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Jakobsonian phonology between iconicoty and mathematical set theory

JAKOBSONIAN PHONOLOGY BETWEEN ICONICITY
AND MATHEMATICAL SET THEORY

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1. Introduction.

Jakobson makes, from a purely semantic point of view, a sharp distinction between, on the one hand, phonology, and morphology on the other. The characteristic of morphology is immediacy, whereas phonology is characterized by mediacy. In this, he agrees with K. Bûher, who states in 1936: "es sind Lautmale am Klangbild der Wörter, was man mit dem Namen Phoneme trifft sie gehören zu den Malen und Marken welche als Diakritika benützt werden und damit als Zeichen an Zeichen auftreten" (Bühler 1936: 7). As Bühler sees it, we have to do with two modes of signifying. Words have a meaning of their own, while phonemes serve to distinguish words. Words signify directly, and phonemes signify indirectly. "Die Phoneme des Wortes fungieren wie Merkmale; es sind die Unterscheidungzeichen am Klangbild das ganze Klangbild [of a substantive] fungiert als Gegenstandszeichen, es reprezentiert ein Ding oder eine Klasse von Dingen. Im Prinzip dasselbe gilt für die Wörter mir, jetzt, ich ; sie verhalten sich aber zum Gegenständlichen ein wenig anders dementsprechend sind ihre Feldwerte im Kontexte ein wenig anders wie die sprachlichen Begriffszeichen; aber Zeichen sind es auch" (Bühler 1934: 33). Zeichen in this sense serve — with some reservations regarding deictic words — the Darstellungsfunktion; that is the "Zuordnung der Lautzeichen zu Gegenständen und Sachverhälten" (Bühler 1934: 29). Roughly speaking, Zeichen refer directly to extra-lingual reality, whereas phonemes serve to distinguish Zeichen. Jakobson and Waugh refine this distinction: morphemes and words have immediacy, whereas distinctive features and phonemes have mediacy as their modes of signifying. The difference between the two is that immediacy serves to make distinctions in the realm of reference (cf. Sapir's "singleness of reference" quoted by Jakobson, see below) whereas the "distinctive features and their concurrent and sequential bundles (phonemes and syllables) differ from all other constituents of language through the lack of their proper, immediate signification. Their only signatum is that of "mere otherness". Without having their own meaning they serve to differentiate the meanings of the grammatical units to which they pertain,

morphemes and words" (Jakobson and Waugh 1979, quoted from Jakobson 1988: 237). "The nasality of the initial consonant in the word mill signals that, all other things being equal, another word beginning with the corresponding consonant without nasality will, with a probability near to 1.0, not have the same meanings as the word with the nasal consonant. The same relationship exists between nil and dill, or between rim and rib." (Jakobson 1988: 47). The criterion for this immediacy is the relation of the sign to extra-lingual reality: "Immediacy in signification of the distinctive features acquires an autonomous role in the more or less onomatopoeic strata of ordinary language" (Jakobson 1988: 237). The distinctive features themselves, then, may, instead of mediacy, carry immediacy; and immediacy means an immediate relation to extra-lingual reality, a "singleness of reference" (Jakobson 1988: 237, 47; Sapir 1949: 34). The signs that have immediacy, then, have their own range of referents in extra-lingual reality (regarding categories like conjunctions and prepositions and grammatical categories like the imperative, it may be preferable to talk about them as connectors and indicators of segments of extra-lingual reality) and the signs that have mediacy serve as components of the signs that have immediacy, but the criterion for the distinction is obviously extra-lingual reality. Immediacy leads to an identification of a segment of extra-lingual reality, mediacy by itself does not.

Thus, one can see distinctive features and "their concurrent and segmental bundles" (phonemes and syllables) as being unmarked as far as immediacy is concerned with regard to morphemes and words, which are marked by immediacy.

In the case that immediacy replaces mediacy in phonological distinctive features and in phonemes, we have to do with iconicity. We have to do with an emulation by the phonological material of the direct impact which the referent has on our sensory organs. In the course of this paper — although this is not the main point I wish to make — that this type of iconicity is actually the only way language offers a more or less direct description of extra-lingual reality. For the rest, language approaches extra-lingual reality through a structure of identification procedures, in particular an ordered set of identification procedures, whose only relation to extra-lingual reality consists in the fact that there must be, in the ordinary case of language, an act of identification — an identification instantiation of any segment of extra-lingual reality whatsoever. The purpose of this article is an attempt to come closer to a classification of the iconicity of the phonological distinctive features precisely by an examination of the notions of structure and ordered set (group) with the distant perspective of utilizing such a classification in the analysis of the application of the phonological distinctive features as artistic devices in verbal works of art.

2. Linguistic Structure.

Trubetzkoy and Jakobson understand by linguistic structure the network of relations (oppositions) between cumulations (bundles) of phonological and semantic features which one can present schematically as follows :

```
u        +_                              (unmarked unit)
u              +a
u                    +b
u              +a    +b
u                          +c
u              +a          +c
u                    +b    +c
u              +a    +b          +c
```
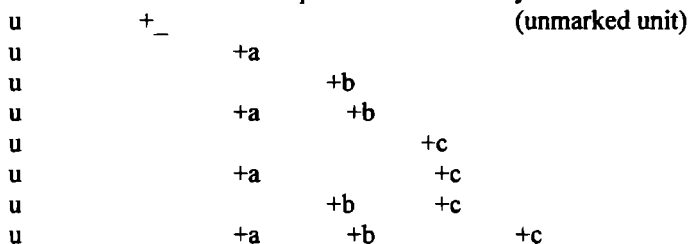
Figure 1: privative binary structure or, geometrically represented :

Figure 2 : a three-feature structure represented as a cube

Jakobson had opted for the binary privative solution as early as 1932 (Jakobson 1932). The fact that they feel that not all phonological oppositions fit this scheme of binary privative oppositons (Trubetzkoy also operates with equipollent oppositions and to Jakobson the last hold-out is the ternary contrarious opposition between compact and diffuse) does them honor as scientists. In the course of the years we see Jakobson dissolve the equipollent opposition grave-acute into two separate features. At the same time, the emphasis switches from the notion of opposition to the concept of invariant additional element (priznak, mark) which is inherent in the marked member of the opposition and recurs in other oppositions as well. The only holdout remains the contrarious ternary opposition compact-diffuse. Also as early as 1932, with the publication of his analysis of the Russian verb, Jakobson starts applying the binary privative feature principle to meaning.

Structure, then, consists, according to Jakobson, of cumulations of invariant phonological distinctive or semantic invariants. But at this point he stops being a structuralist, since these invariants themselves are not ordered. The only hint at an ordering of the phonological distinctive features which one finds in his work are four attempts at a categorization : he tries to rank the features either (a) through the order in which they are acquired by the native learner of the language and the (reverse) order in which they are lost in aphasia, (b) through the statistical ordering of their incidence in the languages of the world, (c) through the order of frequency of their cumulations with other

features and (d) he attempts a classification according to their internal pro-
perties : energy, duration and pitch. It is obvious that the latter classification
comes closest to a breakdown into components resembling the breakdown of
the phoneme into phonological distinctive features and the breakdown of the
Russian case system into semantic features, yet with the classification of the
phonological distinctive features according to energy, duration and pitch no
exhaustive breaks (5. cancellation, and 6. objectiveness) are concerned, I
have first of all come empirically to the conclusion that they don't describe
the referent but rather give instructions as to how the referent is to be identi-
fied. They describe identification procedures, rather than objects to be identi-
fied. They refer to the objects in extra-lingual reality which they are intended
to indicate in terms of the very identification techniques which lead to the
identification of these objects (referents).

    Thus, in fact, immediacy does not exist except in iconicity and synaes-
thesia. The semantic features refer to extra-lingual reality indirectly, although
they are not mediate in the sense of Jakobson and Bühler. But mediacy is not
as simple a notion either as these scholars thought it to be. Further on I hope
to show that mediacy is a consequence of the place of the phonological dis-
tinctive feature and of the phoneme in the semantic, or rather, in final analy-
sis, mathematical structure of language.

    If the conceptual features do not describe segments of extra-lingual re-
ality but procedures for identifying extra-lingual reality, then they indicate
those segments only indirectly. There is no one-to-one relationship between
such a segment and a given feature or cumulation of features. "Linguistic
meaning, defined within the linguistic code itself, is not in an isomorphic
relationship to so-called extra-lingual reality." (Andrews 1990: 55) Conse-
quently, the distinction between mediacy and immediacy becomes obsolete
and irrelevant.

3.3. Ordering of the features.

    These six features are ordered in that each succeeding feature is a ge-
neralization of the instantiations performed in the form of actual identification
acts of the preceding feature. The code of six features is built up out of alter-
nations between the applications of a given feature and the codification of
these applications; the code builds itself through the application of its mem-
bers. The code thus constitutes a hierarchy which originates through autopoi-
esis. The following diagram may serve to illustrate this:

FIGURE 4: Autopoiesis of the Conceptual Feature Hierarchy

As the diagram shows, the six features form an inclusion hierarchy, each succeeding feature incorporating the information carried by its predecessor; in fact, the six features constitute a mathematical group (Andrews 1987: 192–196; 1990:118–124). Figure 5 shows again that each succeeding feature implies the preceding one:

3.4. The features are mathematical concepts.

The first three features are fundamental in that they represent simple mathematical concepts; the three other features are derived autopoietically from the first three. Plurality signalizes a non-singleton set of identifications either of a number of elements (chairs) or of the same element (French polite vous in addressing a single person) which can be formed either by enumeration or by a common distinctive property carried by the members of the set. Plurality, in other words, does not distinguish between an extensional and an intensional set.

The second feature, demarcatedness, indicates a set characterized by a property (an intensional set).

The third feature, preidentity, signifies a set formed by enumeration (an extensional set).

The first three conceptual features represent sets of identifications. The second sequel of three features operates with an element which has already been identified. If we continue to express the operations of the second sequel in terms of identifications and not of identifieds, then the second sequel of three operates with identifications of (an) identification(s).

Verification reidentifies an already identified referent. In terms of identifications, we have to do with an "unmarked" plurality of identifications of an identification set. It opposes Russian po to na or German an to zu, or the imperative to the infinitive.

If we continue the same line of thought, then cancellation represents actually an intensional set of identifications of an identification. The set must have a property. What is that property? That the set is different from the original set of identifications of an identification. What is the obvious difference? The resulting (sub)set of identification(s) of (an) identification must be distinct from the containing set A. The referent of this subset will therefore be non-A, disjunct from the referent of A. The referent of the subset will be the complement of the referent of A. The switch from an inclusion relation between the identifications to disjunctness of the referents is due to the fact that the identifications belong to the code whereas the disjunction is due to the

instantiation of the code. Cancellation eliminates an already identified refer-
ent and replaces it by its complement. In the relation between prepositional
types like out and in, in which in is unmarked and out is marked for cancella-
tion, out indicates the complement of in.

Objectiveness represents an extensional set of identifications of an in-
dentification. The identification(s) of the identification(s) are enumerated
(pointed out). Thus we have to do with a referent which is identifiable only
via an enumeration (i.e. a selection) of identifications of an identification.
Objectiveness signalizes a referent existing at any location wheresoever in an
already identified situation.

Topologically speaking, the referent is outside a given neighborhood. I
originally called objectiveness "distancing", by which I meant that the refer-
ent is potentially maximally distant from a point already identified in the
narrated situation, and in this conceptualization the notion was taken over by
H. G. Lunt and applied to "reported" events in Macedonian (van Schooneveld
1949, 1959; Lunt 1952, Jakobson 1957:135). The referent can be in any rela-
tion with regard to an element identified in an original identification.

Objectiveness demonstrates very clearly the fact that if the first three
features signify the referent indirectly because all they do is indicate which
type of identification process will result in the identification of the given type
of referent, the second set of features works doubly indirectly in that they
indicate three types of identifications of the indentification process resulting
in the identification of the referent. The relation between the first three fea-
tures and the second sequel of three features is represented in Figure 6.

Figure 6: meaning as the autopoiesis of mathematical sets

Obviously, immediacy is out of the question altogether. On the one
hand, since linguistic structures are autonomous in relation to the reality
which is perceivable by the senses, there is no immediate one to one relation-
ship of linguistic structure to extra-lingual reality (Andrews 1990: 55). On the
other hand, the conceptual features, which actually represent sets of identifi-
cation acts, apply equally to acts identifying linguistic reality, that is, acts
resulting in the identification of components of the linguistic sign, such as
distinctive features and phonemes, as well as to acts identifying extra-lingual
reality such as are indicated in categories like morpheme, word, phrase and
sentence.

4. The deictic hierarchy (hierarchy of the identifier).

4.1. Identificational and transmissional deixis.

The linguistic code distinguishes between two types of identifiers. One type of identfier is general; the identifier can be anybody, whether he/she is at the same time the encoder or decoder of a speech transmission or not (the identificational type of deixis). The second type (transmishe speech situation, and of agreement. (van Schooneveld 1984). Singulative transmissional deixis (_"", plur"", etc.) creates signata of an entirely novel nature and leads in the antique type of Indoeuropean language, like Greek, Latin, Sanskrit or Russian, to the concatenation: lexical morpheme — word formative morpheme — part of speech morpheme — grammatical morpheme — agreement morphemes (see 6.) (van Schooneveld 1984); in fact, it is precisely singulative transmissional deixis that, iconically, creates Bloomfield's bound morphemes. (Bloomfield 1933).
        The following diagram symbolizes the four deictic levels on the "other deictic level", the one of identifiers.

Figure 7: the deictic strata
Actually, the "other deictic level of the identifiers" can be integrated in turn with the feature hierarchy. Whereas the features as we have discussed them so far operate with the identification of an identified, the "other deictic level of the identifiers" operates with an identification of an identified and the identification of an identifier at the same time, and the identifier can be converted again into another variety of an identification of an identification. I hope to come back to this in another publication. Within this group we may have a variety of plurality again, as is for instance the case in transmissional deixis; in transmissional deixis we have to do with an identifier of the transmission (speech situation, parole) as well as with an identifier of the narrated situation. In singulative deixis, all identifications are performed simultaneously, which means they are all identified by the same identification.

5. The morphemic structure of the Indoeuropean word.

Thus, four types of deixis multiply the six semantic features by four. In a relatively antique type of Indoeuropean language like Russian, the semantic features are implemented to constitute the signifieds of morphemes forming a word (van Schooneveld 1983b) as indicated in Figure 8. I am listing the optimal number of features: to be sure, only a few of them occur in a word at the

same time. Lex indicates "lexical meaning", wf "word formation", and p.o.s. "part of speech" (,,word category").

_""	plur""	dem""	preid""	verif""	canc""	obj""
(lex)	(wf)	(p.o.s.)	(grammatical)	(agreement)	(agreement)	(agreement)
				(case)	(p.o.s.)	(pers.pron.)
hab	—	ili	—	tat	— em	(number) gender)
plur'	plur'	plur'	plur'	plur'		plur'	plur'
dem'	dem	dem'	dem'	dem'		dem'	dem'
preid'	preid'	preid'	preid'	preid'		preid'	preid'
verif'	verif'	verif'	verif'	verif'		verif'	verif'
canc'	canc'	canc'	canc'	canc'		canc'	canc'
obj'	obj'	obj'	obj'	obj'		obj'	obj'
plur"	plur"	plur"	plur"	plur"		plur"	plur"
dem"	dem"	dem"	dem"	dem"		dem"	dem"
preid"	preid"	preid"	preid"	preid"		preid"	preid"
verif"	verif"	verif"	verif"	verif"		verif"	verif"
canc"	canc"	canc"	canc"	canc"		canc"	canc"
obj"	obj"	obj"	obj"	obj"		obj"	obj"
plur"'	plur"'	plur"'	plur"'	plur"'		plur"'	plur"'
dem"'	dem"'	dem"'	dem"'	dem"'		dem"'	dem"'
preid"'	preid"'	preid"'	preid"'	preid"'		preid"'	preid"'
verif"'	verif"'	verif"'	verif"'	verif"'		verif"'	verif"'
canc"'	canc"'	canc"'	canc"'	canc"'		canc"'	canc"'
obj"'	obj"'	obj"'	obj"'	obj"'		obj"'	obj"'

Figure 8: The morphemic structure of the word in Latin

The morphemic composition of the Latin accusative singular habilitatem 'aptitude'. The features for which the word is actually marked are italicized.

From preid' on, single primes are identificationally deictic.

Double primes: transmissional deixis.

Triple primes: singulative identificational deixis.

Quadruple primes: singulative transmissional deixis

_"" does not indicate a singulative transmissional feature, but rather the absence of one. From the singulative transmissional point of view, the first column is semantically unmarked.

The morpheme -tat- is syncretically word formative and word categorial; it is in both columns marked by dem': (word formative) plur""/dem' indicates a state; dem""/dem' + dem""/obj' generate the part of speech of substantive.

hab- : the lexical meaning of hab-(-ere) has plur' (transitivity; plur':
transitive verb) + verif'.

-ili- : has word formative verif'.

-em-: accusative has grammatical verif'.

6. The birth of the signified.

Finally, on a semeiotic level on which the linguistic relation between
signifier and signified is being established it is again the six feature hierarchy
which determines the semeiosis.

Figure 9: the birth of the signified

7. A mathematical (semantic) interpretation
of the phonological distinctive feature.

The phonological distinctive feature is a physical phenomenon which is
utilized to indirectly distinguish meanings. The linguistic meaning it carries is
that it is identifiable as a linguistic sign a non-limited number of times. It is
marked by plurality. When the phonological distinctive feature is applied,
since it occurs simultaneously with other phonological distinctive features, it
establishes phonemes. By virtue of its invariant acoustical properties, when
the phonological distinctive feature is instantiated, its distinctness from other
invariants is recodified. The phonological distinctive feature creates by its
instantiation mere otherness. This mere otherness becomes a codal fact in the
phoneme. The fact that a phoneme consists of more than one phonological
distinctive feature is an iconic reflex of invariant mere otherness. The signi-
fier of the phoneme, through a stable, invariant cumulation (combination) of
phonological distinctive features, signifies its stable, invariant distinctness
from the other phonemes in the language. Note also that the phoneme can be
pronounced by itself. In the phoneme mere otherness is an a priori given
semantic fact which is acoustically ascertainable indirectly, via the distinctive
features. In the distinctive feature, what Jakobson calls mere otherness and
what I call distinctness is due to the fact that the distinctive feature, a physical
phenomenon, is embedded in a linguistic system. Its semantic characteristic is
acoustic identifiability (plurality of identifications). The mere otherness of the
phoneme, a result of the instantiation of the phonological distinctive feature,
is no other than demarcatedness and is the marking of the signified of the
phoneme. It is give a priori, in the code. The fact that the phoneme is endur-

ingly distinct from all other phonemes of the language by a stable, enduring combination (cumulation) of phonological distinctive features. The enduringness of this combination of distinctive features is iconic : the phoneme as such is semantically distinct.

As to the morpheme, one is reminded of the saying "blood is thicker than water". It is evident that meaning consists of information other than the transmission perception of a sensory impression (the signifier) being transmitted. In any sign there is always informais iconic. While a morpheme has, leaving allomorphs aside, a stable composition, it consists in the vast majority of cases of more than one phoneme and is therefore linear. Every time a morpheme is instantiated (pronounced) its signifier is literally enumerated in the transmission. Thus the distinctness of the signifier, and consequently also of the signified, is enumerated. A word stands by itself ; it is not, in Bloomfield's terms, a bound form like a morpheme. It can be repeated by itself ; semantically it represents an identification of an identification. It is marked by verification. A phrase consisting of a modified and a modifier indicates a qualified segment of extra-lingual reality whose qualification is valid only from the point of view of the given transmission. The qualification is unstable; the phrase is marked by cancellation. The fact that it consists of more than one word iconically reflects the referential power of the phrase having a limited duration. This referential power is constructed in the speech situation and is valid as long as the construction retains its validity. The phrase represents a verification of an identification and this verification is a subset of a normal verification in that it is valid only for the given narrated situation, like the instrumental, which is also marked by cancellation (Jakobson's marginality). Finally, the sentence represents the judgement of the speaker. It is a reidentification, performed at random from the point of view of the addressee, and by way of corollary done as an enumeration by the speaker, of an identification. It is the speaker who wills the rheme onto the theme. The sentence has predicative power. Its specific characteristic is predication. The semantic marking of the sentence is objectiveness.

8. Concluding statement.

Thus it seems that the entire semantic structure of Russian is reduceable to six semantic features, that these features are ultimately mathematical, and that those features are ordered.

It must be possible to translate the mathematical descriptions of the phonological distinctive feature into the same mathematical features that regulate the rest of the language. If we do so, we will have an ordering of the

phonological distinctive features. This ordering will not only give us new insights into the working of sound laws, but in addition it is very likely to indicate a solution of the ternary relation between compactness and diffuseness. Just as important, it should enable us to describe in mathematical terms the aesthetic effect of different phonological units in verbal art. I hope to present such an ordering in the nearest future.

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