Attribute Association

Attribute (really attribute class) association as a means of discovering types was introduced by Spaulding (1953) and is still thought of as the “rationale” for archaeological types. In fact, it has nothing to do with classification, being a grouping device that requires an essentialist ontology.

The rationale for attribute association runs as follows: if one examines the frequency of attributes (attribute classes) independently of their combinations in objects, one can generate a model of random combination. Artefact types are taken to be “preferences” of the ancient artisans, i.e., strong positive associations of attributes. Consequently a given assemblage might have one type, no types, or lots of types, depending upon its structure and the types will account for a variable percentage of the total assemblage. Types are unique to particular assemblages.

To understand what is involved in attribute association, consider an assemblage of pottery of 100 sherds, 25 of which are shell tempered and 75 of which are sand tempered (n·= 100 for temper) and·60 of which have plain exterior surfaces and 40 of which have cord-marked exterior surfaces (n = 100 for exterior surface). Now, if the two temper attribute classes combined randomly with the two surface attribute classes, then we can calculate the expected frequency of their combination as simple compound probabilities:

$$\text{Expected (E)} = P_1 \text{ x } P_2 \text{ x } N$$

Where P_1 is the proportion of a Dimension 1 (e.g., temper) attribute class (e.g., shell) and P_2 is the proportion of a Dimension 2 (e.g., surface) attribute class (e.g., plain) and N is the number of sherds in the collection. Thus the expected frequency (E). for shell plain is 0.25 x 0.60 x 100 = 15. The full set of E values are given below.

	Plain	Cord	Total
Shell	15	10	25
Sand	45	30	75
Total	60	40	100

The next step is to count the number of sherds of each combination in the assemblage and compare these frequencies, called the observed frequencies (O), with the random model to ascertain whether some combinations occur more or less frequently than predicted by the random model. Spaulding does this with chi-squared test. A test is required since departures from the model may be large or small requiring a determination of significance. Two possible outcomes of counting are given to illustrate the range of possible outcomes.

	Plain	Cord	Total
Shell	25	0	25
Sand	35	40	75
Total	60	40	100

	Plain	Cord	Total
Shell	16	9	25
Sand	44	31	75
Total	60	40	100

In the first case, the results are dramatically different than the E values with many more sherds of the cord-marked sand and plain shell combinations than predicted and many fewer cases of plain sand and cord-marked shell than predicted. Thus two types, the positive associations; would be recognized. In the second case, the results are close to the predicted values, close enough to quite likely be the result of sampling error -- hence the need for a test. If on testing, these values are not significantly different from the random model we would be compelled, using Spaulding’s method, to conclude that there are no types!