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Alternative solutions in componential analyses

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ALTERNATIVE SOLUTIONS IN COMPONENTIAL ANALYSES

In this paper we shall discuss one of the central problems of ethnoscience, namely the indeterminacy of the analysis.¹ As the discussion of this topic centers on componential analyses of kinship terminologies, we shall illustrate our arguments with the example of a formal kinship analysis.

The problem of alternative solutions and indeterminacy in formal semantic analysis is most succinctly formulated by Burling (1962, 1963, 1964, 1965, 1969) in a number of articles, of which "Cognition and componential analysis: God's Truth or Hocus Pocus?" (Burling 1964) is the best-known. We shall concentrate on the arguments put forward in that paper. If a componential analysis of a lexical system is to have some kind of psychological validity, so Burling argues, it must deal with the problem of alternative solutions. If alternatives are found in each analysis, the idea that one particular formal analysis is the actual representation of informants' cognitions becomes improbable.

Burling's main point concerns the astonishing number of theoretically possible alternative interpretations of any given set of terms: "If there are three items in the set (call the items, a, b and c) ... one has three obvious choices: use a component which separates a from b and c; one which separates b from a and c; or one which separates c from a and b" (Burling 1964: 20). The possibility of using components which are relevant for only a part of the set doubles the number of possibilities. Whereas for a three term set the possibilities number 6, for any given four term set they number 124. Technical problems of the analysis increase the indeterminacy of an analysis even further; these include: homonymy, empty semantic spaces, non-binary components, parallel components and redundancy. In a paper on Burmese kinship, Burling again

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stresses his point by providing an "ordinary" componential analysis and a "relative product analysis" as an alternative solution (Burling 1965), just as he had provided alternative components for Epling's Njamal kinship analysis (Epling 1961, Burling 1962).

The logic of Burling's reasoning seems valid enough, and constitutes a serious blow to the cognitive claims of ethnoscience. His suggestions of alternative solutions in existing analyses seem to demonstrate the applicability of the logical diversity of possibilities in the practice of componential analysis. But there are criticisms of his work. Among the critical reactions to his 1964 paper, those of Hymes and Hammel are especially important (Hymes 1964, Hammel 1964). In their comments on Burling's paper they tend to doubt the applicability of the total number of logical possibilities to a number of given systems, in our opinion rightly so. We shall try to show that the number of logical possibilities is not always relevant for a given set of terms, and we shall try to indicate the position of the alternative solutions that can be found.

By way of illustration we shall use the Maori kinship terminology. The total set of terms is derived from secondary sources, viz.: Best (Best 1924 I: 362 ff.), Buck (Buck 1949: 338 ff.), Metge (Metge 1964: 50 ff.), with some Maori dictionaries serving as control (Biggs 1966, Reed 1948). We consider the total system as consisting of all monolexemic terms used to denote a kinship relation between ego and alter, which do not cover the semantic domain of two or more other similar terms. The term *matua* is therefore excluded in favor of the two terms *papa* and *whaea*, which together designate the class of relatives denoted by *matua*. For the sake of clarity we shall ignore in our example the technical problems of domain demarcation, homonymy, etc., as these problems are irrelevant to Burling's essential argument.

THE MAORI TERMS AND THEIR DENOTATA ARE:

<i>tipuna</i>	FaFa, MoFa, MoMo, FaMo, FaFaBr, FaFaSi, MoFaSi, MoFaBr, MoFaSi, FaMoBr, FaMoSi, MoMoSi, MoMoBr, FaFaFaBrSo, FaFaMoBrSo, MoMoMoBrDa, etc.
<i>papa</i>	Fa, FaBr, FaFaBrSo, FaFaSiSo, etc.
<i>whaea</i>	Mo, MoSi, FaSi, MoMoBrDa, MoMoSiDa, etc.
<i>tuakana</i>	(for a male ego) ElBr, FaElBrSo, MoElBrSo, FaFaElBrSoSo, MoMoElSiDaSo, etc. (for a female ego) ElSi, FaElBrDa, MoElSiDa, FaElSiDa, MoElBrDa, FaFaElBrSoDa, etc.

<i>taina</i>	(for a male ego) YoBr, FaYoBrSo, etc., identical with <i>tuakana</i> , except that "younger" should be substituted for "elder"; (for a female ego) YoSi, FaYoBrDa, etc., identical with <i>tuakana</i> , except that "younger" should be substituted for "elder".
<i>tungane</i>	(for a female ego) Br, FaBrSo, FaSiSo, MoSiSo, MoBrSo, FaFaBrSoSo, FaMoSiSoSo, etc.
<i>tuahine</i>	(for a male ego) Si, FaBrDa, FaSiDa, MoBrDa, MoSiDa, FaFaBrSoDa, etc.
<i>tamaroa</i>	So.
<i>tamahine</i>	Da.
<i>iramutu</i>	BrSo, SiSo, MoBrSoSo, MoBrDaDa, MoSiDaDa, FaBrSoSo, FaBrSoDa, etc.
<i>mokupuna</i>	SoSo, DaDa, DaSo, SoDa, BrSoDa, BrDaSo.
<i>hoa</i>	Hu, Wi.
<i>hoahoa</i>	HuBrWi, WiSiHu, HuWi.
<i>hunarei</i>	HuFa, HuMo, WiFa, WiMo.
<i>hunaonga</i>	SoWi, DaHu.
<i>autane</i>	(for a female ego) HuBr, HuFaBrSo, HuMoSiSo, SiHu, etc.
<i>auwahine</i>	(for a male ego) WiSi, BrWi, WiFaBrDa, WiMoSiDa, etc.
<i>taokete</i>	(for a male ego) WiBr, SiHu, etc. (for a female ego) HuSi, BrWi, etc.

These terms can be segregated and defined by the following components (with the code used):

1. *Consanguinity - Affinity* (number of affinal links in the ego-alter relation) N^0 , N^1 , N^2
2. *Generation* (generational distance of alter from ego)
 G^{+2} , G^{+1} , G^0 , G^{-1} , G^{-2}
3. *Sex of alter* S^m , S^f
4. *Relative sex* (difference/sameness of sex of ego and alter) R^s , R^d
5. *Relative age of alter* (presence of elder/younger siblings of the same sex in the ego-alter relation) A^e , A^y
6. *Lineal-Lateral* (absence/presence of a sibling link in the ego-alter relationship) L^0 , L^1

For a tabular representation of the system we shall use a matrix with the resulting componential definition of each term:

(term)	(1)	(2)	(3)	(4)	(5)	(6)	Componential definition
<i>tipuna</i>	N ⁰	G ⁺²	—	—	—	—	Consanguineal, two generations older than ego.
<i>papa</i>	N ⁰	G ⁺¹	S ^m	—	—	—	Male consanguineal, one generation older than ego.
<i>whaea</i>	N ⁰	G ⁺¹	S ^f	—	—	—	Female consanguineal, one generation older than ego.
<i>tuakana</i>	N ⁰	G ⁰	—	R ^s	A ^e	L ¹	Genealogically elder non-linear consanguineal of the same sex in the generation of ego.
<i>taina</i>	N ⁰	G ⁰	—	R ^s	A ^y	L ¹	Genealogically younger non-linear consanguineal of the same sex in the generation of ego.
<i>tungane</i>	N ⁰	G ⁰	S ^m	R ^d	—	L ¹	Male non-linear consanguineal of same generation as female ego.
<i>tuahine</i>	N ⁰	G ⁰	S ^f	R ^d	—	L ¹	Female non-linear consanguineal of same generation as male ego.
<i>tamaroa</i>	N ⁰	G ⁻¹	S ^m	—	—	L ⁰	Male lineal consanguineal, one generation younger than ego.
<i>tamahine</i>	N ⁰	G ⁻¹	S ^f	—	—	L ⁰	Female lineal consanguineal, one generation younger than ego.
<i>iramutu</i>	N ⁰	G ⁻¹	—	—	—	L ¹	Non-linear consanguineal, one generation younger than ego.
<i>mokopuna</i>	N ⁰	G ⁻²	—	—	—	—	Consanguineal, two generations younger than ego.
<i>hoa</i>	—	G ⁰	—	R ^d	—	—	Non-related individual of different sex and same generation.
<i>hoahoa</i>	N ²	G ⁰	—	R ^s	—	—	Affinal's affinal of the same sex in ego's generation.

(term)	(1)	(2)	(3)	(4)	(5)	(6)	Componential definition
<i>hunarei</i>	N ¹	G ⁺¹	—	—	—	L ⁰	Lineal affinal, one generation older than ego.
<i>hunaonga</i>	N ¹	G ⁻¹	—	—	—	L ⁰	Lineal affinal, one generation younger than ego.
<i>autane</i>	N ¹	G ⁰	S ^m	R ^d	—	L ¹	Male non-lineal affinal in generation of female ego.
<i>auwahine</i>	N ¹	G ⁰	S ^f	R ^d	—	L ¹	Female non-lineal affinal in the same generation as male ego.
<i>taokete</i>	N ¹	G ⁰	—	R ^s	—	L ¹	Same sex non-lineal affinal of same generation as ego.

For the sake of clarity this matrix can be represented in a “genealogical-space” diagram (fig. 1):

Fig. 1. Genealogical-space diagram

We shall explore how "fixed" this analysis is. If we wish to follow Burling's suggestions, we must search for a different segregation of the lexemes, in order to find alternative components. In that case some or all of those used in the above analysis will have to be eliminated. This proves to be a difficult task. Given the denotata it is impossible to construct a set of components not including e.g. "generation" or "lineal/non-lineal" dimensions. Especially in the non-zero generations the lexemes are very clear-cut and it is difficult to see how the analyst could have freedom in choosing the arrangement of the terms and the assignment of semantic features.

According to the possibilities of formal logic we might search for components segregating the total set in ways other than is done by the chosen components, viz. components segregating *papa*, *hunaonga*, and *iramutu* from the remainder of the set, or any other division. The nature of the kin relations in question makes this impossible, however, thus rendering the diversity of formal logic irrelevant. The position as regards ego's own generation is somewhat more complex: in our analysis we have used three components to divide the four terms; hence we had to use a type of "non-orthogonal space" (Wallace 1962: 354) or "imperfect paradigm" (Kay 1966: 22), as illustrated by figures 2 and 3:

		R^a	R^d	
<i>rel. sex:</i>				
<i>rel. age:</i>	A^o	tuakana	tungane	S^m <i>sex of alter</i>
	A^v	taina	tuahine	S^f

Fig. 2. Non-orthogonal space-diagram after Wallace

Fig. 3. Key-diagram after Kay

The ordering of relative sex is logically the first division to be made, and the application of the two other components to the resulting pairs of terms is secondary.

What about other arrangements and components? The possibility of changing the component "sex of alter" into "sex of ego" is evident, and also trivial. We have to search for a different partition of the set, e.g., a component separating *tuakana* and *tungane* from *taina* and *tuahine*, or one that separates *tuakana* and *tuahine* from *taina* and *tungane*. One can imagine a component such as "higher-lower status" answering the purpose in the first-mentioned case; then the next division would have to bisect the status hierarchy into two based on — what else? — sex-difference and age-difference. In that case we would be merging the relative sex and relative age components into one, namely status level. In so doing, we would be constructing a component with idiosyncratic qualities; it has to be understood in terms of — presumed — Maori standards. One would have to know how genealogical positions affect status hierarchy among the Maori in order to be able to interpret the meaning of this component. In this context the following statement by Hymes is relevant: "The main thing is to observe that the total number of logical possibilities is fully pertinent only if all solutions have an equal chance of being arrived at" (Hymes 1964: 116). By concentrating on the logical possibilities within the system, Burling could not but neglect in his formal criticism the references of this system to the outside world, especially that part of the phenomenal world to which the lexical domain refers. He neglected the semantic aspect of the system; componential analysis is formal in its method, but semantic in its aim. In a study of kinship terminology it is the structured relationships of the kinship ties that are the object. Here the genealogical referent serves as the "etic grid" by which the "emic" properties of the system are established. It is this etic grid that gives meaning to meaning; it is by virtue of the referential and intermediary nature of language that concepts can be transferred and people of different cultures can communicate.

The formal logical analysis gives no recognition to the fact that the terms in question do have a meaning which is recognised outside the context of the lexical system to which it belongs; Burling's handling of the semantic field presumes that the analyst gives primacy to the semantic domain as a domain in itself, and not as a referential structuring of meanings intricately bound up with an external reality. Although the total number of logical possibilities may be astounding, it

is irrelevant as it is semantically empty. An example of a similar drastic decrease of logical possibilities by context-relatedness is found in chess or checkers. A checkers or chess player is confronted with a virtually infinite number of possibilities: in chess about 10^{120} different moves per game, and checkers approx. 10^{60} . As the great majority of these alternative moves are utterly nonsensical or useless, there is no player who will consider even a minute fraction of them in one game. One of the reasons computers are weak chess players is that they think too much, and calculate all the possibilities. The small fraction of possibilities actually tried in practice still results in a great variety of different games. Although the great masters have a vast number of possibilities as regards strategies, openings, combinations, etc., at their disposal, they are obliged to take into account only a small fraction of even that restricted knowledge in one particular game. It is the position of the pieces that compels them to leave the vast majority of their knowledge unused in that particular game.

In a similar way it is unnecessary to take the total number of logical possibilities into account in a componential analysis. We have seen from the Maori example that alternatives are difficult to find or construct. The same is true for the alternative solutions indicated in the literature (Burling 1962, 1963, 1965). It is interesting to note that most of them exclude alternative segregations within the genealogical positions, and are interpretations and combinations of other components, such as, for example, "status difference" as an alternative in the Maori analysis, "membership of the group" (Burling 1962, 1965, Romney & Epling 1958); and "being an heir" (Burling 1963). These are composite components the meaning of which is still to be ascertained from genealogical sources. In many cases the use of this kind of "sociological" component has simplicity and elegance of the analysis as its aim. The simpler the component, the more complicated the componential definitions of the individual terms will often be. So the indeterminacy to which these composite components give rise is not of the kind Burling has indicated in his 1964 paper.

In order further to explore the nature of this indeterminacy we shall use the example of generative grammar. The genealogically based components can be considered to form the "deep structure" of the semantic field; through transformation they generate the different semantic entities labelled by the lexemes. In the transformational phase the application of the components is ordered and restricted in a manner particular to that individual system. As we have seen in our Maori

analysis, not all the components are relevant to the entire semantic field, but most of them cover only a portion of it. For example, in the Maori system the total field is divided first into different genealogical levels, and the G^0 -level is further divided by the consanguineal-affinal component, the G^0N^0 sub-field is divided by the component of relative sex, while finally the component of relative age is applicable only to the cell $G^0N^0R^0$.

While it may not be possible to construct a perfect key-diagram covering all the components, a lexical system cannot be defined simply by indicating the underlying components (deep structure), but the relative importance, the ways of and restrictions in applying them, and the specific combinations of the components (transformation rules) also have to be taken into account. Within one particular analysis there are several sources of indeterminacy which account for the alternative solutions mentioned in the literature, occurring at various levels of the generative model:

Sources of Indeterminacy

Indeterminacy at the lexemic level (the problems of homonymy, empty semantic spaces and metaphoric extensions) is essentially a problem regarding data collection and domain demarcation. It is a problem which can be solved only by means of specific field methods.² However, its solution has no bearing on the validity of componential analysis as an analytical method.

² An example of such field methods is found in Romney & d'Andrade (1964). The fact that our Maori terms have been drawn from secondary sources naturally adds to the kind of uncertainty discussed here.

In the transformational phase there is some margin for different types of variation. Firstly, the deep structure components covering and segregating the same semantic sub-field can be taken together, and interpreted non-genealogically, resulting in the composite, "sociological", components referred to above. Thus the components of "relative age" and "sex of alter" within the G^0N^0 sub-field of the Maori system may be combined and labelled (non-genealogically) "higher-lower status" (see above).

Secondly, all deep structure components remaining at the end of the transformation process can be omitted, thus resulting in a less minutely partitioned field which can then be labelled with collective terms. In fact, the inclusion of such collective terms can be a means of discovering the relative importance of the components. In our Maori analysis omission of the component "sex of alter" in the G^1N^0 sub-field results in a semantic cell to which the collective term *matua* is applicable.

Thirdly, only those deep structure components covering a systematically restricted semantic sub-field can be used for generating a system of core terms, by means of which the remainder of the lexical set is generated. This results in a "relative-product" analysis, as mentioned by Wallace (Wallace 1962, Wallace & Atkins 1960) and exemplified by Burling (Burling 1965). The aim is to define componentially as few core terms as possible, and to use these terms for defining the other terms. In the Maori case in question this results in the following set of terms (Code: Conclin 1964):

S - spouse	C - child
P - parents	+ - same sex
m - male	— - different sex
f - female	/ - relative product operator, viz.
e - elder	C/S: child's spouse
y - younger	• - operator of class inclusion:
	"and also"
italicised capitals - lateral extension	

The terms in this case are:

<i>papa</i>	P.m	<i>iramutu</i>	" <i>tipuna</i> "/" <i>mokopuna</i> "
<i>whaea</i>	P.f	<i>tungane</i>	P/" <i>tamaroa</i> "
<i>tamaroa</i>	C.m.	<i>tuahine</i>	P/" <i>tamahine</i> "
<i>tamahine</i>	C.f.	<i>hoahoa</i>	" <i>hoa</i> "/P/C/" <i>hoa</i> "
<i>hoa</i>	S	<i>hunare</i>	" <i>hoa</i> "/P

<i>tipuna</i>	P/P	<i>hunaonga</i>	C/" <i>hoa</i> "
<i>mokupuna</i>	C/C	<i>autane</i>	" <i>hoa</i> "/P/" <i>tamaroa</i> ".
<i>tuakana</i>	P/C. e+	<i>auwahine</i>	" <i>hoa</i> "/P/" <i>tamahine</i> "
<i>taina</i>	P/C. y+	<i>taokete</i>	" <i>hoa</i> "/P/C.+

The final source of indeterminacy is found on the component level, in the arrangement and representation of the semantic features. We have given a matrix representation and a genealogical space paradigm. A third kind of representation is that resulting from application of the notion of polarity (Murdock 1949: 104); we have not used it as a component in our Maori analysis, and agree with Goodenough (Goodenough 1970: 88) that it is a redundant component in any analysis.

However, polarity or reciprocity can be used in the arrangement of the semantic space by taking together reciprocal terms, as Romney & d'Andrade did in their representation of the English system (Romney & d'Andrade 1964), as illustrated by fig. 4, for consanguineal terms only.

Fig. 4.

Now the question is how relevant these alternative arrangements are. The components identifying the lexemes being the same, the only difference between them is a shift in the representation of the semantic features. The two space-diagrams are essentially the same, save for a different ordering of the generations. There is no simple means of

making a choice between them, nor any obvious reason for preferring one matrix to the others, other than considerations of elegance and personal preference.

Conclusion

We have tried to demonstrate that the problem of alternative solutions in componential analysis is not as difficult as Burling feared. Though the possibilities of formal logic are irrelevant to the semantic domains, there remains a certain kind of indeterminacy in the analysis of a given lexical set. But it should be noted that it is an indeterminacy within one and the same analysis, which does not represent an alternative analysis as in the case of variations due to formal logic. The indeterminacy is of a technical kind, and is a product of the fact that there are various ways of doing essentially the same analysis. Using the same basic components, one can choose from different levels of transformation and types of representation. Thus the irrelevancy of the logical possibilities does not result in a simple one-to-one relationship of componential ordering and informants' cognitions.

The psychological validity of componential analysis remains a problem. There is no single correct solution that can be said to represent faithfully and accurately the cognitions of the native speaker. One may infer from the argument that a search for direct relation of language constituents to mental processes is bound to fail. One cannot expect a componential analysis to be an exact mapping of cognitions. But one can say with some certainty that the linguistic features found are relevant in the system as a system and can be expected to have some mental representation. Probably this mental representation is far more complex than a simple counterpart of the linguistic model. We have no reason for supposing that mental processes are as elegantly simple as we aim our linguistic analyses to be. The dichotomy "hocus-pocus — God's Truth" suffers from a rather simplistic view of the language-thought problem; in a way it reflects an implicit behavioristic legacy. The revealed structure is looked for at the empirical level, this being impossible not only because of lack of the appropriate instruments, but also because structure cannot be expected to "exist" at the empirical level. The hocus-pocus view and the God's-Truth view are not really as different as Burling would have it. As Hammel remarks in his criticism of Burling's paper: (Hammel 1964) "the quest for validity is actually a quest for reality which is epistemologically a futile question as such".

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