossing cultures, I have applied the functional group patterning technique to my Mississippian data from the Wickliffe site in Kentucky. I have samples from fourteen seasons of field work, representing all major areas of the site. Of course, I could not use the same categories; I settled on the groups Ceramics, Arms, Personal, Activities, and Debitage. The assemblage patterns turned out to be useful to show patterned changes among the Early, Middle, and Late occupational periods of the site. Obviously, there’s no sense in trying to compare
the Wickliffe patterns directly to South’s Carolina site patterns, but the basic idea works within each data set.

If we treat the three periods as communities, and construct an index of homogeneity for the three site totals, we get an index of $179.79 \pm 10.48$. The Early, Middle and Late villages are more homogeneous assemblages than the historic sites are.

I also have four seasons of excavations in three Taino sites on the north coast of Jamaica. Two sites are represented by multiple test units, and one by only a single small unit. Comparing the three sites as total assemblages, the index of homogeneity is $191.73 \pm 2.59$, indicating that the assemblages are extremely similar.

The Wickliffe Mississippian and Jamaican Taino sites represent late prehistoric chiefdom societies. The historic sites represent recent state-level societies. It would be nice to have yet another dataset, perhaps one representing a tribal society. I turned to the Occaneechi site, a Contact period village in North Carolina. Stephen Davis and colleagues published Occaneechi on CD-ROM, with one of the most thorough and accessible databases ever published. One of the very nifty features of the CD-ROM is that the reader can take a random sample of excavation units, and study the finds. I selected a random fifteen units at Occaneechi, of which three were blank, giving me twelve samples. I organized the data into the same
categories as the Mississippian and Taino assemblages, since it is a Native American occupation. There is a slight problem with these data in that some of the glass actually post-dates the Occaneechi village, but I think the numbers involved are minor. For the twelve samples at Occaneechi, the index of homogeneity is $191.83 \pm 4.54$, indicating a very high degree of assemblage homogeneity.

The indices of homogeneity can be compared cross-culturally, because we will not be comparing artifact assemblages, we will be comparing distributions of the same type of data: Brainerd-Robinson coefficients of similarity. Theoretically, the more complex the society, the more diverse the assemblages will be: the lower the mean, and larger the standard deviation, of the index of homogeneity.

We can graph the results of the indices as calculated on site totals, and lo and behold, it looks like it works. If there’s a surprise, it is that the chiefdom Taino sites are comparably homogeneous to the tribal Occaneechi site, and not to the Wickliffe Mississippian sites. But the Wickliffe site falls midway, and the historic sites have lower means and the Confluence area sites a larger standard deviation.

Or we can compare diversity within sites, test unit by test unit. Here the curve is less distinct. Occaneechi is still by far the least complex assemblage set. Newry falls between
Occaneechi and the Wickliffe assemblages, while Green Castle is quite comparable to the Wickliffe assemblages. The historic sites show quite a bit of variability — the means are certainly more diverse than the chiefdom societies’ means. Further, neither set of historic sites represents the full range of their societies: particularly not in socioeconomic class or ethnic group. I suspect that a full spectrum of households for each historic society would offer more diversity than do these data.

There are a number of caveats to taking these comparisons uncritically, some you’ve immediately thought of. I haven’t fully explored them yet and can’t begin to in a fifteen-minute presentation. My point today is not that this is some grand new technique that we all need to adopt — I’m not sure yet if it really will be very useful at all.

My point, rather, is that we need to and can develop methods of comparing assemblages cross-culturally. Historical archaeology is not a separate discipline from prehistory. Historic sites represent complex societies. To create a unified archaeology of complex societies, we need to design and test methods that provide comparability across wide ranges of pre-, proto- and historic sites, drawing on principles and addressing problems that are common to prehistory and historical archaeology. Then we can truly begin to say that archaeology is the explanation of the archaeological record.