

**QUANTITATIVE EXPRESSION OF
CULTURAL RELATIONSHIPS**

BY

H. E. DRIVER AND A. L. KROEBER

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ABBREVIATIONS USED

A	Anthropos.
l'A	L'Anthropologie.
AA	American Anthropologist.
AAA-M	American Anthropological Association, Memoirs.
ArA	Archiv für Anthropologie.
AES-P	American Ethnological Society, Publications.
AGW-M	Anthropologische Gesellschaft in Wien, Mitteilungen.
AJPA	American Journal of Physical Anthropology.
AMNH	American Museum of Natural History—
-AP	Anthropological Papers.
-B	Bulletin.
-M	Memoirs.
-MA	Memoirs, Anthropological Series.
-MJ	Memoirs, Jesup Expedition.
BAE	Bureau of American Ethnology—
-B	Bulletins.
-R	(Annual) Reports.
CNAE	Contributions to North American Ethnology.
CU-CA	Columbia University, Contributions to Anthropology.
FL	Folk-Lore.
FMNH	Field Museum of Natural History—
-M	Memoirs.
-PAS	Publications, Anthropological Series.
IAE	Internationales Archiv für Ethnographie.
ICA	International Congress of Americanists (Comptes Rendus, Proceedings).
IJAL	International Journal of American Linguistics.
JAFL	Journal of American Folk-Lore.
JRAI	Journal of the Royal Anthropological Institute.
MAIHF	Museum of the American Indian, Heye Foundation—
-C	Contributions.
-IN	Indian Notes.
-INM	Indian Notes and Monographs.
PM	Peabody Museum (of Harvard University)—
-M	Memoirs.
-P	Papers.
-R	Reports.
PMM-B	Public Museum (of the City) of Milwaukee, Bulletin.
SAP-J	Société des Américanistes de Paris, Journal.
SI	Smithsonian Institution—
-AR	Annual Reports.
-CK	Contributions to Knowledge.
-MC	Miscellaneous Collections.
UC-PAAE	University of California, Publications in American Archaeology and Ethnology.
UPM-AP	University of Pennsylvania (University) Museum, Anthropological Publications.
USNM	United States National Museum—
-R	Reports.
-P	Proceedings.
UW-PA	University of Washington, Publications in Anthropology.
ZE	Zeitschrift für Ethnologie.

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AIMS

This essay differs from its predecessors in the same field in one or all of several ways.

First, it is concerned with the similarities of culture-wholes, or considerable blocks of cultures like the Sun dance. The factors treated

¹ To Driver are due the original concept of this essay and the calculations, to Kroeber the first draft of its formulation; other aspects of the work were performed jointly.

numerically are therefore culture elements or "traits," or in some cases small clusters or "complexes" of these; the relationships inquired into are those between whole tribal cultures. The aim of the investigation is therefore the reverse of Tylor's and Hobbouse's.² Tylor investigated whether traits like matrilinear descent and avoidance of relatives-in-law were or tended to be inherently connected, causally interdependent, on the basis of their occurrence among all ethnic groups (tribes, nations) on whom data were available. We inquire whether the cultures carried or possessed by such ethnic groups are more or less similar to one another, on the basis of their containing or not containing traits such as matrilineate, avoidance, self-torture vows, the fire drill, sinew-backed bow, twined weaving, ridged houses, etc.

Second, we limit each inquiry to a series of geographically contiguous peoples or cultures; in other words, to a group of peoples accepted as having a certain historic unity, or as it is customarily called, constituting a culture area; or a part thereof. Tylor's and Hobbouse's investigations were on a world-wide basis, without consideration of geography. They sought to establish permanences which transcended the "accidents" of history and geography. We look for the precise historic relationships within a temporally and spatially delimited frame. They aimed at "laws," we at "natural" classifications. Such classifications carry genetic significance, in other words, permit of inferential historical reconstructions analogous to those of natural history.

Consequently a criticism does not apply to us which is generally made of Tylor's and Hobbouse's work, namely, that its results are invalid because it is not established that the elements dealt with (tribal cultures) are independent of each other.³ It is true that the problem is shifted rather than done away with. Are our elements or factors, the culture traits, independent of each other? While we are not prepared to answer this question categorically, we believe that culture traits are in the main if not in absolutely all cases inde-

² Tylor, *On a Method of Investigating the Development of Institutions*, RAL-J 18:245-269, 1889. Hobbouse, Wheeler, and Ginsberg, *The Material Culture and Social Institutions of the Simpler Peoples: An Essay in Correlation*, 1915.

³ For instance, if matrilineate and avoidance have been transmitted as an already established association or "complex" from one people to several others, this should obviously be counted as only one case of association or "adhesion," because the association in tribes *b, c, d, e* is derived from, and dependent upon, that in tribe *a*. Tylor however counted *a, b, c, d, e* as so many separate cases. Baptism and confession are associated in Italy, Spain, France because these countries have accepted Christianity, in which these two traits had early "adhered" or become associated. As regards the problem of inherent necessity or tendency toward association, Christianity must count as one case, not these three or more Christian nations as so many cases.

pendent.⁴ This is because so many of them have been shown over and over again, in all domains of culture and in all parts of the world, to occur at times dissociated even if at other times or places they are frequently or even preponderantly associated,⁵ that it becomes a fair inference, until contrary cases are demonstrated, that all traits can occur independently of each other. That, at any rate, appears to be the implicit assumption of all anthropologists of the last generation, with the exception of the few survivors of the Tylor-Morgan-Frazer "evolutionistic" school, and possibly the group of functionalists.⁶ If then we are in error on this point, we believe that nine-tenths of the anthropology and culture history practiced today is also in error in a fundamental if generally unexpressed assumption; and in that case a general inquiry on this point is in order.

Finally, we have utilized for our own purposes only quantitative measures so simple as to be intelligible with a knowledge of nothing more than arithmetic, and so humble as to have been generally overlooked by inquiries into statistical theory and little used by biological, psychological, and economic statisticians. These measures are all proportions: the proportion which traits shared by one tribe with another tribe form of all its traits; of all the traits of the second; of the traits occurring in both tribes; and the arithmetic and geometric means of the first two proportions. The values obtained by these measures have been treated by equally simple procedures: ranking the values found for all the similarities of each tribe; grouping the high and the low values to see if they segregate of themselves into series of tribes, or classes; testing these classes or groups for the simplicity and regularity or the complex irregularity of the total resultant scheme of classification; and testing this scheme again for fit with the known facts of geography and history, such as position, communications, etc.

Our procedure is to examine first the means of measurement used in the few previous analogous studies; second, several other measures;

⁴ Within the limits of ordinary logic or common sense. Essential parts of a trait cannot of course be counted as separate traits: the stern of a canoe, the string of a bow, etc. Even the bow and arrow is a single trait until there is question of an arrow-less bow. Then we have two traits, the pellet bow and arrow bow. Similarly, while the sinew backing of a bow cannot occur by itself, we legitimately distinguish self-bows and sinew-backed bows; and so, single-curved and recurved bows, radically and tangentially feathered arrows, canoes with blunt, round, or sharp sterns, etc.

⁵ Thus baptism occurs without confession in certain Christian sects or denominations.

⁶ The assumption seems to underlie the work of students as diverse in their methods as Boas, Ratzel, Rivers, Elliot-Smith, Wissler, Graebner, Schmidt, Lowie, Dixon, Rivet, etc.

then to apply these, or some of them, to concrete cases chosen, on account of available data, from Polynesia, the Plains and Pacific coast areas of what is now the United States, and Peru; and to compare the results both among themselves and as regards the fit into wider knowledge.

MEASURES PREVIOUSLY USED

In 1926 Clements, Schenek, and Brown,⁷ analyzed statistically Linton's comparative list of the forms taken by certain culture traits in six Polynesian island groups.⁸ Their findings as to the relative strength of the 15 interrelationships involved did not differ profoundly from Linton's, nor did their genetic or historical interpretation of the relationships, except for being free of considerations of race and migration which Linton had injected. They were however of course able to express their findings both more sharply and more "objectively." Their significant figures for each relationship were two. The first gave the positive or negative excess of culture trait agreements over disagreements, common lacks of a trait being counted as agreements the same as common presences. The second figure was a value P , derived by a Pearsonian table from X^2 , the "cell square contingency,"⁹ and expressing the probability that the first figure was not attributable to real relationship but to chance. Thus Samoa and Tonga, in 238 Samoan-Tongan (out of a total of 282 Polynesian) traits considered, show an excess of +155 agreements, and a P of .000000, indicative not only of a high degree of similarity but of certainty that this similarity is actual, not the result of chance. For New Zealand and Tonga the excess of agreements is -55, the P .000625: the relationship is remote, but the reality of the remoteness practically certain. New Zealand and Tahiti, on the other hand, show -5 and .992051: the relationship is neither close nor remote, but the probability is enormously high that the particular figure of -5 is not expressive of actual relationship but rather of chance, in the data assembled.

Several general and particular observations can be made on the Clements treatment.

⁷ A New Objective Method for Showing Special Relationships, AA 28: 585-604, 1926.

⁸ The Material Culture of the Marquesas Islands, B. P. Bishop Mus., Mem. 8, no. 3, 1923 (List, pp. 449-457).

⁹ The culture traits entering into each relationship are distributed in four "cells" containing respectively the number of traits common to the two cultures, present in the first only, present in the second only, absent from both.

First of all, while P is not a function of E (the excess of trait agreements), it tends strongly, in most cases, to stand in inverse relation to it. What P expresses is the expectability of a similar distribution of presences and absences occurring through random chance. The directly significant values remain the relative E 's, which for Tonga-Samoa are $193 - 45 = +148$, for Tonga-New Zealand $82 - 137 = -55$, for Tahiti-New Zealand $124 - 129 = -5$. Historical relationships are referable wholly from these counted E 's. They allow the conclusion that Tongan and Samoan cultures are closely related; Tongan and Maori relatively unrelated within Polynesia; and Tahitian and Maori related to an intermediate degree. All that the P 's add is that we can be sure that the extreme values express a real degree of relationship.

It is a part of Clements' method that common absences of traits are given equal weight with common presences. This touches a fundamental problem of theory in the interpretation of historical growths or culture developments, which is as troublesome in non-statistical as in statistical treatments. We are not ready to express ourselves on the theory of this problem. Obviously if Tonga and Samoa alone in Polynesia do not build rectangular houses, this is presumably as indicative of similarity and probable genetic relationship for the trait as the positive fact that they alone use lateen sails; especially in view of the fact that Tonga and Samoa are adjacent island groups. As regards the Plains Indians, who also do not build rectangular houses, the Tongan-Samoan common absence is unlikely to mean anything as regards relationship, that is, common cultural origin or common specific influences; just as it is unlikely that the recurrence of the lateen sail in Italy means anything of this sort. Clements saw this point and made clear that he was dealing only with *special* relationships *within* a specified, limited area. An impugment of his method by Wallis on this score is therefore wide of the mark;¹⁰ and Clements has sufficiently refuted it.¹¹ Nevertheless, it would be desirable to understand more clearly the theoretical principles involved, so that we might define better the circumstances under which the considera-

¹⁰ W. D. Wallis, *Probability and the Diffusion of Culture Traits*, AA 30: 94-106, 1928. See especially the argument (p. 105) from a hypothetical example of New York and Hopi Indians both lacking Eskimo traits. Wallis' attitude seems to spring from a fear that once statistics are applied to culture, all common sense will be abandoned and a juggernaut of statistical method run blindly over the field and leave it strewn only with nonsensical delusions.

¹¹ *Quantitative Method in Ethnography*, AA 30:295-310, 1928; see p. 304.

tion of absent traits is respectively legitimate and necessary, or invalid and misleading.

Clements works over Linton's original Polynesian data by splitting many of these, until he can operate with the presence and absence of minimal unit elements. This plan is common to all statistical approaches to culture material yet attempted, including our own below; indeed is made necessary by the fact that no other relative or quantitative measure of culture phenomena has yet been devised. It is obvious that the units dealt with are not really commensurable. Some are broader in scope, or more important in the life of the culture-bearers, than others. There is however no biased selection. The phenomena are broken up into the smallest units recognizable or definable. The data are assembled and listed by an ethnological expert conversant with the field, in this case Linton; the final splitting into units is done by another ethnologist. The presumption therefore is that the splitting will at least be more or less evenly irregular in all parts or aspects of the cultures considered.

Polynesia being a well studied area, Linton's tribal data are unusually even in fullness. Of his 282 traits, as systematized by Clements, information is lacking on 41 for Tonga, 22 for New Zealand, 6 for Tahiti, 4 for Samoa, 2 for Hawaii, 0 for Marquesas. This means that a positive presence or absence could be reckoned in 85 to 99 per cent of the cases, according to group. This is a higher proportion of known occurrences or lacks than is usually available.¹²

Clements leaves out of account all present or absent traits common to his six ethnic groups. This is legitimate and advisable, because what he is really concerned with is the relative degree of similarity and dissimilarity between groups within his circle of six, and the inclusion of common traits would have swelled his totals while reducing the sharpness of his differentiations. Had his study been concerned with the proportion of general Polynesian to locally specialized elements of culture, the common traits would of course have had to be included; in a comparison between Polynesia and other parts of the world, the

¹² A slight asymmetry of data results from Linton's original study having been concerned primarily not with Polynesia as such, but with the position of the Marquesas within Polynesia. This is why there are no unreported traits for Marquesas. A large proportion of the gaps (Clements' "x" in his basic table of unit traits) are accounted for by the absence of the paper mulberry and consequently of tapa in New Zealand (11 traits reckoned as "x" when they might better have been counted "o"—which would reduce the New Zealand x's from 22 to 11); and 28 of the 41 Tongan x's due to lack of cited information (really lack of occurrence?) on details of human figure representation in art.

universal or general Polynesian traits would obviously be far more significant than their locally diversified variants of detail.

In a later paper¹³ dealing with the Sun Dance of the Plains Indian tribes on the basis of data assembled by Spier,¹⁴ Clements used two other statistical measures, r and Q , respectively the well-known coefficient of correlation and coefficient of association.

Clements, in subsequent discussion with us, doubted whether these coefficients were properly applicable to data of the Sun Dance order, for reasons of statistical theory. We had already found fault with his culture-historical inferences from these Sun Dance coefficients, on the ground that they were out of fit with the known geographical, historical, and general cultural relations of the Plains tribes, and therefore necessitated involved and seemingly improbable reconstructive hypotheses. This matter will be touched upon below.

MEASURES USED

The measures of relationship which we propose to test all deal with the traits shared or not shared by two tribes, each such pair being considered separately. The respectively greater and lesser relationships of the various pairs of tribes are then determined by ranking. In proportion as the rankings follow some consistent plan, on the basis of known geographical or historical facts, or simply according to an internal scheme of their own, the results give a "fit" and presumably possess reliability and significance.

Only three values enter into these measures. The first is the number of identical positive traits in the cultures of the two tribes or ethnic groups that are being compared. As these traits are shared or *common*, we shall call this value c . Next there is the total number of traits possessed by or known for the first tribe of the pair; and the same for the second tribe. We may call these two values a and b .

It would be desirable if one knew in all cases that the values of a and b were strictly comparable, that is, had been obtained by exactly the same method of inquiry. Unfortunately, this rarely is wholly so, and sometimes far from it. The data for tribe A may be much the fuller, not necessarily because the culture is richer, but because field

¹³ Plains Indian Tribal Correlations with Sun Dance Data, AA 33:216-227, 1931.

¹⁴ The Sun Dance of the Plains Indians: Its Development and Diffusion, AMNH-AP 16:451-527, 1921.

studies have been more intensive. In that case we may not know whether a given trait occurring in A is present but not reported on in culture B, or is really lacking there. We can only trust—and reasonably so with data secured by ethnologists of experience—that a fair sample has been got of the total culture, so that the proportion of traits shared and not shared by tribe B with tribe A—its c and $b-c$ components—bear about the same proportion to each other as they would if the complete value which b has in nature had been obtained.

Sometimes the record will be clear as to a trait being lacking in one culture, but deficient as to its being present or absent in another. Thus a trait may be present in tribe A, known to be lacking in tribe B, uninquired into in tribe D. In that event, this trait goes into the value a for comparison with value b , but not with value d . In other words, the values a and b are likely to vary somewhat with each comparison made, when established trait-absences are distinguished in the data from gaps in knowledge. It is only when the condition of the data is such as to forbid this distinction being made generally, that a , and b , have constant values throughout all comparisons.

The simplest measure is c_{ab}/a , that is, the proportion which tribe A traits shared with tribe B bear to the total number of traits possessed by tribe A. The measure is however awkward because the corresponding value c_{ab}/b is normally different. For instance, Hidatsa and Blackfeet have 9 Sun Dance traits in common. But as the total of reported Hidatsa Sun Dance traits is 22, and of Blackfoot 38, the value of c/a is $9/22$ or 41 per cent; of c/b , $9/38$ or 24 per cent. This means that as soon as comparisons between different pairs of tribes are made, say of Hidatsa-Blackfoot with Assiniboin-Ponca, there are two values in each case. Wallis¹⁵ solved this difficulty by arbitrarily choosing the lower one for each pair; but this procedure obviously may misrepresent the situation. If for instance, as is wholly possible, it should prove that the full Hidatsa dance consisted of only 22 traits, $c/a = .41$ would be a true value, and the substitution for it of $c/b = .24$ quite unwarranted. The only valid procedure is to use some mean of the c/a and c/b values, in which case the means from all the pairs of tribes can be compared at once; or to retain both the c/a and c/b values and forego a general comparison. In the latter event it is still possible to rank the tribes B, D, E, F . . . as to their degree of similarity to A; and the same for every other tribe in turn. It will be seen below that this plan yields empirical results corresponding rather

¹⁵ AA 30:100, 104, 1928.

well, so far as they are comparable, with the results from other measures. But the piecemeal, cumbersome nature of the results renders it difficult for the figures to make a decisive impression on the mind.

We shall call this measure P , for simple proportion. More accurately, it is P_a and P_b , because there is almost always a two-way value. This P of course is not to be confused with the Pearsonian P discussed above in connection with E .

The difficulties just discussed are overcome by taking the arithmetical mean of the two values of P ; that is, $(c/a + c/b)/2$. We designate this value as A . It allows the A 's for all pairs of tribes to be compared at once.

Another measure is the geometrical mean, G , of the two P 's; namely $\sqrt{(c/a) \cdot (c/b)} = c/\sqrt{(a \cdot b)}$. This is nearly as easily computed as the arithmetical mean A . Its value coincides with this when a and b are equal, but runs somewhat lower when a and b differ in value.

The measure $c/\sqrt{(a \cdot b)}$ is recognized in statistical theory as a form of r or correlation coefficient.¹⁶ As such a coefficient, however, its validity depends on the sigmas of the values dealt with, and these cannot be ascertained for data of the kind we are dealing with. We therefore expressly refrain from using this measure as one of correlation, and employ it merely as a mean of two proportions.

Another simple measure is the proportion which common or shared traits constitute of the *total* number of different traits possessed by the two tribes, and which we designate by T . The numerator, as in all our formulas is c ; the denominator, a plus b , less however c , to prevent the c traits which are already included in a being counted again for their occurrence in b . Hence, $T = c/(a + b - c)$.¹⁷

To recapitulate, with an example:

A, Hidatsa tribe, total known Sun Dance traits, a , 22; B, Blackfoot, b , 38; traits shared by Hidatsa and Blackfoot, c , 9.

$$P = c/a, c/b; c/a = 9/22 = .409; c/b = 9/38 = .237.$$

$$A = (c/a + c/b)/2 = (.409 + .237)/2 = .323.$$

$$G = \sqrt{(c/a) \cdot (c/b)} = c/\sqrt{(a \cdot b)} = 9/\sqrt{(22 \cdot 38)} = 9/\sqrt{836} = .311.$$

$$T = c/(a + b - c) = 9/(22 + 38 - 9) = 9/51 = .176.$$

¹⁶ It is discussed as to its theoretical or empirical validity by T. L. Kelley, *Statistical Method*, 190, 1924; G. H. Thomson, *Brit. Jour. Psychol.*, 8:275, 1916; and R. Pearl, *Introduction to Medical Biometry and Statistics*, 366 ff., 1930.

¹⁷ The formula can also be given as $c/(a + b + c)$, with a and b in this case denoting not the total number of traits occurring in A and B but the number of traits *peculiar* to A and B, that is found respectively in A and B but lacking in B and A.

We shall now apply one or more of these measures successively to the tabulations of Polynesian trait distributions by Linton, of the Plains Indian Sun Dance by Spier, of Northwest Coast Indians by Kroeber, and of Northeast Peruvian Indians by Tessmann, in order to compare the results of the several measures both among one another and against the generally accepted ethnological, geographic, and historical situations to which the tabulated data refer and of which they form part.

POLYNESIA

The actual relationships in Polynesia are fairly clear without technical statistical treatment, in fact were approximately formulated by Linton in his original memoir,¹⁸ although his treatment differs from Clements' and ours in considering migrations and racial factors jointly with culture trait distributions. This case, therefore, furnishes a specially good opportunity to match in detail the results of several measures. It is plain from Linton's data, and still more so from Clements' E:P expression of them, that the six Polynesian cultures considered fall into three groups. The most segregated comprises Samoa and Tonga. Next most distinctive is the pair Marquesas and New Zealand. The group of feeblest internal coherence is composed of Tahiti (Society) and Hawaii. Within this group, it is Tahiti that has much the closer relationships with both Samoa-Tonga and Marquesas-New Zealand. Hawaii, in other words, is related to the remainder of Polynesia largely through Tahiti. In the same way, the two other groups are related to each other mainly through Tahiti. They share few traits which they do not also share with Tahiti. On the other hand, they frequently share with Tahiti but not with each other. Tahiti thus is central in relationship, the five other populations peripheral to it. The situation might accordingly be depicted by a recognition of four groups, namely Tahiti, Hawaii, Marquesas-New Zealand, Samoa-Tonga, with the degree of relationship in this order. Within the last two groups, Marquesas is somewhat closer to Tahiti and the rest than is New Zealand, and Samoa is similarly closer than Tonga.

In general, the degrees of cultural affinity accord fairly with geographical position, but there is one important exception: Marquesas and New Zealand are almost on opposite sides of Tahiti. Either, therefore, the connections between them traveled around Tahiti; or

¹⁸ As cited, Bishop Mus. Mem. 8, no. 5, 1923: "Conclusions," pp. 458-467.

the connection between them was later interrupted while Tahitian relations with Marquesas continued. This is an alternative that cannot be resolved by statistical method applied to a trait count, but requires a culture-historical evaluation and interpretation which is best given by Polynesian specialists, though they might conceivably be aided by statistics in the definition and analysis of their problem.

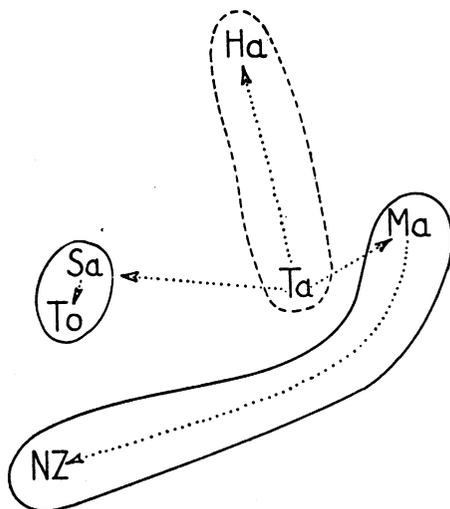


Fig. 1. Polynesian relationships. The distances are those on the map. Cultural similarities are indicated by enclosures of different strength; probable courses of cultural relationship, by arrows.

Both Linton and Clements have given such historical interpretations or reconstructions.¹⁹ We wish only to point out that the one of Clements is an ethnological addendum to his statistical treatment, not an inherent consequence of it. As a matter of fact he assumes two or probably three former types of Polynesian culture, plus a later overlay which culminated in Tahiti but failed to reach New Zealand. However, it might just as well be assumed, granting the later overlay, that the older culture was originally one, an "old generalized Polynesian," and that this became differentiated in the three groups before the overlay began; or again, that Tahiti was the continuous center of Polynesian influence early as well as late, but that the elements which reached relatively self-sufficient districts like Samoa-Tonga at once began to be specialized away from their original forms, while the Tahitian influence on New Zealand was later interrupted by a cessation

¹⁹ Linton, p. 458 seq. Clements, p. 604.

of communications. As between alternative hypotheses like these, the opinion of a student saturated in the facts and feel of Polynesian culture will always be worth more, assuming that he is unbiased, than that of the statistician, whose technique after all is only ancillary to such problems.

Both the cultural and spatial relationships of the six cultures are illustrated in the diagram (fig. 1). It will be seen that even apart from the Marquesas-New Zealand relation, culture similarity is not a mere function of distance, since Samoa and Tonga are geographically about as near to Hawaii as is Tahiti, although culturally they are much more dissimilar.

Of course, the whole Polynesian problem can be solved only with consideration of the other cultures—Tuamotu, Easter, Rapa, Tubuai, Mangaia, etc.;²⁰ and even after the internal relations have become defined, there remains the larger problem of the relations of Polynesia as a whole to the remainder of Oceania. Still, we have now a quantitative and presumably reliable expression of 15 interrelationships of six major types of Polynesian culture; in other words, a definite and authentic classification, irrespective of its genetic interpretations. Against this, the results of the several statistical treatments can be matched, as in the adjoining table 1.²¹

In this table, the 15 known Polynesian interrelationships are ranked in the order which follows logically from the way in which the cultures group themselves, in other words *from the scheme of relationships viewed as a whole*. Now when the rankings according to the several formulas are matched against this ranking, it is seen that,

G: the ranking is perfect.

T: the ranking is nearly perfect, only 8 and 9 and again 11 and 12, marked in the table by asterisks, exchanging places by small intervals.

A: the ranking is the same, plus 10 and 11 interchanged.

E-P: the ranking is very irregular, the order 1, 2, 3, 4 . . . 15 being replaced by: 1, 3, 2, 5, 7, 9, 10, 6, 4, 11, 8, 14, 12, 13, 15 for the E's, and similarly for the P's.

From this it can be concluded that the *A*, *G*, and *T* formulas are likely to yield results much more in accord in detail with the general trend of the facts than the *E:P* formula. In other words, *A*, *G*, and *T* results fit the general ethnological picture better, point for point, than *E:P*. They express the presumably actual scheme of classification, or relationships, regularly; *E:P*, irregularly.

²⁰ For instance, the Marquesas-New Zealand cultural unit cuts geographically across several other Polynesian inland groups.

²¹ All our computations in this table are based on Clements' trait list.

Whether the slight edge of greater regularity of *G* over *A* and *T* is because it is a truer measure, or an accident of this set of figures, we cannot say. It will be noted that the irregularities all involve the degree of superiority of similarity of Samoa versus Tonga in relation to the remaining groups, or of Hawaii versus Marquesas in relation to Samoa-Tonga. These are all definitely small differences. In other words, the rankings from 8 to 14 obviously differ by small steps, and have not the significance of those elsewhere in the table or of the difference between themselves as a unit and the remainder.

TABLE 1
POLYNESIAN RELATIONSHIPS

		Rank	E†	P	c‡	A	G	T
Main Group II	[S-To	1	148	.000000	46	.68	.67	.51
Main Group IB	[M-NZ	2	64	.001011	90	.65	.64	.48
Main Group IA	[Ta-H	3	69	.000697	78	.60	.60	.43
	[Ta-M	4	40	.065944	81	.59	.58	.41
Relations between IA and IB	[H-M	5	3	.956276	79	.53	.54	.36
	[Ta-NZ	6	-5	.992051	60	.49	.48	.32
	[H-NZ	7	-20	.677677	59	.46	.45	.30
	[Ta-S	8	37	.321339	43	.45	.43	.27
	[Ta-To	9	58	.049119	32	*.46	.41	*.28
	[H-S	10	-24	.335656	32	.32	.31	.18
Relations between IA-IB and II	[H-To	11	1	.930439	25	*.33	.31	.173
	[M-S	12	-51	.128463	35	*.33	.30	*.174
	[M-To	13	-43	.216631	25	.31	.28	.15
	[NZ-S	14	-46	.022856	24	.27	.24	.14
	[NZ-T	15	-55	.000625	14	.20	.18	.09
<i>Means for:</i>								
	Tahiti.....					.52	.50	.34
	Marquesas.....					.48	.47	.31
	Hawaii.....					.45	.44	.29
	New Zealand.....					.41	.40	.27
	Samoa.....					.41	.39	.25
	Tonga.....					.40	.37	.24

† E=excess of positive and negative agreements over disagreements.

‡ "c"=common presences of traits.

The method followed in this case, namely of testing the fit of all parts of the situation against a scheme expressing the set or trend of the whole situation, may be somewhat rough and ready, and may not have much statistical justification; but it does seem to rest on common sense and may engage the confidence of anthropologists who distrust or know little of statistical procedure.

Of course, the fewer the cultures compared, the easier it is to recognize the trend of their totality. The fit-test is therefore well adapted to cases like this Polynesian one, where the data refer to only 6 cultures and the total number of relationships is 15. For instance, the 19 tribes on whom there are Sun Dance data possess 171 inter-relationships; and unless these were unusually orderly, that is distributed according to some simple factor such as distance from a geographical center, or a unilinear successive historical transmission, there would expectably be enough irregularities in the set of the Sun Dance picture as a whole to make its scheme less easily apprehended.

We have added, in table 1, c , the number of common traits actually present, for comparison with the values of E , the excess of common presences plus common absences over disagreements. Of the two, c gives the better fit to the whole situation. Specially to be noted is that every relation into which either Samoa or Tonga enters has a c below 50, every other relation one above 50. This may result from an impoverishment in original Polynesian traits which overtook Samoan-Tongan culture. Or again it may be the result of the fact that while Samoa and Tonga evidently are the most divergent, the basic comparative list of data was compiled from the point of view first of Marquesas, and secondly of Polynesian as a whole, so that many positive traits limited to Samoa and Tonga may have failed to be included. In this event, a more balanced assemblage of data, "fairer" to Samoa and Tonga, would bring up their c 's, and perhaps rank all the Polynesian c 's approximately in the order of the A 's, G 's, and T 's. If on the other hand Samoan-Tongan is actually an impoverished form of Polynesian culture, its c 's would remain low, and yet the close relationship of its two members would be correctly expressed by the high A , G , and T of their mutual relationship as against lower values outside. Only a Polynesianist could safely decide between the alternatives. Whatever the reasons, most of the c 's arrange themselves consistently. Witness for instance the way in which the Samoan c is regularly higher than the Tongan in the corresponding relations: 43:32, 32:25, 35:25, 24:14. As against this, the E 's are more scattering; for instance, in the same eight cases, 37:58, —24:1, —51:—43, —46:—55. Ninety-one traits are known actually to occur in Samoa and Tonga, of which 46 are common, 45 particular to one or the other of the two. But there are 147 traits, or half as many again, which though known elsewhere in Polynesia are absent in Samoa-Tonga. This huge number certainly proves that Samoa-Tonga is well set apart in Polynesia, and to this extent the E is significant, perhaps more expressive of the facts than the Samoan-Tongan A , G , and T values. But if the basic list of traits is weighted through having been compiled from the Marquesan angle, and if Samoa and Tonga prove to be not jointly impoverished but cultures rich in joint local developments, the ultimate inclusion of these would result in a great increase of instances where these were jointly lacking in other islands, in other words of common absences elsewhere, which would swell the E 's of all non-Samoan-Tongan relationships. Obviously, an impartial selection of data is as necessary for statistical purposes as for other purposes.

It is worth while also to give the P or simple proportion values. As these are two-way figures, they are best presented under the head of each island group, as in table 2.

TABLE 2
POLYNESIA: P VALUES

<i>Tahiti:</i>					
*Ma .648	Ha .619	NZ .517	*To .364	Sa .347	
<i>Hawaii:</i>					
Ta .590	Ma .589	NZ .480	Sa .239	To .225	
<i>Marquesas:</i>					
NZ .621	Ta .526	Ha .473	Sa .224	To .188	
<i>New Zealand:</i>					
Ma .687	Ta .451	Ha .440	Sa .197	To .123	
<i>Samoa:</i>					
To .590	Ta .551	*Ma .437	Ha .400	NZ .338	
<i>Tonga:</i>					
Sa .779	Ta .552	*Ma .431	Ha .431	NZ .274	

Out of 30 values all but 4 rank according to the relationship classification previously outlined. These 4 are starred in the table. It will be seen that the two-way values have one virtue not possessed by the previous averaged values. They tend to show through which member of a related pair of islands their main connection with the remainder of Polynesia exists. Thus while Samoa and Tonga are clearly most closely related to each other, Tonga "plumps" much more on this special relationship. Thus, Tonga with Samoa .779, with Tahiti only .552; but Samoa with Tonga .590, with Tahiti .551, or only little less. Obviously it is through Samoa that the Samoan-Tongan relationship to the rest of Polynesia chiefly arises, or remains expressed; Tonga has specialized away from everything but Samoa. Similarly with the Marquesas-New Zealand pair: New Zealand here is the specialized member, Marquesas the connecting one. The same thing is shown by the relative rankings elsewhere in the table. In 7 cases out of 8, Samoa and Marquesas have a higher relationship ranking than respectively Tonga and New Zealand.

At only one point does table 2 suggest a modification of the conclusions previously reached. In 3 cases out of 4—and these are 3 of the starred ones—Marquesas shows a higher value than Hawaii. Thus Tahiti shares 65 per cent of its traits with Marquesas, only 62 with Hawaii. These figures suggest that the Tahiti-Hawaii grouping of figure 1 and table 1 may not be a real one, but that there should be recognized instead a basic Tahiti-Marquesas-Hawaii group, with New Zealand related to this primarily through Marquesas, Samoa through Tahiti, and Tonga through Samoa. This modified classification possibly expresses the history of the relationship somewhat better than the former one.

PLAINS INDIAN SUN DANCE

As already stated, this is a complex ceremony on which data sufficient for statistical treatment have been collected among 19 tribes or subtribes of the central United States. We have followed the basic list of Spier²² as given on his pages 464, 466, 473 and summarized under "Number of Common Traits" on page 478.²³ It should be noted that Spier does not formally list any traits, such as the center pole, which are absolutely universal; nor, on the other hand, any which are wholly peculiar to a single tribe.

The Plains tribes do not segregate as much among themselves in their Sun dance as the Polynesians of various archipelagos differ in their whole culture. The Sun Dance is not only merely a fraction of a culture, but it is of less antiquity. There may be other reasons also. At any rate the groupings are much less incisive. The Cheyenne and Arapaho form a fairly clear unit in their Sun Dance, it is true; but this unit is not so well set off from other tribes as are Samoa-Tonga from the other Polynesians. The Arapaho dance is nearly as similar to Gros Ventre as to Cheyenne; this in turn is nearly as similar to Blackfoot as to Arapaho; whereas Cheyenne has a greater similarity to Ponca than Arapaho has; and so on. In other words, the interrelationships are thoroughly ramified. As there are 171 such interrelationships among 19 tribes—or 153 among 18 that we have dealt with²⁴—the picture is too complex for an obvious, offhand organization of results. Some measure or mechanism of classifying the interrelations is desirable. Clements found this in consideration of the number of high and low *Q*'s and *r*'s shown by each tribe. We have fol-

²² AMNH-AP 16:451-527, 1921.

²³ Clements has added several supplementary traits from page 489 and elsewhere, bringing his total up to 92, as against 82 in Spier's basic lists (in spite of a footnote reference, p. 217, as to intactness of Spier's list, which is obviously an oversight). We have retained Spier's original 82 to avoid printing a new but only slightly different basic list of traits.

²⁴ We computed but then omitted the various values for the Northern Cheyenne, because their ceremony is probably substantially identical with that of the Southern Cheyenne, though much less completely reported. All 17 of its known traits recur among the 47 of the southern divisions; and there is nothing to show that it lacks any considerable proportion of the other 30. The division of the Cheyenne into two "tribes" is recent—probably as late as that of the Arapaho into a northern and a southern group. We have accounts of both the Northern and Southern Arapaho Sun dances, and these, although not identical, are so nearly alike that Spier wisely listed them as one. We prefer to consider the two Cheyenne ceremonies as one until there is evidence to the contrary. The inclusion of the Northern rump complicates and tends to distort the total picture.

lowed the procedure of simple serial ranking of all other tribes with reference to each one in turn. This is more lengthy, but it preserves the particular facts as to each special relationship. At least, nothing of special or local significance is smeared out by premature generalization.

For comparative uses the chief defect of the Spier data is that they show only presences of traits, so that known absences of traits and absence of knowledge as to traits are not differentiated. For this condition, which is almost as unfortunate for ethnological as for statistical purposes, Spier is largely not to blame, the original sources being defective in that essentially they are descriptions made without sense of a wider problem. But the defect is doubly serious in measures like $E:P$, or r and Q if they are applicable, because these treat common absences, which may not be real, as common agreements. From this "doubleweighting" of possible error our P , A , G , T are free.

The error is likely to become particularly large in proportion as the original descriptive accounts are incomplete and the entered figures in the basic list correspondingly low. For instance, the Gros Ventre ceremony with 37 recorded traits, and the Blackfoot with 38, share 26 traits. They therefore possess respectively 11 and 12 not found in the other; or, there are 26 traits in which they are known to agree, 23 in which they are known to disagree. Our values P , A , G , and T are all derived from the distribution of these $26 + 11 + 12 = 49$ traits. We make no assumption in regard to the $(82 - 49 =) 33$ traits on which there is no report for the Blackfoot and Gros Ventre, other than to assume that such of them as may exist but have not been reported are likely to be distributed in more or less the same way as the 49 which have been reported for one or both tribes. The $E:P$ measure however, if it is applied at all to data like Spier's, must reckon the 33 wholly unreported traits as jointly absent from the Gros Ventre and Blackfoot dances. Hence: common, 26, plus common lacking (*sic*), 33, make 59 agreements; Gros Ventre only, 11, plus Blackfoot only, 12, make 23 disagreements; excess of "agreements" over disagreements, E , $59 - 23 = 36$. But with smaller numbers, Ute 14, Plains Ojibwa 8, common 2, therefore 62 traits not reported for either tribe. Hence, agreements $2 + 62 = 64$, disagreements, $12 + 6 = 18$, E , $64 - 18 = 46$, or 10 greater than the Gros Ventre-Blackfoot E . This in spite of the fact that Gros Ventre and Blackfoot share more than half, but Ute and Plains Ojibwa only one-eleventh, of the traits reported for one or both members of each pair of tribes.

In the Polynesian basic list, absent traits were distinguished from traits not reported on, and the total data for each island group were much more nearly equal, so that the E values are undoubtedly significant. But for the Sun Dance, any comparison of pairs of tribes for which the data are deficient is bound to produce a high E .

The same thing holds for r and Q . Hence Clements' Q value for Gros Ventre-Blackfoot is .49, but for Ute-Plains Ojibwa, .65.²⁵ Even if r and Q are admissible in this case on grounds of pure theory of statistics, as Clements now himself doubts, it is evident that a classification or historical reconstruction based on them would tend to be erroneous because the inclusion of all gaps in knowledge among agreements would introduce a positive element of fallaciousness, as serious in proportion as the gaps were numerous. We had actually written an argument to show that Clements' Q findings yielded a complicated and unlikely internal picture and a bad fit to the generally known facts of Plains ethnology. This argument need not be given; but the circumstance indicates that wrong statistical method is likely to show in the ethnological results.

Table 3 gives the various tribal rankings from the point of view of each tribe, for A , G , T , and P in turn. To simplify typography, we have omitted decimal points, so that the figures are all percentages. It is evident that the A , G , and T rankings agree very closely. Where there is a difference in rank, it is usually on account of a difference of only a very few per cent, so that it is more conspicuous than intrinsic. The P value rankings agree rather well with the others, but not so closely as these with one another.

Our descriptive and inferentially historical scheme, as based on these rankings, is given in figure 2. We will merely say that the tribes are shown in their geographical positions,²⁶ connected by arrows according to the leading intertribal influences indicated by the numerical values. Particularly strong relationship is shown by double arrows; relationship which presumably was about equally reciprocal, by double-pointed ones. Broken-line arrows mark relations of secondary strength; in some cases, like the Kiowa, presumably older and overlaid ones. The direction of one-way arrows is determined by ethnological as much as statistical considerations. The Arapaho-Wind

²⁵ AA 33:220, 1931.

²⁶ Based on Mooney's map for 1832, BAE-R 17, pl. 57. This delimits areas, as the Wissler-Spier map does not. The Cheyenne are shown as still a unit. We have put the "Canadian" Dakota where presumably most of them came from—the Wahpeton territory.

TABLE 3

PLAINS SUN DANCE RANKINGS OF TRIBES IN PERCENTAGES

<i>Cheyenne</i>	A	Ap 78	Bl 60	Pn 57*	Sr 57*	GV 56	Og 54*	Ki 54*	Hi 54	PC 51	Ak 49	Cr 47	WR 46	PO 44	As 41	CD 37	Ss 32	Ut 31	M 50
	G	Ap 77	Bl 59	GV 55	Pn 54	Og 53	Ki 52	Sr 52	Hi 50	PC 48	Cr 46	Ak 46	WR 44	As 37	PO 31	Ut 26	CD 26	Ss 25	46
	T	Ap 63	Bl 42	GV 38	Og 36	Pn 35	Ki 34	Sr 31	Hi 30	Cr 30	PC 29	Ak 27	WR 27	As 21	Ut 14	PO 12	Ss 11	CD 10	29
	P	Ap 83	Bl 53	GV 49*	Og 49*	Pn 40*	Ki 40*	Cr 38	Hi 34*	WR 34*	Sr 34*	PC 34*	Ak 32	As 26	Ut 14	PO 13*	Ss 13*	CD 11	35
<i>Arapaho</i>	A	Ch 78	GV 73	WR 65	Ki 62	Bl 61	Og 59	Cr 55	As 54	Sr 52	PC 49	Pn 48	Ak 47*	Ut 47*	Hi 45	PO 43	CD 36	Ss 31	53
	G	Ch 77	GV 72	WR 62	Bl 60	Ki 59	Og 58	Cr 53	As 49	Sr 46	Pn 45	PC 44	Ak 43	Hi 41	Ut 39	PO 29	CD 24	Ss 24	49
	T	Ch 63	GV 54	Og 42	Bl 42	WR 41	Ki 39	Cr 34	As 29	Pn 27	PC 26	Sr 25	Ak 24	Hi 23	Ut 19	PO 11	Ss 10	CD 9	30
	P	Ch 72	GV 59	Og 50*	Bl 50*	WR 44	Ki 42	Cr 41	As 31*	Pn 31*	PC 30	Ak 28*	Sr 28*	Hi 26	Ut 20	PO 11*	Ss 11*	CD 9	34
<i>Gros Ventre</i>	A	Ap 73	Bl 69	PC 62	Ch 56	Cr 55*	As 55*	WR 54	PO 54	Sr 50	Og 47	Ki 44	Pn 43	Ak 42	Hi 40	CD 39	Ut 38	Ss 28	50
	G	Ap 72	Bl 69	PC 60	Cr 55*	Ch 55*	WR 53*	As 53*	Sr 48	Og 47	Ki 43	Pn 42	Ak 41	PO 41	Hi 39	Ut 34	CD 29	Ss 24	47
	T	Ap 54	Bl 53	PC 42	Cr 38	Ch 38	WR 35	As 34	Og 31	Sr 29	Ki 27	Pn 26	Ak 25	Hi 23	PO 18	Ut 18	CD 13	Ss 11	30
	P	Ap 86	Bl 70	Ch 62	Cr 51	PC 49*	Og 49*	WR 46	As 41	Ki 38	Sr 35*	Pn 35*	Ak 32	Hi 30	Ut 22	PO 19	CD 14*	Ss 14*	41
<i>Blackfoot</i>	A	GV 69*	Sr 69*	Ap 61*	PC 61*	As 61*	Ch 60	Cr 55	Og 46	WR 40	Ak 39	PO 38	Pn 36	Hi 33	Ki 31	CD 31	Ut 23	Ss 17	45
	G	GV 69	Sr 65	Ap 60*	PC 60*	Ch 59	As 59	Cr 54	Og 46	WR 40	Ak 37	Pn 35	Hi 31	Ki 31	PO 29	CD 23	Ut 21	Ss 14	43
	T	GV 53	Sr 45	Ap 42	Ch 42	PC 41	As 40	Cr 37	Og 30	WR 25	Ak 22	Pn 21	Hi 18	Ki 18	PO 12	CD 10	Ut 10	Ss 6	28
	P	Ap 71	GV 68	Ch 66	Cr 50	PC 47*	Sr 47*	Og 47*	As 45	WR 34	Ak 29*	Pn 29*	Ki 26	Hi 24	PO 13*	CD 11	Ut 13*	Ss 8	37
<i>Sarsi</i>	A	Bl 69	Ch 57	GV 50	Ap 52	As 43*	Ki 43*	PC 42	WR 39	Og 38	Cr 37	Ak 33	Pn 31	PO 27	Hi 24	CD 18	Ut 12	Ss 07	37
	G	Bl 65	Ch 52	GV 48	Ap 46	As 43	Ki 42	PC 41	WR 38	Og 36	Cr 36	Ak 33	Pn 31	Hi 24	PO 24	CD 16	Ut 12	Ss 06	35
	T	Bl 45	Ch 31	GV 29	As 27	PC 26	Ap 25	WR 23	Ki 21	Cr 21	Og 20	Pn 18	Ak 15	Hi 14	PO 12	CD 08	Ut 06	Ss 03	20
	P	Bl 90	Ch 80	Ap 75	GV 65	Og 50*	Ki 50*	As 45*	PC 45*	WR 45*	Cr 45*	Pn 35*	Ak 35*	Hi 25	PO 15	CD 10*	Ut 10*	Ss 05	43
<i>Assiniboin</i>	A	PC 70	Bl 61	GV 55	Ap 54	PO 51	WR 59	Cr 47	Og 46	Sr 43*	CD 43*	Pn 42	Hi 41*	Ch 41*	Ak 40	Ss 39	Ki 29	Ut 17	45
	G	PC 69	Bl 59	GV 53	Ap 49	WR 48	PO 45*	Cr 45*	Og 44	Sr 43	Pn 42	Hi 41	Ak 40	CD 38	Ch 37	Ss 37	Ki 28	Ut 17	43
	T	PC 53	Bl 40	GV 34	WR 32	Ap 29	Cr 29	Sr 27	Og 27	Pn 26	Hi 26	PO 25*	Ak 25*	Ss 23	Ch 21	CD 20	Ki 20	Ut 09	27
	P	Bl 77*	Ap 77*	PC 73	GV 68	Og 59	WR 55*	Cr 55*	Ch 55*	Pn 45	Sr 41*	Hi 41*	Ak 41*	Ki 32	PO 27*	Ss 27*	CD 23	Ut 14	48
<i>Plains Cree</i>	A	As 70	PO 67	GV 62	Bl 61	Ch 51	WR 50	Ap 49	Pn 48	Hi 48	Cr 44	Ak 43	Sr 42*	CD 42*	Og 37	Ss 32	Ki 27	Ut 27	47
	G	As 70	GV 60	Bl 60	PO 58	WR 50	Pn 48	Hi 48	Ch 48	Ap 44	Cr 43	Ak 43	Sr 41	CD 36	Og 36	Ss 29	Ki 27	Ut 26	45
	T	As 53	GV 42	Bl 41	PO 33	WR 33	Pn 32	Hi 31	Ch 29	Ap 27	Sr 26	Cr 25	Og 21	CD 19	Ss 16	Ki 16	Ut 15	29	
	P	GV 75*	Bl 75*	As 67*	Ap 67*	Ch 67*	WR 54	Pn 50*	Hi 46*	Og 46*	Ak 42	Sr 38	PO 34	CD 21*	Ut 21*	Ss 21*	Ut 21*	47	
<i>Plains Ojibwa</i>	A	PC 67	GV 54	As 51	CD 50	Pn 49	Cr 47	Ch 44	Ak 43*	Ap 43*	WR 41	Bl 38*	Og 38*	Hi 34	Ss 32	Sr 27	Ut 19	Ki 16	41
	G	PC 58	CD 50	As 45	Pn 42	GV 41	Cr 38	Ak 37	WR 33	Ch 31*	Ss 31*	Hi 30	Ap 29	Bl 29	Og 28	Sr 24	Ut 18	Ki 13	34
	T	PC 33*	CD 33*	As 25	Pn 21	Ak 21	Cr 18*	GV 18*	Ss 18*	WR 16	Hi 15	Bl 12*	Og 12*	Ch 12*	Sr 12*	Ap 11	Ut 10	Ki 06	17
	P	PC 100	GV 88	As 75*	Pn 75*	Cr 75*	Cr 75*	Ap 75*	WR 63*	Ak 63*	Og 63*	Bl 63*	CD 50*	Hi 50*	Sr 38*	Ss 38*	Ut 25	Ki 25	61
<i>Crow</i>	A	GV 55*	Bl 55	Ap 55*	WR 51	Ak 49	Og 48	Ch 47*	Hi 47*	As 47*	PO 47*	PC 44	CD 40	Ki 37*	Sr 37*	Pn 35*	Ut 35*	Ss 23	44
	G	GV 55	Bl 54	Ap 53	WR 50	Ak 48*	Og 48*	Ch 46	Hi 45*	As 45*	PC 43	PO 38	Ki 37	Sr 36	Pn 35	Ut 32	CD 31	Ss 20	42
	T	GV 38	Bl 37	Ap 34	WR 33	Ak 31	Og 31	Ch 30	Hi 29	As 29	PC 25	Ki 22	Sr 21*	Pn 21*	PO 18	Ut 18	CD 14	Ss 10	26
	P	Ap 69	GV 59*	Bl 59*	Ch 56	Og 53	WR 47	Ak 41	Hi 38*	As 38*	PC 38*	Ki 34	Pn 31	Sr 28	Ut 22	PO 19	CD 16	Ss 13	39
<i>Wind River</i>	A	Ap 65	GV 54	Ut 52	Cr 51	PC 50	As 49	Ch 46	Ak 44	Ki 43*	Og 43*	Ss 42	PO 41	Bl 40	Sr 39	Pn 37	Hi 33	CD 32	45
	G	Ap 62	GV 53	PC 50*	Cr 50	Ut 49	As 48	Ch 44	Ak 43	Ki 43	Og 42	Bl 40	Ss 38	Sr 38	Pn 37	PO 33	Hi 32	CD 27	43
	T	Ap 62	GV 35	PC 33*	Cr 33*	As 32	Ut 30	Ak 28	Ch 27*	Ki 27*	Og 26	Bl 25	Sr 23*	Pn 23*	Ss 21	Hi 19	PO 16	CD 13	27
	P	Ap 86	GV 61	Ch 57	Cr 54	Og 50	Bl 46*	PC 46*	As 43*	Ki 43*	Ak 39	Ut 36	Pn 36	Sr 32	Hi 29	Ss 25	PO 18	CD 14	42
<i>Ute</i>	A	WR 52	Ap 47	GV 38	Og 37	Cr 35	Ki 31	Ch 31	Ss 30	PC 27	Pn 26	Bl 23	Ak 22	PO 19	Hi 17	As 17	Sr 12	CD 00	27
	G	WR 49	Ap 39	GV 34	Og 33	Cr 32	Ss 30	Ki 29	Ch 26	PC 26	Pn 25	Ak 22	Bl 21	PO 18	Hi 17	As 17	Sr 12	CD 00	25
	T	WR 30	Ap 19	GV 18*	Cr 18*	Og 17	Ss 17	Ki 16	PC 15	Ch 14	Pn 14	Bl 10	PO 10	Ak 09	Hi 09	As 09	Sr 06	CD 00	14
	P	Ap 73	WR 67	GV 53	Og 53	Cr 47*	Ch 47*	Ki 40	PC 33*	Bl 33*	Pn 33*	Ss 27*	Ak 27*	As 20	Hi 20	PO 13	Sr 13	CD 00	35
<i>Kiowa</i>	A	Ap 62	Ch 54	Ak 48	Hi 45	GV 44	WR 43*	Sr 42*	Og 40	Cr 37	Bl 31*	Ut 31*	Pn 30	As 29	PC 27	CD 25	Ss 18	PO 16	37
	G	Ap 59	Ch 52	Ak 47	Hi 44	GV 43*	WR 43*	Sr 42*	Og 39	Cr 37	Bl 31	Pn 30	Ut 29	As 28	PC 27	CD 20	Ss 16	PO 13	35
	T	Ap 39	Ch 34	Ak 31	Hi 28	GV 27*	WR 27*	Og 24	Cr 22	Sr 21	Bl 18	Pn 17	Ut 16	As 16	PC 16	CD 09	Ss 08	PO 06	21
	P	Ap 83	Ch 68	GV 50	Og 46	WR 43*	Ak 43*	Hi 39*	Cr 39*	Sr 36*	Bl 36*	Pn 29	As 25	PC 25	Ut 21	CD 11*	Ss 11*	PO 07	36
<i>Ogala</i>	A	Pn 70	CD 60	Ap 59	Ch 54	Hi 50	Ss 49	Cr 48*	Ak 48*	GV 47	Bl 46*	As 46*	WR 43	Ki 40	Sr 38	PO 38	PC 37	Ut 37	48
	G	Pn 68	Ap 58	Ch 53	Cr 48	Hi 47*	GV 47*	Bl 46*	Ak 46*	CD 45	As 44	WR 42	Ss 41	Ki 39	PC 36	Sr 35	Ut 33	PO 28	44
	T	Pn 50	Ap 42	Ch 36	Cr 31*	GV 31*	Bl 30	Hi 29*	Ak 29*	As 27	WR 26	Ki 24	PC 21	Ss 21	CD 20	Sr 20*	Ut 17	PO 12	27
	P	Ap 68	Ch 58	Pn 55	GV 45*	Bl 45*	Cr 43	Hi 35*	Ak 35*	WR 35*	As 33*	PC 28	Sr 25	Ss 23*	CD 20*	Ut 20*	PO 13	35	
<i>Ponca</i>	A	Og 70	CD 58	Ch 57	PO 49	PC 48*	Ap 48*	Ak 45	GV 43*	Ss 43*	As 42	Hi 38	WR 37	Bl 36	Cr 35	Sr 31	Ki 30	Ut 26	43
	G	Og 68	Ch 54	CD 49	PC 48	Ap 45*	Ak 45*	GV 42*	As 42*	PO 42*	Ss 40	Hi 38	WR 37	Bl 35*	Cr 35*	Sr 31	Ki 30	Ut 25	42
	T	Og 50	Ch 35	PC 32	Ak 29	Ap 27	CD 26	As 26	GV 26	WR 23*	Ss 23*	Hi 23*	Cr 21*	Bl 21*	PO 21*	Sr 18	Ki 17	Ut 14	25
	P	Og 85	Ch 73	Ap 65	GV 50	PC 46	Bl 42	Ak 42	WR 38*	Cr 38*	As 38*	Hi 35	Ki 31	Ss 27*	CD 27*	Sr 27*	PO 23	Ut 19	42
<i>Sisseton</i>	A	Og 49	Pn 43	WR 42	As 39	Hi 33	PO 32*	CD 32*	Ak 32*	PC 32*	Ch 32*	Ap 31	Ut 30	GV 28	Cr 23	Ki 18	Bl 17	Sr 07	31
	G	Og 41	Pn 40	WR 38	As 37	Hi 31*	PO 31*	CD 31*	Ak 30*	Ut 30*	PC 29	Ch 25	GV 24	Ap 24	Cr 20	Ki 16	Bl 14	Sr 06	27
	T	As 23*	Pn 23*	Og 21*	WR 21*	PO 18*	PO 18*	Hi 17*	Ut 17*	PC 16	Ch 11*	GV 11*	Ap 10	Cr 10	Ki 08	Cr 06	Bl 03	15	
	P	Og 75	Pn 58*	WR 58*	As 50*	Ch 50*	Ap 50*	Hi 42*	Ak 42*	PC 42*	GV 42*	Ut 33*	Cr 33*	Ki 25	Bl 25	PO 25	CD 25	Sr 08	40
<i>Canadian Dakota</i>	A	Og 60	Pn 58	PO 50	As 43*	Hi 43*	PC 42	Cr 40	GV 39	Ch 37	Ap 36	Ak 34	Ss 32*	WR 32*	Bl 31	Ki 25	Sr 18	Ut 00	36
	G	PO 50	Pn 49	Og 45	As 38*	Hi 38*	PC 36	Cr 31*	Ss 31	Ak 29*	GV 29*	WR 27	Ch 26	Ap 24	Bl 23	Ki 20	Sr 16	Ut 00	30
	T	PO 33	Pn 26	Og 20*															

River *A* and *G* of 65 and 62 rank third for the Arapaho, but first for Wind River. Arapaho has six other *G* values above 50 (that is, numerous other close relations), Wind River has only one. Wind River's Arapaho value is therefore more significant to it than the

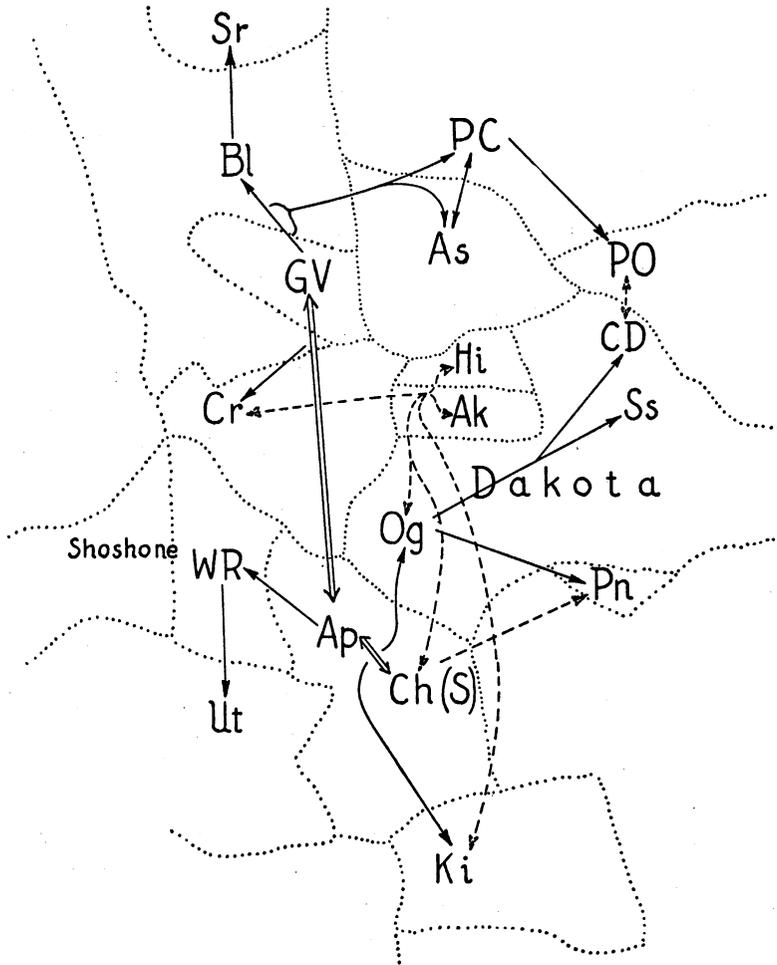


Fig. 2. Principal Sun Dance influences as reconstructed from values in table 3.—Geography after Mooney.

same Wind River value is to Arapaho. The Arapaho are more centrally situated, the Wind River wholly marginal. Arapaho culture has a far richer ceremonial development, apart from the Sun Dance, than Wind River. And finally, twice as many traits are known for the Arapaho (54) as for the Wind River (28) Sun Dance. While this

last as an isolated fact might be the result of inequality of observation, in the light of the foregoing considerations it is not likely to be wholly such. The outcome is that the arrow has been drawn from Arapaho to Wind River. This does not imply that the influence was entirely in this direction; only that the prevailing trend was such. This trend may have been overwhelming or far from it; but in the words of the legend of the diagram, it was at least the "principal influence."

Similarly for the other arrows. Not every ethnologist may agree with every one of them; but every student knowing the Plains tribes will see at least some obvious and more or less convincing reason for their directions.

We have avoided unnecessary arrows, as between Blackfoot and Arapaho, where the connection is obviously through Gros Ventre; or between Sarsi and Arapaho and Assiniboin, where the avenues are evidently Sarsi-Blackfoot-Gros Ventre-Arapaho and Sarsi-(Blackfoot-Gros Ventre)-(Assiniboin-Cree). We hold it as a merit and validation of our diagrammatic reconstruction that most of the connections of secondary strength are thus automatically expressed by being embodied in the primary connections.

In several cases influences more or less equally emanating from or impinging upon a pair of tribes have been indicated by forking arrows. Thus the Plains Cree and Assiniboin ceremonies are evidently related about equally to those of the Blackfoot and Gros Ventre; hence the connecting arrow is forked at both ends. It is not unlikely that the two more easterly dances were derived from the Gros Ventre-Blackfoot one before this was as fully differentiated into two as now. It is also possible that the Cree were the chief recipients from this source; but the high relationship of the Cree and Assiniboin ceremonies indicates strong influences between them, probably reciprocal. The Crow, Oglala, and Kiowa, though not specially interconnected among themselves, all show fairly strong and about equal similarity to both the Arikara and Hidatsa, who however are not very closely connected between themselves. Here broken, forked, and double-ended arrows express the inference that a former relation of the three nomadic with the two sedentary tribes was overlaid by a later and stronger dependent relation upon Cheyenne-Arapaho-Gros Ventre, whereas the Arikara and Hidatsa perhaps drifted apart, or at any rate did not assimilate further. This case, by the way, contains the one instance, other than the known split of the Gros Ventre from the Arapaho, of a major relation running counter to geographical position

of the tribes in the middle nineteenth century. The Kiowa, according to Mooney's account²⁷ of their traditions, were originally farther north, and until nearly 1800 in the Black Hills and in relations with the Crow and with the village tribes. One might expect this transient association, however, to have left less impress upon them than the

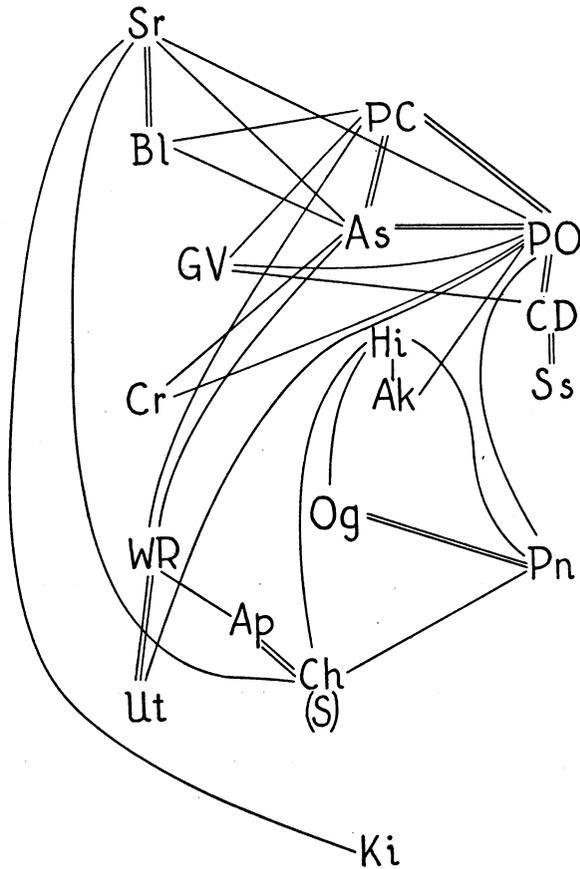


Fig. 3. Principal Sun Dance influences, diagrammed from the invalid (?) *Q* coefficients.

later and perhaps longer one with the Cheyenne and Arapaho; which is precisely what our figures show and the diagram tries to express.

In short, we believe our diagram representing similarities and presumable historical derivations to be simple, self-consistent, and in excellent agreement with what is known of the recent geographical

²⁷ BAE-R 17, pt. 1, 1898.

situation, movements, speech affiliations, and general cultural relations of the Plains tribes.²⁸

For comparison we have drawn a similar diagram (fig. 3) expressing Clements' computed Q values, doubling the lines whenever the value exceeded .80. We submit that this is a far more crisscrossed and less coherent diagram than our figure 2. It is also full of anomalies on the side of the general ethnology and tribal history of the plains. The principal point of radiation is constituted by the peripheral and late intrusive Plains Ojibwa! The Kiowa connect not with the village tribes and Cheyenne-Arapaho with whom they had earlier and recent contact, but with the Sarsi; and again, not with the Blackfeet on whom the Sarsi are culturally dependent. The Gros Ventre link with eastern tribes instead of the Arapaho of whom they are an offshoot or the Blackfeet with whom they have lived a century. The prime Canadian and Sisseton Dakota relationship is not with the Oglala Dakota but with the non-Siouan Ojibwa. And so on.

Finally, we have ventured to diagram Spier's conclusions as to the historical development of the dance (fig. 4), in order to compare a non-statistical with a statistical culture-historical approach. Spier does not present a clear-cut historical reconstruction,²⁹ but rather discusses derivations as between particular tribes, or of special features like the "torture complex." He also quite properly uses documentary alongside inferential historical evidence. The diagram is therefore perhaps not quite as he would have drawn it; but it is at least an attempt to condense his opinions fairly.

It is obvious that the Spier diagram approximates our own much more closely than the one based on the Q association coefficients. The most important difference is that the Arikara-Hidatsa form of dance, although according to him more likely than not derived from the Arapaho-Cheyenne, is by Spier made the basis of an important secondary diffusion to the Crow, Blackfeet, and Assiniboin. The Crow and Blackfeet in turn have influenced the Kiowa; the Assiniboin, the Plains Cree. Our Assiniboin-Cree association as a secondary or tertiary center derived from Gros Ventre-Blackfoot is therefore broken up, to compensate, as it were, for the elevation into an important place of the Arikara-Hidatsa, whose historical status our scheme fails

²⁸ The fairly high relation between Plains Ojibwa and Canadian Dakota may be a real relation due to recent assimilation subsequent to the movement of these Dakota out of the United States; or an accident of low figures (8) on both sides.

²⁹ *Op. cit.*, "Historical Relations," 491-499.

heavily overlaid as to be unobtrusive in a numerical approach to the totality of phenomena, while the clues they have left may still be significant to historical insight.

Inasmuch as Spier knows more about the Sun Dance than anyone else, we find welcome corroboration in his interpretation. At the same time we are pleased to be able to reject a recent repudiation by him³⁰ of his own Sun Dance history reconstruction, as being "misleading and unnecessary." If "unnecessary" means of no interest, that is a matter of taste and therefore of choice which cannot be argued. But as to the Spier reconstruction being fundamentally unsound, our arriving by a different method at so nearly the same results makes this very unlikely. We prefer to believe that Spier is a better culture historian than he wants to admit.

RECONSTRUCTED HISTORY

For those anthropologists who are more interested in probable results than in questions of statistical method, we append an outline of our interpretation of the Sun Dance history.

The ceremony originated, or its kernel was first shaped, mainly among either the village tribes or the Arapaho. Our present data do not allow of a positive or even strongly probable choice between these alternatives. On the one hand is the greater variety and richness of village culture, with agriculture, palisaded towns, age-graded societies, and so forth, implying many antecedents of considerable historic depth. On the other side stands the fact that the third village tribe, the Mandan, are not known ever to have had a Sun dance, and that the Arikara-Hidatsa association is historically known or at least traditionally considered to be later than the Mandan-Hidatsa one. The closeness of Arikara and Pawnee speech argues a quite recent separation of these two tribes. Since the Pawnee like the Mandan have no Sun dance, the suggestion is rather strong that either the ceremony is not of village tribe origin or that its whole origin is much more recent than generally assumed, perhaps not much over 200 years. Perhaps the Arapaho took up a suggestion from a village (Hidatsa?) nucleus and worked it over into the first ceremony which could be called a Sun Dance. This may have happened about the time they seem to have taken from the Mandan-Hidatsa the scheme of age-graded societies. At any rate, village-tribe fortunes began to decline about 1800 or earlier, and from this time on the Arikara and Hidatsa exerted little influence on the Plains Sun Dance; the Arapaho, a great deal. The Arikara and Hidatsa ceremonies perhaps retrograded or became receptive; at any rate, they largely went separate ways, since they are not markedly similar to each other.

Whether the Arapaho devised the main lines of the dance out of their own inspiration or from something Hidatsa which they remodeled, they became its main promoters among the nomadic Plains tribes. With them at this time the

³⁰ AA 31:222, 1929.

Gros Ventre are still to be included—perhaps already a semi-independent ethnic unit, but culturally part of the Arapaho. The Gros Ventre before long passed the ceremony on to the Blackfeet with whom they became associated.⁸¹ The Arapaho, on the other hand, drifted into close affiliation with the Cheyenne, to whom they gave the ceremony, and then jointly elaborated it.⁸²

These four tribes—Cheyenne, Arapaho, Gros Ventre, Blackfoot—all Algonkin and all in the nineteenth century resident in the true or western Plains⁸³ toward the foot of the Rocky mountains, were the true developers of the Sun Dance. Its conception may have been by a village tribe; its birth and early growth and spread were among Algonkins. In its former habitus it was an Algonkin ceremony.

From this start its development into a Plains ritual can be followed in detail with considerable assurance. The Blackfeet gave it to the Athabascan Sarsi. Jointly with the Gros Ventre they passed it on to the Plains Cree, who passed it further to the Ojibwa. The Assiniboin got it from their allies the Cree or jointly with them. The Crow took it from Blackfeet, Gros Ventre, and Arapaho—most likely, that is, from the Gros Ventre about the time these were separating from the Arapaho and transmitting it to the Blackfeet. The Arapaho gave it to their neighbors, the Wind River Shoshone, who passed it on to their Shoshonean neighbors, the Ute. The Kiowa took over mainly the later joint Arapaho-Cheyenne form; as did the Teton Oglala, the nearest of the Dakota divisions. The Teton spread it to the other western Dakota, of whose ceremony we have no direct record; to the eastern or Santee Dakota, where we know it among the Sisseton and Wahpeton (Canadian); also to the cognate Siouan Ponca, who however also seem to have accepted some direct Cheyenne influence. The Crow, Oglala, and Kiowa, of whom the first two were historic and the last traditional neighbors of the village tribes, either got into a relation of secondary interinfluencing with these, or more likely kept some remnants of an earlier influence from them—whether of the Sun Dance as such or of other ritual elements later incorporated in the Sun dance is not wholly clear.

Except for the obscure part played by the village tribes, every tribe received the preponderant mass of its ceremony either from an Algonkin tribe or from one related to itself in speech. Four Siouan tribes were separately influenced from Algonkin sources: the Assiniboin, Crow, Oglala, and Ponca. No Algonkin tribe took its ceremony from a non-Algonkin one. Speech relationship was a definite aid to spread of the dance. The spread was always to near-by tribes, almost invariably to actually adjacent ones. There is not a single long leap, except as tribes are known to have moved to a new habitat.

Of course, every tribe added its innovation or change. Each is likely to have borrowed in some degree even from neighbors who on the whole influenced it little. And no doubt there were occasional backwash influences from a receiving to an imparting tribe. In the aggregate the result of these minor currents may have been considerable. But they display no distinctive direc-

⁸¹ Much as the age-graded ritual societies seem to have traveled the route Mandan-Hidatsa, Arapaho-Gros Ventre, Blackfoot.

⁸² As the Cheyenne lack age-graded societies, it seems fairly likely that they joined the Arapaho in elaborating the Sun Dance after the Arapaho (through their Gros Ventre subdivision) had passed both Sun Dance and age societies on to the Blackfeet.

⁸³ As contrasted with the tall-grass Prairies eastward. They may well all, except perhaps the Cheyenne, have been resident in the western Plains or Rocky mountain foothills long before the nineteenth century.

tions, and therefore become relatively insignificant as against the major trends that have been outlined. These more important sequences are not the whole picture; but they give, so far as they are correct, its essential outlines. All historical depiction, whether documentary or inferential, statistically supported or not, aims to find and express primarily such major trends.

We should like to add a word about the Sun Dance problem. We regard this as begun rather than finished. Most of the extant tribal accounts are obviously incomplete, some woefully so. On a whole series of tribes there are no data: all the Teton Dakota other than the Oglala, all the Yankton-Yanktonai Dakota, the Blackfoot subdivisions. Above all, the data were nearly all got independently, with different personal equations and without much consciousness of the problem of interrelations, which could arise only after Spier had made his comparative analysis. One competent student with a few days or weeks among each tribe, say a total of six months in the field, could still secure a set of balanced data free from serious gaps, now that Spier's work has defined what the pertinent data are. Absences of traits could then be utilized for whatever significance they may have. Whether statistical or non-statistical method of interpretation were then employed would be of secondary consequence. But the history of this interesting ritual, and the processes that shaped its history, would be known with much greater certainty and exactitude than now.

SOUTHERN NORTHWEST COAST CULTURES

Some years ago Kroeber in the course of a discussion of the place of the native culture of northwestern California in that of the greater Northwest (North Pacific) culture, compiled a table showing trait similarities and differences between this sub-area and three others in Oregon and Washington, namely southwestern Oregon, the lower Columbia area, and Puget sound.³⁴ He concluded that northwest California and southwest Oregon, roughly the lower Klamath and Rogue river drainages, were similar enough to be considered one sub-culture, but that in the region of the lower Umpqua the culture changed enough to warrant its being put into another sub-area, that of the lower Columbia.

As a considerable number of traits had thus been put into conveniently comparable form, we decided to restate these according to units present or absent in each subculture, in order to test Kroeber's "subjective" judgments of classification against the statistically "objective" findings. The original table was therefore reworked into our present basic table 4, on which all computations are based.

³⁴ UC-PAAE 17:151-169, 1920; BAE-B 78:903-912, 1925.

TABLE 4

OCURRENCE OF TRAITS IN SOUTHERN NORTHWEST COAST SUB-AREAS
 C, N. W. California; O, S. W. Oregon; L, Lower Columbia; P, Puget Sound
 x, trait present; o, absent; -, no data

	C	O	L	P
<i>Body and Dress</i>				
1. Head deformation.....	o	o	x	x
2. Universal.....	o	o	x	o
3. General.....	o	o	x	x
4. Sign of free birth.....	o	o	x	o
5. Tattooing.....	x	x	x	x
6. Women on face.....	x	x	o	o
7. 3 stripes on chin.....	o	x	o	o
8. Almost solid on chin.....	x	o	o	o
9. Men, measuring lines on arm.....	x	x	-	-
10. Women's hair in 2 clubs.....	x	x	o	-
11. Parted, but flowing.....	o	o	x	-
12. Dentalium nose ornament.....	x	x	x	o
13. Women's basketry hat.....	x	x	x	x
14. Brimless cap.....	x	x	o	o
15. Brim, peak, and knob.....	o	o	x	x
16. Flattened cone.....	o	o	o	x
17. Men's basketry hat.....	o	o	x	x
18. Brim, peak, and knob.....	o	o	x	x
19. Flattened cone.....	o	o	o	x
20. Men's deerskin shirt.....	o	x	o	o
21. Men's leggings, limited use.....	x	x	x	-
22. Men's robe.....	x	x	x	x
23. Of deer fur.....	x	x	o	o
24. Twined or woven.....	o	o	x	x
25. Fur strips or mountain goat wool.....	o	o	x	o
26. Cedar bark or dog hair.....	o	o	o	x
27. Women's petticoat.....	x	x	x	x
28. Fringed deerskin.....	x	o	o	o
29. Fiber.....	x	x	x	x
30. Fiber for profane use.....	o	x	x	x
31. Women's deerskin gown.....	o	x	x	-
<i>Houses</i>				
32. Material redwood.....	x	o	o	o
33. Sugar pine.....	o	x	o	o
34. Cedar.....	o	x	x	x
35. Bark.....	o	x	x	o
36. Planks vertical.....	x	x	x	o
37. Breadth 12 feet.....	o	x	o	o
38. 20 feet.....	x	o	(x)	o
39. Up to 30 or 40 feet.....	o	o	x	(x)
40. Up to 60 feet.....	o	o	o	x

TABLE 4—(Continued)

	C	O	L	P
41. Length 15-20 feet.....	o	x	o	o
42. 23 feet.....	x	o	(x)	o
43. Up to 100 feet.....	o	o	x	(x)
44. Up to 500 feet.....	o	o	o	x
45. Houses divided.....	o	o	x	x
46. Mat beds.....	x	x	x	x
47. On floor.....	x	x	o	o
48. On raised platform.....	o	x	x	x
49. House excavated.....	x	x	x	x
50. Center only.....	x	o	o	o
51. Whole area.....	o	x	x	x
52. Entrance round.....	x	o	x	x
53. Oval.....	o	o	x	x
54. Rectangular.....	o	x	o	o
55. Door sliding.....	x	x	o	-
56. Hung.....	o	o	x	-
57. Ridges.....	x	x	x	o
58. One.....	o	x	x	o
59. Two.....	x	o	o	o
60. House carved or painted.....	o	o	x	x
61. Summer house.....	o	x	x	-
62. Brush hut.....	o	x	o	-
63. Rush lodge.....	o	o	x	-
64. Inmates 7-10.....	x	x	o	o
65. Several families.....	o	o	x	x
<i>Sweat-house</i>				
66. Permanent, sunk.....	x	x	-	-
67. Rectangular.....	x	x	-	-
68. Planks.....	x	x	-	-
69. Earth-covered.....	o	x	-	-
70. Movable.....	o	x	o	-
71. Men sleep in.....	x	x	-	-
72. Heated by open fire.....	x	o	-	-
73. Steam from stones.....	o	x	-	-
<i>Canoe</i>				
74. Redwood.....	x	-	o	o
75. Cedar.....	o	-	x	x
76. Length 18 feet.....	x	-	o	o
77. 40-50 feet.....	o	-	x	x
78. Blunt prow.....	x	x	x	o
79. Sharp prow.....	o	o	x	x
80. Painted or carved.....	o	-	x	x
81. Coasting voyages.....	o	-	x	x
<i>Basketry</i>				
82. Twining.....	x	x	x	x
83. Warp hazel or willow.....	x	x	-	-
84. Weft split roots.....	x	x	o	x
85. White patterns <i>Xerophyllum tenax</i>	x	x	x	x

TABLE 4—(Continued)

	C	O	L	P
86. Black patterns maidenhair fern.....	x	o	-	-
87. Black patterns mud-dyed.....	o	x	-	-
88. Red patterns alder-dyed.....	x	x	-	-
89. Decoration by overlaid wefts.....	x	x	o	o
90. Wrapped twining; false embroidery.....	o	o	x	x
91. Checker work.....	o	-	-	x
92. Twill work.....	o	-	-	x
93. Wallets and bags.....	o	o	x	-
94. Conical burden basket.....	x	x	-	-
95. Mortar hopper.....	x	x	o	-
96. Cradle twined.....	x	x	o	o
97. Cradle wooden.....	o	o	x	x
<i>Food</i>				
98. Salmon.....	x	x	x	x
99. Salmon the staple.....	x	o	x	x
100. Acorns.....	x	x	x	o
101. Acorns staple.....	x	x	o	o
102. Camas and bulbs.....	x	x	x	-
103. Important.....	o	o	x	-
104. Wasp larvae eaten.....	x	x	-	-
105. Tobacco.....	x	x	x	x
106. Cultivated.....	x	x	o	o
107. Common.....	x	x	o	o
<i>Utensils</i>				
108. 2-pronged salmon harpoon.....	x	x	-	-
109. Seed beater.....	x	x	-	-
110. Basketry.....	x	o	-	-
111. Stick.....	o	x	-	-
112. Slab mortar.....	x	x	-	-
113. Mush paddle.....	x	x	-	-
114. Spoons.....	x	x	x	x
115. Elk antler.....	x	x	o	o
116. Mountain sheep or goat.....	o	o	x	x
117. Geometric carvings.....	x	-	x	o
118. Animal carvings.....	o	-	o	x
119. Wooden troughs or bowls.....	x	-	x	-
120. Well made, ornamented.....	o	-	x	-
121. Joined boxes.....	o	-	o	x
<i>Society</i>				
122. Wealth cause of social rank.....	x	x	x	x
123. Birth cause.....	o	o	o	x
124. Debt slavery.....	x	x	o	o
125. War slavery.....	o	o	x	x
126. Slave sacrifice occasional.....	o	o	x	x
127. Descent paternal.....	x	x	x	x
128. Potlatch.....	o	o	x	x
129. Potlatch important.....	o	o	o	x

TABLE 4—(Concluded)

	C	O	L	P
130. Dentalia measured by fives, or number to arm length.....	x	o	o	—
131. By tens.....	o	x	—	—
132. By number to fathom.....	o	o	x	—
133. Burial in ground.....	x	x	o	o
134. Lying.....	x	o	—	—
135. Sitting.....	o	x	—	—
136. In canoes.....	o	o	x	x
137. In houses	o	o	x	o
138. In canoes or boxes, often elevated <i>War</i>	o	o	o	x
139. Armor.....	x	x	x	—
140. Of rods.....	x	x	x	—
141. Of elk hide.....	x	x	x	—
142. Elk hide over rods.....	o	x	o	—
143. Hide helmets.....	o	x	o	—
144. Shield.....	o	—	x	—
145. War dance of incitement..... <i>Religion</i>	x	x	—	—
146. Masks and societies.....	o	o	o	x ³⁵
147. Formulas.....	x	x	—	—
148. Long, narrative or dramatic.....	x	o	—	—
149. Short, type of prayer.....	o	x	—	—
150. Girls' adolescence ceremony.....	x	x	x	x
151. Ritual number 10.....	x	o	o	o
152. Ritual number 5.....	x	x	x	x
153. Disease from pain object in body.....	x	x	x	—
154. From soul theft.....	o	o	x	—
155. Shaman's power in pain objects.....	x	o	o	o
156. Shaman's power from spirits.....	o	x	x	x
157. Men shamans.....	o	x	x	—
158. Women shamans.....	x	x	o	—

As to selection of data in Kroeber's original list, his knowledge was obviously more full for the southern than for the northern sub-areas, as shown by the increasing number of blanks (—) to the north; but there is no weighting of positive traits in favor of California. Thus:

	California	Oregon	Lower Columbia	Puget
Traits present.....	81	87	80	61
Traits absent.....	77	57	49	42
Unknown.....	0	14	29	55

³⁵ Found on coast of Olympic peninsula, not strictly on Puget Sound.

The rankings of the six interrelations of the four areas, according to the various measures discussed, are shown in table 5.

TABLE 5
RANKINGS OF SUB-AREAS OF SOUTHERN NORTHWEST COAST CULTURE
In Percentages

	P _a	P _b	A	G	T	E ³⁶	Q ³⁷	r ³⁷
Low. Col.-Puget Sd.	80	77	79	78	64	+49	77	47
NW. Cal.-SW. Oreg.	69	78	74	73	58	+56	68	38
SW. Oreg.-Low. Col.	51	57	54	54	37	-09	-22	-11
NW. Cal.-Low. Col.	41	54	48	47	31	-21	-31	-17
SW. Oreg.-Puget Sd.	42	46	44	44	28	-22	-48	-25
NW. Cal.-Puget Sd.	31	39	35	35	21	-41	-69	-40

As to ethnological findings, the several measures make it clear that Kroeber was correct in drawing a line across the coast region of Oregon,³⁸ and that the part of the state south of this line adheres closely to northwest California. If however Northwestern California and Southwestern Oregon are thrown into one culture area because of their high *A*, *G*, and *T* values, the Lower Columbia and Puget Sound, with even higher values, must also be considered a single area, whereas Kroeber kept them separate. This was obviously owing to his one-sided interest in placing and delimiting northwestern California. If his motivation had been an evenly balanced interest in the Northwest coast as a whole, or in its entire southern half, he ought to have been able at least to glimpse the major demarcation which the numerical treatment reveals.

The general results conform to expectability because the Northwest coast is a long, narrow area in which the arrangement of sub-areas is linear. A successive diminution of relationship according to distance is therefore to be anticipated and shows very clearly in the figures.

³⁶ Absolute numbers of traits.

³⁷ Probably invalid statistically, appended for comparison.

³⁸ Whether the line falls at the Umpqua mountains and across the lower Umpqua river, or elsewhere, is of course not evidenced by the figures, since these depend on the grouping of traits according to the areas chosen. It can only be inferred that if the line were fundamentally wrong, that is if it passed through the middle of a natural or actual area, this would show in the figures, since the values on the two sides of the line would then be high.

	A	T
Adjacent areas:		
C-O.....	74	58
O-L.....	54	37
L-P.....	79	64
Mean.....	69	53
Areas separated by one area		
C-L.....	48	31
O-P.....	44	28
Mean.....	46	29
Areas separated by two areas		
C-P.....	35	21

The only departure from linear geographic regularity is between Southwest Oregon and Lower Columbia, where exceptionally low values indicate a difference of greater importance between these two areas, in other words a major cultural frontier.

For comparison, we have added the values of the coefficients of association, Q , and correlation, r . It will be seen that the rankings for these measures in this case coincide very neatly with those from our own measures, although in the Sun Dance they departed radically from them. We assume that this difference in results is owing to the fact that in the present case blanks in knowledge have been carefully distinguished from absences of traits, whereas in the Sun dance they were counted as traits. What if anything the agreement of the Q and r rankings with the P , A , G , and T rankings in the present case means from the point of view of statistical theory, we do not attempt to say. But it does not look as if these coefficients expressed anything which our simpler measures do not express.

In table 6 we have computed the G of five classes of traits entering into tables 4 and 5, in order to see if different types of culture traits, such as material and non-material ones, showed any greater or less tendency to either adhesion or variability, or whether perhaps certain areas resembled one another more in one domain of culture than in another. It will be seen that the results are negative. It can therefore be inferred as a working principle, unless there are specific circumstances pointing to the contrary, that material and non-material culture traits can be used commingled for comparisons, and that an occasional deficiency of data on particular aspects of culture, such as art, religion, or technology, is not likely to impair the value of comparisons, provided the data available are authentic, precise, and not too limited in scope.

TABLE 6
G VALUES FOR SEVERAL ASPECTS OF NORTHWEST CULTURES

	Body and dress	House and sweat-house	Basketry and utensils	Society	Religion	Total culture
Low. Col.-Pug. Sd.....	77	76	76	76	87	78
NW. Cal.-SW. Oreg. ...	80	52	88	67	63	73
SW. Oreg.-Low. Col...	53	50	40	35	83	54
NW. Cal.-Low. Col.....	45	42	50	32	50	47
SW. Oreg.-Puget Sd...	45	35	57	33	87	44
NW. Cal.-Puget Sd.....	39	23	43	33	50	35
Mean of six pairs.....	57	46	59	46	70	55
σ	12	17	18	18	16	15
100 σ /M.....	21	37	31	39	23	27

The one irregularity of significance in this table seems to be the Northwest California-Southwest Oregon high values for basketry and dress and low values for houses and religion, coupled with Southwest Oregon-Lower Columbia high value for religion. That is to say, in certain features, especially cults, the Oregon area adheres more closely to the area on its north than the one on the south with which it is on the whole the most closely united.

As to further investigations in this field, two possibilities are patent. One is a study of the whole Northwest coast from Mount St. Elias to Cape Mendocino, with the data gathered or compiled from the point of view of the area as a whole, that is, the totality of its regions, instead of one sub-area. The linear arrangement of the sub-areas makes the expectable picture an unusually simple one, so that any marked departure from a step-by-step progressively equal change of degree of relationship would at once become significant. Second, as regards the areal units to be compared, a tribe-to-tribe comparison would group the tribes into true or natural sub-areas of culture, free from suspicion as representing dogmatic or conventional formulation. These sub-areas could then be treated empirically, as just suggested, to make clearer the primary organization and fundamental history of the whole Northwest Coast.

NORTHEAST PERU

In 1930 G. Tessmann published a large and important volume on the Indians of the tropical forest of northeastern Peru.³⁹ In this he has included a tabular listing of the tribal occurrence of 212 culture traits assigned to six Kulturfamilien and Kulturgruppen, that is, to four cultures and two subcultures. The lists show the traits in which each of 34 tribes participates in each of these six postulated cultures. A series of colored cartograms visualizes the findings.

Obviously, all of Tessmann's results depend on the validity of the six cultures of which he regards traits as characteristic. Unfortunately, he does not make clear any empirical basis on which his cultures are founded. His argument as to their valid coherence probably rests in good part on intuitive reactions to the experience of gathering and arranging the data, but is presented somewhat dogmatically as the product of a philosophy concerned with the inner significance of culture aspects. This procedure is hardly one to inspire confidence: the six original cultures may be as essentially hypothetical as the Graebner-Schmidt ones. With the use of such assumptions, the classification of data can come out only in terms of the assumptions. The reader's sole check is the degree of coherence or order in the ultimate results. And here Tessmann fails to help out because he includes no one compact tabulation or map showing the degree to which his numerous tribes participate in the six assumed primary cultural units. There are six tabulations in as many parts of the book, and four cartograms with different symbols for the material, social, and spiritual parts of each of the cultures.⁴⁰

However, there is valuable material in the distribution of 1500 trait occurrences among 34 contiguous tribes, and we resolved to work over these data. Tessmann generally distinguishes between absence of traits and absence of information,⁴¹ but his lists are marked by several peculiarities, such as frequent negative wording of traits ("kein Hund"),⁴² and some counting of traits as of double or half weight.

³⁹ *Die Indianer Nordost-Perus: Grundlegende Forschungen für eine Systematische Kulturkunde.* Hamburg, 1930.

⁴⁰ Pp. 656, 691, 715, 729, 751, 775; cartograms 39-42.

⁴¹ This renders his material unusually eligible for calculation of coefficients involving known common absences.

⁴² So that presence of a trait is indicated by an absence of the negative trait.

TABLE 7
OCCURRENCE OF TRAITS AMONG 34 PERUVIAN TRIBES

Items rearranged and combined from Tesmann
x, present; - , absent; blank, not known if present or absent
Roman numerals refer to Tesmann's tables I, p. 65; II, 68; III, 71; IV, 73; V, 75; VI, 77
Following Arabic numerals refer to Tesmann's items in these tables
The order of tribes in Tesmann's and approximately geographical

	Ut	Oka	Mui	Bor	Yag	Tik	Aui	Kot	Plo	Sab	Qui	Zap	Iqu	And	Jiv	Kan	Job	Chay	Mun	Chan	Agu	Onu	Sim	Kok	Yam	Oma	Iam	Pan	Kam	Ch-ma	Nok	Am	May		
A. SOZIALE KULTUR																																			
I 5	1. Ehe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
II 8	2. Ehehe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
VI 3	3. Vielweiberei nur bei Häuptlingen	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
II 9	4. Frauenkauf	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
V 1	5. Kinderheirat vorherrschend	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
II 7	6. Nur-Erwachsenenheirat	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
III 1	7. Mann-weiblicher Geschlechtsverkehr vor der Ehe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
I 4	8. Freier Geschlechtsverkehr vor der Ehe	(x)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
I 4	9. Freier Geschlechtsverkehr auch vor der ersten Menstruation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
II 5	10. Mann-weiblicher Geschlechtsverkehr erst nach der ersten Menstruation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
VI 2	11. Vor der Ehe Arbeitleistung an den Schwiegervater	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
I 7	12. Ehebruch wird bei der Frau bestraft	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
V 4	13. Bei Ehebruch wird der Verführer vielfach getötet	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
VI 6	14. Männerknebel	(x)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
I 2	15. Kurzes Wochenbett der Frau (1 bis 3 Tage)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
I 3	16. Sitzende Stellung der Kreisenden	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 4	17. Knieende Stellung der Kreisenden	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 10	18. Lange eheliche Enthaltsamkeit nach der Geburt eines Kindes	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I 8	19. Kurze eheliche Enthaltsamkeit nach Geburt	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 11	20. Echte Gleichgeschlechtliche	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 11	21. Echte Gleichgeschlechtliche mit eigenem Namen	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VI 4	22. Gleichgeschlechtliche Handlungen verachtet	x	(x)	x	(x)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
III 3	23. Gleichgeschlechtliche Handlungen zwischen Knaben und Jünglingen allgemein	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
III 4	24. Gleichgeschlechtliche Handlungen zwischen Knaben und Jünglingen werden bestraft	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 3	25. Feminine gleichgeschlechtliche männlichen Geschlechte	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I 9	27. Mann-männlicher Geschlechtsverkehr unter Knaben und Jünglingen	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I 11	28. Menstruationsgebrauch	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I 11	29. Tintur aus weiglicher Spitze	(-)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VI 1	30. Mädchen und Bräutigam machen den Menstruationsgebrauch mit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 2	31. Verlobung nur für einige Tage	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 6	32. Verlobung während längerer Zeit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 3	33. Abschluss der Wöchnerin	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 1	34. Beschneidung der Frau	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IV 1	35. Beschneidung der Frau ein kultartiges Fest	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IV 2	36. Mann sieht bei der Ehe zur Frau	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IV 2	37. Ort innerhalb des Hauses	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 13	38. Dorfbildung	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
III 3	39. Mann pflanzt, Frau erntet Maniok	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 14, III 5	40. Beide Geschlechter pflanzen und ernten Mais und Maniok	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 5	41. Maniok (und Mais?) von Frauen gepflanzt und geerntet, auf Veranlassung der Männer	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 15	42. Frauen spinnen und weben	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 6	43. Männer spinnen und weben	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VI 5	44. Sippe auf exogamer Grundlage	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
B. MATERIELLE KULTUR																																			
I 2	1. Bogen und Pfeil	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 5	2. Bogen und Pfeil als Fischfang-Jagd- und Kriegswaffe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
III 1	3. Bogen und Pfeil nur Fischereiwaffe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 1	4. Dünner Speer mit weiglicher Spitze als Jagd- und Kriegswaffe	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
V 1	5. Speer aus Palmbaum mit aufgesetzter Spitze	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 2	6. Zweispitzige Stosslanze für Fische	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 3	7. Mehrspitzige Wurfpfeile für Fische	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II 4	8. Wurfbreite	x																																	

For this reason we have compiled from his lists a new one, in which each trait is a positive and equivalent unit. Inasmuch as all our subsequent findings depend on this list, we give it here, as table 7.

From this list we have calculated but one set of intertribal values, those for $G = c/\sqrt{ab}$, because of the labor of computing more than 500 relations anew for other measures. In the case of this Peruvian material, accordingly, we are comparing not measures among themselves, but a numerical result by a single one of our formulas against Tessmann's direct interpretations. The 561 G 's are given in table 8.

With so many tribes involved in comparison, it is rather expectable that some will fall on or near the borderline of such groups as eventuate, and participate in several. While some groups emerge well defined, others are clear only as to their nucleus, their limits in terms of included tribes being somewhat ambiguous.

Another difficulty is that a complete set of intertribal rankings becomes cumbersome to follow. We have indeed decided on the grouping of the tribes by this principle of ranking, as in the previous cases. But it seems unnecessary to give 34 series each of 33 rankings, as a merely more convenient rearrangement of table 8. Instead we have ordered the sequence of tribes in this table so as to depart from the geographical sequence mostly followed by Tessmann, and instead to collocate, so far as possible, tribes which show the highest G values among each other. This means that the highest ranking values should in general come along or close to the diagonal which bisects the table. In general, they do fall there, and thus evidence that our groupings are not random or arbitrary. Further to emphasize the inherent organization of the results, we have put all above-average G values in italic type, and high values in blackface. Finally, the same letter has been preposed to the name of each of the tribes seeming to compose a natural group. Thus the first four tribes are preceded by A, and form group A; the next 7 by B, and constitute subgroups *a*, *b*, and *b1* of B; and so on.

A condensation for greater convenience is given in table 9, which contains only the means of inter-group and intra-group G values. Thus the 6 values of 87, 80, 86, 90, 86, 83 which the four A tribes show with each other in the large table, are here reduced to the single figure 85, their mean. The 12 values expressing the G relation of the same four tribes with the three of group Ba, are similarly reduced to their average of 39, and so forth.

TABLE 9

CONDENSATION OF TABLE 8 TO GROUP MEANS

Highest values for each group (read horizontally) in blackface; unusually low ones in italics

	A	Ba	Bb	C	D	E	Fd	Fc	Fa	Fa1	Fa2	Fb	Fb1
A	85	38	39 ⁴³	36	29	35	39	36	<i>28</i>	38	30	31	37
Ba	38	56	49⁴⁴	46	44	50	47	51	46	48	45	43	43
Bb	39 ⁴³	49⁴⁴	49⁴⁵	44⁴⁶	40	40	46	45	47	46	46	44	38
C	36	46	44⁴⁶	54	42	39	36	33	<i>28</i>	41	36	34	46
D	29	44	40	42	67	37	34	45	44	43	46	48	48
E	35	50	40	39	37	—	68	56	47	53	50	45	46
Fd	39	47	46	36	34	68	75	59	60	64	61	59	46
Fc	36	51	45	33	45	56	59	—	63	64	53	58	42
Fa	<i>28</i>	46	47	<i>28</i>	44	47	60	63	77	63	67	66	44
Fa1	38	48	46	41	43	53	64	64	63	—	68	65	46
Fa2	30	45	46	36	46	50	61	53	67	68	—	61	53
Fb	31	43	44	34	48	45	59	58	66	65	61	70	52
Fb1	37	43	38	46	48	46	46	42	44	46	53	52	—

Two groups emerge as indubitable from tables 8 and 9: four tribes on the northeastern border of the area considered (A); and about 17 (F) that are situated in all parts except the north (see map, fig. 5). About a third of the F tribes, on the lower Huallaga and Marañon, constitute a natural unit (Fa) with high *G*'s among themselves; another third a unit (Fb) on the Ucayali; the others are somewhat doubtfully includible in these two (Fa1, Fa2, Fb1), or form smaller subgroups (Fc, Fd) to the northwest of the others. The strength of group F is its massiveness; of A, its distinctness. A is easily the most differentiated of all the groups; the Fa and Fb nuclei have the next highest internal *G*'s.

⁴³ 43 without Iquitos.⁴⁵ 51 without Iquitos.⁴⁴ 50 without Iquitos.⁴⁶ 42 without Iquitos.

An interesting group is C, consisting of three widely separated tribes, Auishiri, Mayoruna, and Amahuaca (fig. 5). Their interrelation values are low—51, 60, 52, mean 54—but those with other groups and subgroups are lower still, the means ranging from 46 to

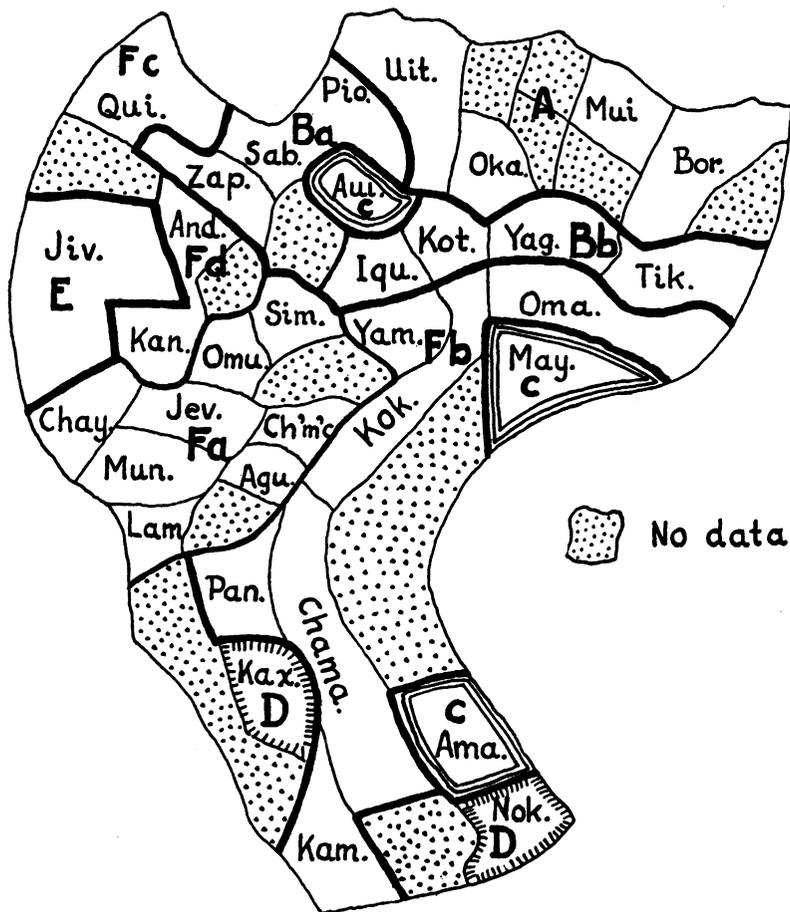


Fig. 5. Tribes of Northeastern Peru (schematic after Tessmann), showing groups of related tribes (according to Driver and Kroeber).

only 28. Each has a few *G*'s above 50 with neighboring tribes; but these are scattering. In view of the geographical separation of these three tribes, even the moderate *G*'s which they possess with each other compel the acceptance of these as significant of a genuine but probably old and partly overlaid connection between them.

The Iquitos, who adjoin the Auishiri, could be reckoned with this group, but equally with Bb. The footnotes to table 9 show the relation with C.

Another geographically broken group, D, consists of two southern tribes, the Kashibo and Nokamán. Their G with each other is 67; all other values are below 52, except for 61 between Nokamán and near-by Chama. The means of D G 's with other groups range from 30 to 48.

The Jívaro of the western border stand well by themselves (E). They seem really to be an assemblage of tribes with an unusually large aggregate territory. Their relations are definitely highest with two F tribes, Kandoshi, 69, and Andoa, 67, who constitute subgroup Fd and border on their east; next with Quijos (Fc), Munichí (Fa), and Záparo (B)—all 56 and none in geographical contact. With the rest of F, E relations are only moderate. This localization of Jívaro connections probably justifies their being kept in a separate group, which may be construed as having exchanged influences with certain of the nearer tribes of F, and in a secondary degree of B. On the other hand, no great violence would be done to the facts by considering the Jívaro a subgroup (Fe) of F.

The remaining seven tribes live in two areas: the Pioché, Sabela, Záparo (Ba) on the Napo, and the Iquitos, Koto, Yagua, Tikuna (Bb) in line along the main Amazonas. The Napo (Ba) tribes show the higher internal G 's, mean 56, versus 49 for Bb, or 52 if Iquitos (Bb) is excluded and reckoned in C. Their relationship with each other (Ba-Bb) has a mean G of 50; means with other groups range from 39 to 48.⁴⁷ The culture of both B subgroups is thus either unusually generalized or pretty well mixed. But they do not fit into any other groups. Their relationship is no closer to C or D than to F. The principal reason for keeping them distinct from each other is their geographical separateness.

These findings interpret as follows:

Group A, Northeastern: Uitoto, Okaina, Muimane, Bora, and no doubt other adjacent tribes ("no data" on fig. 5), between the Putumayo and the Yapura. This group differs considerably more from all others investigated in the region than any of these differ from one another. The indication is strong that our A tribes constitute only a southern or southwesterly fringe of a culture occupying a larger area, and delimited by the Putumayo from the cultures of the bulk of northeast Peru. The distinctness of A is almost as marked against adjacent B as against more remote C, D, E, F, suggesting that the Putumayo frontier is sufficiently recent for little cultural osmosis to have taken place across it.

⁴⁷ For groups of several tribes. B shows mean G of 51 with Fc (Quijos only) and 50 with E (Jívaro only).

This group shows the largest number of culture traits or complexes characterizing it, of any under consideration. These traits include: chiefs polygamous; *work done for father-in-law before marriage;⁴⁸ *brief confinement at birth; kneeling parturition; *homosexuality held in contempt; long betrothal; *bridegroom participates in girl's rite; *exogamic sibs; no bow and arrow; *palmwood spear with foreshaft; *tapir hide armor; set nets; wicker fish traps; *hollow log fish traps; *monkey traps; *intoxicants absent; *tobacco juice (brew) used at pacts; coca; *salt made of plant ash; *no dogs kept; *signal drum; no spinning or weaving; *pottery punched out of a lump and undecorated; *quadrangular house frame; log stool; peanut; *man's loin cloth; *women naked, but painted with designs; *novice becomes shaman through magic ball entering him; *shamans kill tribal foes; *squat inhumation; *numerous "cults."

Group B, Northern: Ba, Pioché, Sabela, Záparo, on the Napo; Bb, Tikuna, Yagua, Koto, Iquitos, on the united Amazonas. Contact between the two groups is interrupted by the Auishiri of group C. The most upstream Bb tribe, the Iquitos, is nearly as similar to the Auishiri of group C as to the Bb tribes with which it has been included. It may therefore be designated as Bb1. This B cluster of tribes has not a well differentiated culture, either as a unit or as two sub-units. The internal relations of the B tribes are the weakest of any group, the external relations fairly strong. The Ba subgroup is a little more definitely marked off than Bb, even if the latter is "purified" by omission of Iquitos. The least relationship exists toward the north and east against immediately adjacent A. The B culture is evidently an unusually generalized one. The only traits at all tending to be confined to it prove to be the *couvade* and pre-pubertal intercourse.

Group C, Scattered: Auishiri on the Curaray north of the Marañon, Mayoruna on the Yavari northeast of the lower Ucayali, and Amahuaca on the Yuruá east of the upper Ucayali; possibly also Iquitos near Auishiri, though we have left this in Bb.⁴⁹ The numerical interrelations of these three tribal cultures are only moderate, but definitely stronger than external ones. In view of the geographical separation, they therefore seem significant: either the three tribal cultures are dispersed remnants of a once centered single culture, or such a culture formerly extended over a large territory but has since been submerged over most of its area. Such at least would be the inference from the figures.

An examination of traits common to the C tribes, however, leads to the possibility of a different interpretation. There are no traits strictly confined to the three tribes of this group. The majority of traits that are more characteristic of it than of other groups are negative: *absence* of salt, dogs, Pan's pipe, double skin drum, canoes, spoons, fire fans, stools, combs. The only positive traits are true homosexuals and cremation or eating of the corpse. The question therefore fairly arises whether the C culture is really the remnant of an old, low-level, meager, culture, or a secondarily impoverished one, perhaps as the consequence of ethnic misfortunes, such as wars, expulsion, or white contacts. Such causes might be quite recent, and yet have caused rather similar losses in different localities. It will be noted that with the exception of canoes, the absences from the C culture in no case involve any element of

⁴⁸ The asterisk, *, indicates that the trait is wholly confined to the group, or at most shared with one or two immediately adjacent tribes. Unmarked traits are typical of the group, but recur elsewhere in northeast Peru.

⁴⁹ Tessmann's cartogram map which we have used as a base for figure 5 is schematic. The precise position of the survivors of the tribes is shown on his large map.

real importance. Pottery, textiles, houses, all continue to be made. It is little luxuries and conveniences that are lacking—dogs, Pan's pipes, stools, fans, combs—the sort of things that a people grown poor or in refuge might easily dispense with. It cannot be affirmed, at least by us, that this is what actually has happened to the Auishiri, Mayoruna, and Amahuaca; but the possibility cannot be ignored.⁵⁰

Here then is a case where examination of the individual culture traits themselves may lead to a verdict different from that arrived through a consideration of the mere distribution of the traits. It is again a question of negative traits.

Group D, Southern: Nokamán and Kashibo, respectively east and west of the Ucayali near the southern end of the territory under examination, and separated from each other by the Chama and Kampa of group Fb. A movement of these greater tribes along the Ucayali presumably has split the Nokamán and Kashibo apart recently enough for their culture to retain a fairly high degree of uniformity. Local influences have not been specially strong, except between Nokamán and neighboring Chama (Bb) and Amahuaca (C).

The D traits themselves are also mainly negative, and none are confined to the two tribes. They are: *absence* of spear-thrower, blowgun, tobacco, flute, drum, loom, (decorated?) pottery, stools, men's dress. The positive traits are: homosexual practices common and not disapproved; and only evil shamans (= absence of good ones!). The negative traits are mostly different from the negative ones of C. However, both groups consist of scattered tribes. C and D are the only groups which are not geographically continuous and which are characterized chiefly by absences of traits. This parallel is probably significant.

Group E, Western: Jívaro. A single large tribe, or cluster of related tribes, on the Santiago. Within our area, similarities are numerically strongest with the adjacent *d* form of F culture, and next strongest with the somewhat more northerly *c* or Quijos type. As the Jívaro are marginal within the area, in fact just inside the edge of the tropical forest, one of two historical alternatives is indicated for them. Either they carry an essentially Andean (as opposed to lowland Amazonian) culture, which has impinged on and been reciprocally influenced by that phase (*d*, Kandoshi, Andoa) of the lower Marañon-Ucayali (F) culture with which it came most in contact (i.e., $E + F > Fd$). Or, Jívaro culture is essentially of Marañon-Ucayali origin and type but specialized by highland contacts (i.e., $E = Fe = F + H$). Data confined within our geographical frame will not wholly resolve the alternative.

The characteristic Jívaro traits are: child marriage; *passive homosexuals; brief betrothal; †*men spinning and weaving; †round wooden shields; deadfalls for human beings; double flute with double stops; wooden signal drum; †*short spindle with whorl slipped on from above; †*vertical loom; †*pottery lacquered inside; *broom of leaves; high round stool with four-edged pedestal; *sleeping bunk with foot; square loincloth for men; †*head trophies; shamans kill any alien; †*“amulets”; †*“animism.” This is a fairly strong list, and free of negative traits. The daggered items, †, are likely to be more or less general Andean in origin. There are, on the other hand, few traits shared by the Jívaro with group F as a whole and only with it. It seems therefore that the

⁵⁰ Group A also has some striking lacks (weaving, bow, women's clothing, poor pottery) but they are compensated for by strong positive traits (great houses, special spears, traps, men's dress, sibs, cults). The absences are therefore merely part of the result of strong and distinctive specializing tendencies—a very different thing from absences or possible losses without compensation, as in group C.

Jívaro are either an old Andean population which has moved into the tropical forest, or an old forest people, not originally of group F, long exposed to Andean influences. From this in turn it follows that their neighbors the Andoa and Kandoshi (Fd) are probably F-culture peoples modified by contact with the Jívaro.

Group F, Central-Southern: 17 tribes, or half of the total considered, holding a large and irregular but nearly continuous territory and falling into four subgroups:

Fa, Central Western, on the lower Marañón and Huallaga: Chayahuita, Munich, Jebero, Aguano, Chamieuro, Simaku, and probably Omurana (Fa1, with Fb resemblances) and Lamisto (Fa2).

Fb, Eastern and Southern, about confluence of Marañón and Ucayali, and up the Ucayali: Omagua, Kokama, Yameo, Chama, Panobo; also perhaps Kampa (Fb1 = G?).

Fc, Northwestern, Quijos, on the upper Napo, separated from the remainder of the group.

Fd, Central, Kandoshi and Andoa, on the Pastaza, between Fa and Fc, and strongly affected by, or possibly affecting, the Jívaro (E) on their west.

In spite of its size, the F group has, except for A, the highest internal numerical relations. Its 136 intertribal *G*'s average 64, against corresponding 53 for B, 54 for C, and 67 for two-tribe D. The internal subgroup means are: *a*, 77; *b*, 70; *d*, 75; as against A, 85. The most pronounced and distinctive phase of the culture is the Marañón-Huallaga one (subgroup *a*). This is shown not only by its high internal interrelations, but by the fact that its relations with foreign A and C are the lowest of all found. Subculture *b* may be regarded as a closely related eastern variant of *a*, *c* as a geographically detached one, *d* as a neighboring one influenced by E. It is notable that Fa tribes like Chayahuita and Jebero which are adjacent to Jívaro (E), show a rather small degree of similarity to it. This again argues for the cultural strength or independence of the Marañón-Huallaga subgroup.

The group F culture is marked off positively on the whole, but not specially strongly. Its characterizing traits are: true homosexuals; domestic fowl adopted; Pan's pipe of 10-12 tubes; *6-stop flute; *horizontal loom for cotton; *well made and decorated pottery; blackened calabash cup; *shell spoon; *sleeping bunk with mat of Ficus bast; *burial in canoe or log; shamans kill personal enemies; *bow used only for fish; little use of ear ornaments; *absence* of: tattooing; lip ornaments; nose ornaments; set nets; fish traps; *couvade*. This is not an imposing list, but it is definite; and its features recur pretty consistently among all four subgroups.

(*Group G.*) The Kampa have been included in F, and within it tentatively in Fb, because within the area here dealt with they can be placed nowhere else. However, they might be considered as partaking mainly of a culture not otherwise represented in the field of investigation—a hypothetical culture group G. They are certainly more aberrant from all the other F tribes than these are *inter se*. Only 12 of the 136 intra-F values fall below 50; 11 of these are of Kampa with some other F tribe,⁵¹ and range as low as 39. The Kampa relations with A, B, C, E are lower still, evidently because the seat of these cultures is more remote; and within F, Kampa similarity is greater with *b* because this is adjacent. These values suggest that the Kampa represent the margin of a culture whose main distribution lies outside the frame of the present comparison.

⁵¹ The twelfth is Chama-Kandoshi, 49.

On the other hand, they show almost no specifically characteristic traits. All that can be said is that they possess a few features which occur elsewhere in forested Peru but not in its southern part, and which are not typical of the F tribes in general. These traits are: polygamy of chiefs; squatting parturition; set nets; fish traps. These are insufficient criteria on which to base a separate G culture. The Kampa are therefore provisionally best considered an F-culture tribe, somewhat differentiated by their marginal position.

It will be seen that three cultures, A, E, and F, can be positively determined among the 34 tribes considered. The distinctiveness of these is in the order of mention. Cultures A and E also seem the richest or "highest"; F is the most widely distributed, at least in Northeast Peru. Quantitative trait interrelations and consideration of the nature of the traits coincide in pointing to these conclusions.

For the B, C, and D group tribes, the case is otherwise. Their trait-count interrelations suggest the three groups, though not compellingly; but consideration of specific culture traits shows such to be either wanting (B) or to consist of absences of traits found elsewhere (C, D). Groups C and D therefore may be tribes whose cultures have recently suffered losses due to ethnic misfortunes. Group B consists of a string of tribes situated like a barrier between the A and F tribes, giving no marked evidences of actual impoverishment, but possessing a definitely colorless, uncharacteristic culture. If this is in origin a blend of cultures A and F, it is a weak mixture, with few characteristic traits of either of these.

COMPARISON WITH TESSMANN'S RESULTS

We are now in a position to compare our classification with Tessmann's. Although his organization of results continues along lines of the six hypothetical cultures which he assumes to begin with, it is possible to condense his numerical data in such a way as to show groupings of tribes as well. We have done this in table 10, in which his "cultures" are shown in vertical columns, while the tribal data are given in horizontal lines with those tribes on adjacent lines whose participation in each "culture" is the greatest. This arrangement yields groups of similar tribes, to which we have affixed Tessmann's names for the "cultures" most characteristic of them, adding also our letter designations.

It is clear that the two classifications on the whole agree rather well. The greatest difference is that Tessmann unites Ba, Bb, C, and D into a single "Altkultur" group; although even within this our C tribes form a distinct sub-unit with the highest proportion of traits

characteristic of the group.⁵² Our Ba is marked off as another subgroup by higher participation in Tessmann's "Sub-Andean culture"; D, by traits characteristic of the Amazonian and Ucayali cultures.

TABLE 10

TOTALS OF TESSMANN'S 212 TABULATED TRAITS DISTRIBUTED ACCORDING TO HIS ASSUMED CULTURES (COLUMNS) AND THE INDICATED GROUPS OF RELATED TRIBES (HORIZONTALS)

	Northern culture 35 traits	Old culture 57 traits	Sub-Andean culture 34 traits	Amazonian culture 61 traits	West Amazon subculture 16 traits	Ucayali subculture 9 traits	Total traits for tribe
(Northern Group=our A)							
Uitoto.....	30	23	2	2	1	-	58
Okáina.....	30	14	2	4	-	-	51
Muinane.....	28	20	2	5	1	1	58
Bora.....	29	20	2	6	2	-	59
("Old" Group=Ba, Bb, C, D)							
(Ba)							
Pioché.....	6	22	4	9	1	-	43
Sabela.....	-	18	2	1	-	-	21
Záparo.....	1	20	7	10	2	-	40
(Bb)							
Iquitos.....	1	31	2	12	2	-	49
Koto.....	4	23	-	8	1	1	38
Yagua.....	5	22	1	6	1	-	36
Tikuna.....	4	14	-	14	4	1	37
(C)							
Auishiri.....	2	40	2	7	-	-	51
Mayoruna.....	1	52	-	3	1	-	55
Amahuaka.....	-	35	-	8	-	5	48
(D)							
Kashibo.....	2	24	2	14	3	4	50
Nokamán.....	-	24	-	14	4	7	49
(Sub-Andean Group=E)							
Jívaro.....	-	13	33	9	2	1	58
Kandoshi.....	-	14	11	10	4	-	41
Andoa.....	2	5	6	7	-	-	20
(Amazonian Group=F, Fb)							
Quijos.....	2	13	5	15	3	1	39
Munichi.....	-	-	-	11	3	1	15
Kokama.....	-	4	-	33	4	1	42
Yameo.....	2	6	2	27	4	1	42
Omagua.....	2	3	-	59	-	1	65
Lamisto.....	1	13	3	18	2	-	37
Pánobo.....	-	7	3	27	1	2	40
(West Amazon Subgroup=Fa)							
Jebero.....	-	4	1	30	16	1	52
Chayahuita.....	-	7	1	22	10	1	42
Chamicuro.....	-	9	2	19	8	-	39
Aguano.....	-	2	2	22	10	1	38
Omurana.....	1	16	2	13	5	2	40
Simaku.....	-	11	1	18	8	-	39
(Ucayali Subgroup=Fb)							
Chama.....	-	18	2	27	-	10	57
Kampa.....	4	13	4	20	1	6	49

Blackface and *italic* figures are the highest numbers in the columns representing Tessmann's putative cultures. They are not necessarily the highest numbers in the horizontal lines referring to tribes.

Tessmann's "half" traits have been included in the additions for this table, but odd halves have been dropped from the figures shown.

⁵² With Iquitos, doubtful between Bb and C, next.

Our one-tribe (Jívaro) group E Tessmann would probably enlarge by inclusion of the two F'd tribes (Kandoshi, Andoa); but since we admit E as possibly being Fe, the difference is greater in appearance than in fact.

Within the great F group, Tessmann's West Amazon corresponds nearly to Fa, Ucayali to the southern part of Fb, Amazon to northern Fb, Fc, and a couple of tribes of Fa.

Most of these differences are analogous to those common in taxonomy, as when a family is elevated into a new order by another student, or several families are reduced to genera of one family. That is to say, they represent legitimate differences of opinion on certain points, while the majority of phenomena are classified alike.

We admit that Tessmann did not draw up a summary like table 10 and perhaps would repudiate it. But it seems a perfectly proper procedure to convert his arbitrary "culture families" (assemblages of culture traits), substantiated chiefly by philosophical argument about their inner coherence, into groups of actually existing tribes which resemble each other in the degree in which they share in each other's culture. If his cultures are invalid, of course our table 10 tribal groupings derived from them also fall. But so far as his cultures are real, our conversion of them into their best expression in tribe-group terms is also fair. Now the fact emerges that while in our own computations and classification we have completely disregarded his assumed original "culture aggregations," we arrive at tribal culture groupings rather strikingly similar to those inferable from his trait distributions when these are viewed from the tribal angle. Our difference of opinion with Tessmann, then, is not over his implicit conclusions, which we construe as being nearly the same as ours, as soon as they are inductively formulated, but over the fact that he has refrained from drawing inductive conclusions and instead has operated with assumptions as to culture entities which remain hypothetical. We feel that he is a good ethnologist in dealing with concrete ethnological data in spite of preferring to philosophize about them. The fundamental concord of his implied tribal groupings with our own, obviously suggests that the "cultures" from which his implicit groups are derived by us also rest at least partly on reality. If the cultures were nonsensical, the tribal groupings based on them would presumably also be nonsensical in terms of our trait-count coefficient, geography, or anything else objective. We discard the Tessmann "cultures" as entities merely because we do not know how he arrived

at them and do not understand the higher philosophy with which he justifies them. We believe that an inductive attempt to portray the organization of phenomena as they exist in the world today is preferable to, or certainly should precede, an intuitional leap at a reconstruction of how they were organized formerly or are organized of inherent necessity. We cast no slurs upon Tessmann's intuitional faculties, which we infer to be excellent; but his insistence on giving them precedence is scarcely good scientific method.

The upshot of this discussion is twofold. First, that the ethnologist who knows his facts and has absorbed the feel of them can come to essentially sound inferences about them without technical devices. Second, that if he publishes his facts in full and their specific occurrences in detail, the trait-count method and a simple statistical treatment will allow others to reach objectively founded general interpretations even if the facts are presented in a wrapping of assumptions or reconstructions.

CONCLUSIONS

Our findings may be summarized thus:

In culture history studies, statistical treatment by the method of presence and absence of unit traits is ancillary to the non-statistical methods in use. Statistical results can never be better than the data, whose value depends on the ethnological competence with which they are collected and analyzed.

To a large extent trait-count computations merely corroborate the ordinary ethnological findings made by students who know their field comparatively. This is true of Linton, Spier, Kroeber, and Tessmann for Polynesia, the Plains Sun dance, the Northwest Coast, and Peru.

On the other hand, statistical treatment usually expresses results more precisely and definitely. In all cases examined it also indicates greater or less corrections of the ethnological interpretations. These corrections we believe to be valid.

The several measures empirically tested by us all yield expressions of the relationship of tribal or national cultures in terms of culture traits or elements. Each tribal culture is compared with every other one; conclusions are drawn primarily by the ranking of the numerical values obtained, and then by the grouping of these rankings. All the measures used by us consist of fractions having as numerator c , the

number of traits common to the two tribes in question. They differ in denominator. The simplest measure is $c/a = P$, a being the total traits known from tribe A. This of course yields two values, c/a for tribe A and c/b for tribe B, and is therefore awkward in comparisons between large series of tribes. A and G are the arithmetical and geometrical means of Pa and Pb : $A = (c/a + c/b)/2$; $G = c/\sqrt{a \cdot b}$. A fourth measure is $T = c/a + b - c$, whose denominator is the total number of traits occurring among the two tribes in question. In application, these four measures, especially the last three, give values which differ absolutely, but which rank and group the examined tribes in very similar order.

E , the plus or minus excess of positive and negative agreements over disagreements of traits, seems to give less coherent results than A , G , and T , that is, a less consistent scheme of rankings, especially when the data do not distinguish absence of knowledge from known absence of traits. Its derivative P merely expresses the degree to which low E values are likely to be non-significant.

A , G , and T are simple formulae allowing of rapid calculation, and are logically intelligible as measures without knowledge of statistical theory. This statement does not quite hold for G , in that it substitutes the geometric for the arithmetic mean; but granted this substitution, it is equally intelligible. G is of further interest in that it has the same formula as one form of the coefficient of correlation, r .

How far negative agreements, that is, common absences of traits, should be given equal weight with positive ones, is an important theoretical question to which we give no definitive answer. It would seem that within the limits of a true natural group or field, which would ordinarily be a small one, absences should be as significant as presences; but that in proportion as the total group is not an intrinsically valid one, and this would tend to hold increasingly with increase of its size, absences may be misleading. We know, however, of no positive criterion of distinction.

For statistical purposes, nearly all ethnological data seem to be faulty, though in varying degree, in that they incline to name chiefly occurrences, leaving it to be doubtfully inferred whether unnamed traits are known to be absent or have not been considered or inquired into. But fundamentally this defect is about as serious in non-statistical as in statistical comparative ethnology. It is merely less obtrusive.

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