

UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

**STUDIA
GERMANICA POSNANIENSIA
XXIII**

Festschrift für Andrzej Zdzisław Bzdega zum 70. Geburtstag



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**STUDIA
GERMANICA POSNANIENSIA
XXIII**

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JERZY BAŃCZEROWSKI

ASPECTS OF GENERAL MORPHOLOGY A TENTATIVE AXIOMATIC APPROACH

1. Introductory remarks

The purpose of this study is the formulation of definitions for some morphological categories within an axiomatic theory. In order to justify our approach, which diverges from the current morphological theorizing, let us say a few words about the situation within theoretical morphology from an admittedly biased viewpoint.

The intensification of research within morphology, which has resulted in the rapid growth of knowledge in this subdiscipline of linguistics, and which, in turn, finds reflection in a vast literature, presents new challenges for the systematization of this knowledge, and imparts a touch of urgency to it. The morphological** domain has considerably expanded due to new morphological theories, often penetrating hitherto unknown realms of language reality, and increasing the number of relevant facts and valid issues. In face of this violent accretion of morphological information the systematization in question is now more important than ever, because it can prevent us from sinking into informational chaos. However, in spite of undeniable progress, the situation within theoretical morphology is far from satisfactory. This is consequent to a considerable extent upon the quality of morphological theories.

A detailed comparative examination of these theories is beyond the scope of this article. Nevertheless, a general characterization of the state of the art within

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** The term 'morphological' will be sometimes abbreviated here to the prefix *mph-*.

morphology would be incomplete without mentioning that various competing mph-theories do not seem to project a clear picture of mph-reality. This is mainly due to the use of imprecise, vague or ambiguous terminology. But the formal flaws of many theories also play a role. In consequence, definitions are hardly adequate and theorems susceptible to misunderstanding. As a result, the mph-domain emerging from these theories as the image of mph-reality is incoherent, chaotic, or impressionistically tinged.

Of course, the continuation of such a situation is undesirable both in the short and in the long term, and its improvement depends heavily upon the perfection of methods of formulating mph-theories, in order to eliminate at least some of their deficiencies, and thereby to enhance their exactitude. The most precise form that a linguistic theory could take would be axiomatic proceeding as a consequence from logical reconstruction.

To our knowledge, no mph-theory has been thus far formulated as a full-fledged axiomatic one, although the necessity of logical reconstruction has already been clearly recognized and partially applied in the mph-domain (cf. Lieb 1983: 154ff; 1992; Bogusławski 1992: 12, 52, 130; Pogonowski 1996). Since our intention is to construct an axiomatic mph-theory, let us recall that in formulating it, we must be able to:

- (i) distinguish the set of primitive terms on the one hand, and the set of primitive sentences (axioms) on the other,
- (ii) define all other terms, which are not primitive, and to prove all theorems, which are not axioms.

Simultaneously, at this initial stage of our considerations, we would like to emphasize the tentative character and the limited scope of the theory to be outlined subsequently as well as the absence of complete certitude on our part as to whether the mph-terms, which will be employed, are appropriate, and whether the axioms are well chosen. Since it is intended to capture only a certain fragment of mph-reality, this theory is rather modest in the goals which it attempts to pursue. Nonetheless, in spite of all its inadequacies and deficiencies it may be serviceable for the inquiry into the applicability of the axiomatic method in morphology.

In addition to specifically linguistic terms we shall also utilize a number of extralinguistic, mainly logical, ones^{***}. Some of the former may be sensed as strange, since they have no precedence in linguistic tradition. However, their use arises from the needs of this paper rather than from a desire to indulge in multiplying them futilely.

2. Primitive and some auxiliary defined terms

Below we shall give at first the list of primitive terms, and subsequently the explanations of their intuitive meanings. These terms being undefinable in the theoretical system at hand thus enjoy a hierarchically higher status, than defined ones do, because the latter are always ultimately reducible to the former.

^{***} cf. Notes

The choice of primitive terms for our theory seems to confirm the conviction that morphology is epistemologically posterior to semantics and syntax. In other words, the morphological grammar of a language cannot be constructed prior to its semantic or syntactic grammar. Or, putting it yet another way, morphology presupposes or is conceptually dependent upon semantics and syntax, and of necessity it must avail itself, in addition to specifically morphological terms, of those of these two subdisciplines of linguistics.

2.1. List of primitive terms

The following 12 terms have been thus distinguished as primitive (undefined) within our present axiomatic system.

- (i) *Utr* – the set of all utterances,
- (ii) *Seg* – the set of all linguistically relevant segments,
- (iii) *hfn* – the relation of homophony,
- (iv) *Dct* – the set of all dictons,
- (v) *Mof* – the set of all morphatons,
- (vi) *DSE* – the set of all semantic dimensions,
- (vii) *dsg* – the relation of designation,
- (viii) *sgf* – the relation of signification,
- (ix) *lkf* – the relation of lexification,
- (x) *smf* – the relation of semification,
- (xi) *hlk* – the relation of homolexy,
- (xii) *mfq* – the relation of morphatonal qualification.

2.2. Utterances and their segmentation. Homophony

What will be here called an utterance is in fact a kind of text. Every text is a communicative unit in the sense that it must have been actually produced by a linguator in a communicative situation, real or imaginary. Each text is an individual, concrete, non-repeatable entity, produced *hic et nunc*, that is, by a definite speaker, in a definite time and place. Strictly speaking its existence as such in the space-time does not exceed by much the time of its production, whereafter it disappears into the past and its original whole disintegrates and thereby disfigures. As spatio-temporal, physical entities texts are linear; they begin, develop, and terminate in time.

An *utterance* can be viewed as a minimal text, since from the communicative viewpoint it is, as a unit, further indivisible. Some utterances may assume the form of sentences, whereas others do not. But even in the latter case they allow us to reconstruct the corresponding sentences, as more complete utterances. The set of all utterances is denoted by *Utr*. The formula $x \in Utr$ reads: *x* is an utterance.

Utterances may be segmented in various ways and, accordingly, the resulting lingual segments are of various kinds. Among such segments, the following can be distinguished: *phonons* (actual phones), *morphons* (actual morphs), *vocabu-*

lons (actual vocables), and *dictons*. Needless to say, each segment, as a constituent of an utterance, is as individual and concrete as the utterance itself. The *set of all linguistically relevant segments* is denoted by the symbol *Seg*. The formula $x \in \text{Seg}$ reads: x is a segment. The *relation of being a subsegment of (sgm)* will be defined as follows:

Df 2.1 $\text{sgm} = \{(x,y): y \in \text{Seg} \wedge x \in \text{P}^<y \cap \text{Seg}\}$

According to this definition, x is a subsegment of segment y , in symbols: $x \text{sgm } y$, iff x is a segmental part of y .

Segments treated by the language consciousness of a given language community as auditorily indistinguishable will be referred to as homophonous. To account formally for this auditory indistinguishability we shall avail ourselves of the *relation of homophony*, symbolized as *hfn*. The formula $x \text{hfn } y$ reads: segment x is homophonous with segment y .

2.3. Signation: designation and signification

Utterances as well as some of their constituent segments refer to, that is, signate extralingual entities, whereby connections between the lingual and extralingual realities are established. The lingual units capable of signating will eventually be defined as signs. However, synonymously and more neutrally we shall also use the term 'expression'.

In order to account formally for two aspects of signation we shall operate with the following two relations:

- (i) the *relation of designation (dsg)*, and
- (ii) the *relation of signification (sgf)*.

The relation of designation binds a lingual expression with an extralingual entity in such a manner that the latter is apprehended as a quiddity. The formula $x \text{dsg } \delta$ reads: x designates δ . The predecessor of the relation *dsg* will be called *designator*, and its successor – *designatum*. The relation of signification also binds a lingual expression with an extralingual entity, but it does so in such a manner that the latter is captured as a quality (property), which will be conceived of here simply as meaning. The formula $x \text{sgf } \sigma$ reads: x signifies σ or, equivalently, x conveys meaning σ . The predecessor of the relation *sgf* will be called *significator*, and its successor – *significatum* (meaning). Obviously, a lingual expression may simultaneously designate an entity δ and signify its property σ .

The concept of signification is thus inseparably connected with both:

- (i) meaning or significatum, and
- (ii) sign or signum

Meanings as properties of entities can be conceived of as capable of forming semantic dimensions. Each such dimension in turn could be viewed as the set of all homogenous meanings. The *set of all semantic dimensions* is symbolized as *DSE*. The formula $D \in \text{DSE}$ reads: D is a semantic dimension. Having the set

DSE at our disposal the *set of all meanings* or significata, denoted by *SGT*, can be introduced by means of the following definition:

Df 2.2 $SGT = \cup DSE$

The set of all *signs* or *signa* will be symbolized as *Sgn*, and defined as follows:

Df 2.3 $Sgn = \{x: x \in Seg \wedge sgf^>x \neq \emptyset\}$

In light of this definition, only those lingual segments which signify meanings function as signs.

The concept of meaning identity will be formally captured in terms of the *relation of homosignification* (*hsg*) to be introduced as follows:

Df 2.4 $hsg = \{(x, y): x, y \in Sgn \wedge sgf^>x = sgf^>y\}$

Two signs are thus homosignificative, in symbols x *hsg* y , iff they have the same meanings.

2.4. Modes of signification. Homolexy and homosemy

A meaning can be signified either in a lexical or semical manner, that is, it can be either lexified or semified. Consequently, within signification two subrelations will be distinguished:

- (i) the *relation of lexification* (*lkf*) and
- (ii) the *relation of semification* (*smf*).

Both of these relations belong to our primitive terms. The formula x *lkf* σ reads: x lexifies meaning σ or, alternatively, x is a lexificator of σ . And, analogously, the formula x *smf* σ reads: x semifies meaning σ or, alternatively, x is a semificator of σ .

Ex: For the sake of illustrating the distinction between lexification and semification of meanings, let us consider the expression *in the rivers* which lexifies such meanings as: Natural object, Water basin (Reservoir), Elongated, Containing flowing water, etc. On the contrary, the meanings of Locativity (Inessivity), Definiteness, Plurality are here semified.

One and the same meaning available in a given language may be both lexified and semified. The semification of a meaning enhances its conspicuity with regard to the meanings being lexified. The signification of one and the same meaning via both modes can be exemplified as follows:

Ex: The meaning of Praeteritality, together with other meanings, is signified lexically by such expressions as: *yesterday, last year, former, previously, the past*. And, it is signified semically by: *lived, had lived, having occurred, ex-president*. Similarly, the meaning of Inessivity (location inside an object) is signified lexically by: *the interior, the internal part, the inner space, the inside, internally, inner*. And, the same meaning is signified semically by: *in the house, inside the house, within the room*. What is more, a lexificator (that is, a lexifying expression) can sometimes be translated into a corresponding semificator (that is, a semifying expression), as can be seen in the following sentences:

- (i) *The interior of the house was very roomy.*
- (ii) *There was a lot of room inside the house.*
- (iii) *There was a lot of room in the house.*

Meaning as such is neither lexical nor semical but it can be conveyed by signifiers of both kinds, lexificators and semificators. In other words, the carriers of meaning are lexical or semical, the meaning itself is neither. However, the question of whether a third kind of signifier, namely, a lexisemificator should be added to the two already distinguished in order to account for those cases, in which the semificator is not separable from the lexificator, without impairing the integrity of the latter, also arises. Thus, for instance, the verb forms *wrote*, *came*, *bought* seem to semify the meaning of Praeteritality. If, however, the presumable semificator is detached, what remains is not a morphological unit.

The relations *lkf* and *smf*, similarly to the relation *sgf*, thus hold between lingual expressions and meanings. This should be borne in mind, in order to not confuse them with lexicalization and semicalization, both of which are restricted exclusively to lingual expressions.

As regards the meanings, that they signify, signs enter into various semantic relations, among which homolexy and homosemy figure prominently. Signs, which are indistinguishable with respect to the meanings they lexify and, additionally, are etymologically affined bear the *relation of homolexy*. The formula $x \text{ hlk } y$ is read: sign x is homolexical with sign y . The relation of homolexy belongs to our primitive terms, whereas the *relation of homosemy* (*hsm*) will be defined as follows:

$$\text{Df 2.5 } \textit{hsm} = \{(x, y): x, y \in \textit{Sgn} \wedge \textit{smf}^>x = \textit{smf}^>y\}$$

In accordance with this definition, two signs x and y are homosemical, in symbols: $x \textit{hsm} y$, iff they semify identical meanings.

2.5 Dicton

A special role in our morphological considerations will be attributed to dictons, since we conceive of them as the maximal units of morphology. Each particular dicton, as a kind of segment, is an individual, concrete, non-repeatable entity. It always functions as a language sign, which may be linearly continuous or discontinuous. What is more, each dicton is simultaneously both a lexificator and a semificator. Among the meanings which it semifies, there must obligatorily be those that are relevant for its syntactic categorization.

Lingual units delexicalized to a certain degree or, in other words, already affected by the process usually referred to as grammaticalization, but which we prefer to call semicalization, have lost their semantic and syntactic independence to a certain extent, thereby becoming synsemantical and synsyntactical. And, in order to be fully understood, they must complement other words and form the corresponding dictons together with them.

In accordance with our concept of dicton, desinences, affixes, adpositions, including articles, auxiliaries, and the like should be treated as subdictonal units. Consequently, such expressions as: *reads, a-reader, the-readers, misread, reading, is-reading, has-read, along-the-street, by-car*, etc. are all instances of dictons. Owing to their lexical and semical signification dictons are signs also conveying information of how to combine them with other dictons.

The set of all dictons is denoted by the symbol *Dct*. The formula $x \in Dct$ reads: *x* is a dicton.

The concept of dicton as proposed above seems to be convenient for morphological typology, by serving as a common denominator for relatively heterogeneous or even seemingly incomparable units. Such units result from the integration of the delexicalized units with the corresponding fully lexical ones. Since the delexicalized units are of various kinds, the dictons incorporating them are also structurally differentiated.

If the dicton has a lingual reality and is not an exclusively imaginary unit, the forces that cause the subdictonal constituents to form relatively integral wholes, that is, particular dictons, should be determined. But first, the systems operating within dictons should be identified, which, in turn, is equivalent to the identification of:

- (i) the relevant subdictonal units, and
- (ii) the relevant subdictonal relations.

The former embrace such units as: morphatons, morphons, morphotactons, and vocabulons, and the latter such relations as morphatonal qualification, morphonal qualification, etc.

2.6. Morphaton: morphon and morphotacton

Within dictons, various morphologically relevant units are recognizable. Such units will be called morphatons. Thus, for instance, in the dicton *misleading* the following six morphatons can be distinguished: *mis-*, *-lead-*, *-ing*, *mislead-*, *-leading*, and *misleading*. Obviously, not every arbitrary subsegment of the dicton *misleading* will be a morphaton. Such segments as *misl-*, *-islea-*, *-ding* are, for certain, not of this kind.

The set of all morphatons is symbolized by *Mof*. The formula $x \in Mof$ reads: *x* is a morphaton. It goes without saying that morphatons as components of dictons are individual and concrete just as dictons are. The *relation of being a morphaton of (mf)* will be defined as follows:

$$\text{Df 2.6 } mf = \{(x, y): y \in Dct \wedge x \in sgm \prec y \cap Mof\}$$

According to this definition, *x* is a morphaton of dicton *y*, in symbols: $x \text{ } mf \text{ } y$, iff *x* is a constituent segment of *y*. The set of all morphatons of dicton *y* will be denoted by $mf \prec y$. A dicton then, is but a particular kind of morphaton, and this fact is formally expressed by the following inclusion:

2.1 $Dct \subset Mof$

The relation m_f can be extended from dictons to morphatons, which will find reflection in the *relation of being a submorphaton of (mfa)* to be introduced by the following definition:

$$\text{Df 2.7} \quad mfa = \{(x, y): x, y \in Mof \wedge x \in sgm^<y\}$$

On the strength of this definition, x is a submorphaton of morphaton y , in symbols: $x mfa y$, iff x is a constituent segment of y . Needless to say, a submorphatonic morphaton is at the same time a subdictonal one. And this can be expressed by the following theorem:

$$2.2 \quad x mfa y \rightarrow \bigvee_z (x mf z \wedge y mf z)$$

Within the set Mof at least three kinds of units can be distinguished, in particular the following: (i) morphons, (ii) morphomeron, and (iii) morphotactons.

Each dicton signifies various meanings through its constituent morphatons. The search for the minimal signifiers of meanings within dictons leads us to the concept of morphon or actual morph. This concept will be introduced in terms of the *relation of being a morphon of*, symbolized by mr , and defined in the following manner:

$$\text{Df 2.8} \quad mr = \{(x, y): y \in Dct \wedge x \in mf^<y \wedge \bigvee_{\sigma} [\sigma \in sgf^>x \wedge \\ \wedge \bigwedge_z (z \in sgm^<x \wedge z \neq x \rightarrow \sigma \notin sgf^>z)]\}$$

In light of this definition, x is a morphon of dicton y , in symbols: $x mr y$, iff x is a minimal signifier of meaning σ in y , that is, no subsegment of x can be a signifier of σ . We could also say that x is indivisible with respect to the signification of σ , or that it is an atomic signifier of σ within y . Thus, morphons are always established with respect to meanings conveyed by dictons, which the morphons are subsegments of. Consequently, a meaning specifies the corresponding morphon. If x is a morphon, then the symbol $sgf^>x$ denotes the set of all meanings signified by x , none of which can be conveyed by any subsegment of x . The symbol $mr^<y$ denotes the set of all morphons, which are constituents of dicton y .

Ex: In the dicton *misleading* exactly three morphons can be distinguished, namely, *mis-*, *-lead-*, and *-ing*. We could formally, although not completely correctly, write $mr^<misleading = \{mis-, -lead-, -ing\}$. The extension of the relation mr to morphatons finds expression in the relation mrf to be defined in the following manner:

$$\text{Df 2.9} \quad mrf = \{(x, y): x \in Mor \wedge y \in Mof \wedge x \in sgm^<y\}$$

The set of all morphons, denoted by Mor , will be introduced by means of the following definition:

Df 2.10 $Mor = mr \langle Dct$

The following corollaries can be easily deduced:

$$2.2 \quad x \in Mor \rightarrow \bigvee_y (y \in Dct \wedge x \in mr \langle y)$$

$$2.3 \quad x \in Mor \rightarrow \neg \bigvee_y (y \in sgm \langle x \wedge y \neq x \wedge sgf \rangle y = sgf \rangle x)$$

Theorem 2.2 brings out the fact that morphons do not exist outside dictons or, to put it differently, without dictons as superordinate units there are no morphons. Depending in their existence completely upon the prior existence of dictons, morphons are thus, in a certain sense, ontologically posterior to dictons. In light of 2.3, a morphon appears as a minimal lingual sign, no subsegment of which can signify all its meanings.

However, although the definition of the morphon seems to agree with our intuitions, the identification of particular morphons within a dicton may be difficult. For the sake of illustration, let us briefly consider an aspect of this problem in such Polish dictons as:

(i) $w \text{ domu}$ 'in a/the house'

(ii) $w \text{ dom}$ 'in (to) a/the house'

The former of these dictons conveys the meaning of Inessivity, and the latter that of Illativity. The Inessivity seems to be signified by the discontinuous morphon $w-$ $-u$, whence both $w-$ and $-u$ could be viewed as co-significators of this meaning. In addition to being a component of morphon $w-$ $-u$, segment $-u$ is also a separate morphon, since it conveys the meanings of Genetive and Singularity. This, in turn, would point to the possibility of segmental overlapping of morphons. The dicton $w \text{ dom}$ seems to exhibit the co-signification of Illativity. One of the co-significators of this meaning is w . Either the morphon dom or a zero segment would appear to be another, but it is not easy to determine, which of the two it actually is. Problems of this sort may make one doubt, whether the definition of morphon as formulated above is adequate and, consequently, whether it should not be accordingly modified.

The phenomenon of the linear discontinuity of morphons seems to require the introduction of the notion of *morphomeron*, which could be conceived of as a linearly separable subsegment of a morphon. As examples of morphomerons the continuous constituents of transfixes and circumfixes can be adduced. Morphomerons turn out to be units suitable for constructing linear mph-structures of dictons.

A morphon as an individual concrete unit will be opposed to a morph, which is already a more abstract object. The *set of all morphs*, symbolized as *MOR*, will be introduced by means of the following definition:

Df 2.11 $MOR = Mor / hfn \cap hsg$

In accordance with this definition, a morph emerges as the class of all homophonous and homosignificative morphons. The formula $X \in MOR$ reads: X is a morph.

A morphaton may consist of more than just one morphon. Such a morphaton will be termed morphotacton or, simply, mortacton. The *set of all morphotactons*, denoted by *Mot*, will be introduced with the help of an auxiliary term, that is, the *relation of being a morphotacton of (mt)*. The definitions of these two concepts will be formulated as follows:

Df 2.12 $mt = \{(x, y): y \in Dct \wedge x \in mfr^<y \wedge \text{card}(mfr^<x) > 1\}$

Df 2.13 $Mot = mt \langle Dct$

Ex: In the dicton *misleading* there are exactly three morphotactons: *mislead-*, *-leading*, and *misleading*.

As can be easily noticed the following theorem holds:

2.4 $Mor \cap Mot = \emptyset$

To recapitulate, it can be said that each morphon is always semantically indivisible, although it may be linearly divisible; each morphotacton is always composite, since it consists of more than one morphon, and each morphaton is either a morphon or morphotacton.

Not every dicton may necessarily be a morphotacton in the sense previously defined. Some of them may consist of exactly one segmental morphon. The *set of all morphodictons (Dcm)*, that is, those which are segmentally monomorphonal, will be introduced by means of the following definition:

Df. 2.14 $Dcm = \{x: x \in Dct \cap Mor\}$

In accordance with this definition, a morphodicton is a dicton and a morphon at the same time.

2.7. Morphological qualification

Although within dictons various kinds of morphatons can be distinguished, dictons themselves are not simply sets of such units. The morphatons are diversified with respect to their mph-status, which, in turn, is specified by the properties they acquire as constituents of dictons, within which they enter into various relations, one of which is the *relation of morphatonal qualification (mfq)*. This relation forms a basis for mph-subordination *sui generis*.

The mph-theory adhered to here rests, among other things, upon the assumption that tautodictonal morphatons are linked by the relation *mfq*, which underlies the construction of morphotactons, which, as we already know, are always morphologically composite, and hence viewable as mph-syntagmas. The formula $x \text{ mfq } y$ will be read: morphaton *x* is qualified by morphaton *y* or, alternatively, morphaton *y* qualifies morphaton *x*. The predecessor of the relation *mfq* will be called *qualificatum*, and its successor *qualificator* (qualifier). Instead of writing $x \text{ mfq } y$ we shall sometimes write equivalently $(x, y) \in \text{mfq}$.

Ex: In order to exemplify the relation *mfq* we shall avail ourselves of the following dictons: (i) *talks*, (ii) *has talked*, (iii) *reprinting*, (iv) *insensibility*, (v) *along the streets*. Let us now enumerate below the morphatons bound by the relation

mfq within the dictons at hand and forming the corresponding pairs: (i) (*talk-*, *-s*); (ii) (*talk-*, *-ed*), (*has*, *talked*); (iii) (*reprint-*, *-ing*), (*-print-*, *re-*); (iv) (*-sens-*, *-ibil-*), (*-sensibil-*, *-in*), (*insensibil-*, *-ity*); (v) (*street-*, *the*), (*the-street-*, *-s*), (*along*, *the-streets*).

However, the decision as to which morphaton is qualified by which may sometimes be far from obvious. What is more, alternative solutions seem to be available in certain cases.

Thus, morphatons are not simply joined together within a dicton, but their being bound by the relation *mfq* has semantic and/or syntactic consequences, that is, it serves to provide the dicton with required semantic and syntactic properties. The idea behind morphatonal qualification is that qualifier *y* expands (or changes) the significatum (total meaning) of its qualificatum *x*, whereby the significatum of the morphotacton resulting from the composition of *x* and *y* includes the significata of *x* and *y* (or differs from them). Whether the qualifier also restricts the range of designation of its qualificatum remains to be investigated. It seems appropriate to say that the more semicalized a morphon is, the more susceptible it is to functioning qua qualifier. Sometimes instead of the term 'morphatonal qualification' we shall use the term *morphological qualification* synonymously.

The restriction of the relation *mfq* to morphons is reflected in the *relation of morphonal qualification (mrq)*, the definition of which is as follows:

Df 2.15 $mrq = \{(x, y) : x, y \in Mor \wedge x mfq y\}$

In conformity with this definition, the formula $x mrq y$ reads: morphon *x* is qualified by morphon *y*.

Each morphotacton can be viewed as resulting from the operation of totification of a set of morphatons. In order to account formally for this operation various relations can be considered. For the time being, we shall content ourselves with the *relation of morphotactonification (mtf)*, the definition of which will be formulated as follows:

Df 2.16 $mtf = \{[(x, y), z] : z \in Mot \wedge x, y \in mf^<z \wedge x mfq y \wedge S^<(x, y) = z\}$

In light of this definition, two morphatons *x* and *y* combine to form morphotacton *z* or, equivalently, *x* and *y* morphotactify to *z*, in symbols: $(x, y) mtf z$, iff *x* is qualified by *y*, and *x* and *y* completely exhaust *z*.

Ex: The English morphatons *active-* and *in-* combine to give morphotacton *inactive*. Similarly, *foresee-* and *-able* result in *foreseeable*.

Thus, the relation *mtf* mirrors the construction of more complex mph-units out of less complex ones. The following corollaries can be inferred:

2.5 $mtf \subset (Mof \times Mof) \times Mot$

2.6 $(x, y) mtf z \rightarrow x mfq y$

Various kinds of qualificational structures of dictons can be considered. Their dichotomous analysis, for instance, necessitates distinguishing within morphotac-

tons maximal qualificata and qualificators. These two concepts will be introduced, respectively, in terms of the following relations, namely:

- (i) the *relation of having as maximal morphatonal qualificatum (mfqm)*, and
- (ii) the *relation of having as maximal morphatonal qualificator (mfqr)*.

The definitions of these relations will be formulated as follows:

$$\text{Df 2.17 } \mathbf{mfqm} = \{(x, y): \bigvee_z (y \mathbf{mfq} z \wedge \mathbf{mtf}'(y, z) = x)\}$$

$$\text{Df 2.18 } \mathbf{mfqr} = \{(x, y): \bigvee_z (z \mathbf{mfq} y \wedge \mathbf{mtf}'(z, y) = x)\}$$

According to definition 2.17, morphotacton x has morphaton y as its maximal qualificatum, in symbols: $x \mathbf{mfqm} y$, iff there is morphaton z which qualifies y , and such that the combination of y and z results in x . The content of definition 2.18 is *mutatis mutandis* analogous.

Ex: In the dicton *has been written*, the morphaton *has been* is the maximal qualificatum and morphaton *written* the maximal qualificator. In *has been* the maximal qualificatum is *has*, and the maximal qualificator *been*. In the dicton *misleads* the maximal qualificatum is *mislead-*, and the maximal qualificator *-s*.

The relations \mathbf{mfqm} and \mathbf{mfqr} are functions:

$$2.7 \quad \mathbf{mfqm}: \mathbf{Mot} \rightarrow \mathbf{Mof}$$

$$2.8 \quad \mathbf{mfqr}: \mathbf{Mot} \rightarrow \mathbf{Mof},$$

since the following conditions are satisfied:

$$2.9 \quad \bigwedge_x [x \in \mathbf{Mot} \rightarrow \bigvee_y (y = \mathbf{mfqm}'x)]$$

$$2.10 \quad \bigwedge_x [x \in \mathbf{Mot} \rightarrow \bigvee_y (y = \mathbf{mfqr}'x)]$$

The relations \mathbf{mfqm} and \mathbf{mfqr} tacitly presuppose exactly one dichotomous division of every morphotacton. However, certain morphotactons may offer serious problems in this regard.

Another qualificational structure of dictons, which could be called the *mrq*-structure, is based upon the relation \mathbf{mrq} . This structure starts with exactly one morphon, and terminates with one or more morphons. Of course, the inception and the termination of the *mrq*-structure of a dicton may or may not coincide, respectively, with the inception and the termination of the corresponding linear morphomeronal structure. The subsequent definitions introduce in due order two concepts, indispensable for the determination of the *mrq*-structures of dictons, namely:

- (i) the *relation of having as morphonal qualificatum initiale (mrqmi)*, and
- (ii) the *relation of having as morphonal qualificator ultimus (mrqru)*.

$$\text{Df 2.19 } \mathbf{mrqmi} = \{(x, y): x \in \mathbf{Dct} \wedge y \in \mathbf{mr}^<x \wedge \neg \bigvee_z (z \in \mathbf{mf}^<x \wedge z \mathbf{mfq} y)\}$$

$$\text{Df 2.20 } \mathbf{mrqru} = \{(x, y): x \in \mathbf{Dct} \wedge y \in \mathbf{mr}^<x \wedge \neg \bigvee_z (z \in \mathbf{mf}^<x \wedge y \mathbf{mfq} z)\}$$

According to definition 2.19, dicton x has morphon y as qualificatum initiale or, equivalently, y is qualificatum initiale of x , in symbols: $x \text{mrqmi } y$, iff there is no such morphaton z in x , which would be qualified by y . And according to definition 2.20, dicton x has morphon y as qualificator ultimus or, equivalently, y is a qualificator ultimus of x , in symbols: $x \text{mrqru } y$, iff there is no such morphaton z in x , by which y would be qualified.

Ex: In the dicton *misleading*, the morphon *-lead-* is qualificatum initiale, and in the dicton *inactivity* this status is assumed by morphon *-act-*. The problem of determining the ultimate qualifiers is sometimes not easy to decide.

Having at our disposal the relation *mrqmi*, the concept of a *proper submorphaton*, in terms of the *relation of being a proper submorphaton of (mfap)*, can be introduced.

Df 2.21 $\text{mfap} = \{(x, y): y \in \text{Mot} \wedge x \in \text{mfa}^< y \wedge (x = \text{mrqmi}'y \vee \vee \text{mrqmi}'x = \text{mrqmi}'y)\}$

In light of this definition, x is a proper submorphaton of morphotacton y , in symbols: $x \text{mfap } y$, iff x is either qualificatum initiale of y , or both share the same qualificatum initiale.

Ex: In the dicton *preschooler* both *preschool-* and *-school-* are proper submorphatons. And, in *preschool-* only *-school-* fulfills this function.

As can be rightly supposed, both the intradictonal relations *mfq* and *mrq* have their counterparts in the relations of interphrasal and interdictonal qualification, respectively.

3. Axiomatics

The system of axioms for the fragment of general morphology, a theory of which is surveyed here, is rather rich, and it provides for 25 propositions given below. However, notice should be taken that this system is not yet complete. Nevertheless, its richness certainly points to the complexity of the domain of general morphology. There are 18 specifically linguistic terms occurring in the axioms, of which 8 are primitive, that is: *Utr*, *Seg*, *hfn*, *Dct*, *Mof*, *lkf*, *smf*, and *mfq*. The remaining 10 terms have already been introduced by means of definitions.

The specifically morphological axioms, to be viewed as basic principles of general morphology, characterize certain relevant properties of the mph-terms occurring therein. They formally express some of those intuitions concerning the mph-reality of language, which cannot appear in the theorems to be proved.

Let us now proceed to the enumeration of our axioms, falling into 4 relatively distinct groups, and subsequently to the explanation of their intuitive sense.

3.1 List of axioms

$$\text{Ax 1 } 0 < \text{card}(Utr) < \aleph_0$$

$$\text{Ax 2 } 0 < \text{card}(Seg) < \aleph_0$$

$$\text{Ax 3 } Utr \subset Seg$$

$$\text{Ax 4 } x \in Seg \rightarrow \bigvee_y (y \in Utr \wedge x \in sgm^<y)$$

$$\text{Ax 5 } hfn \in \text{aeq}(Seg)$$

$$\text{Ax 6 } hsg \in \text{aeq}(Sgn)$$

$$\text{Ax 7 } x \in Dct \rightarrow \bigvee_y (y \in Utr \wedge x \in sgm^<y)$$

$$\text{Ax 8 } x \in Dct \rightarrow lkf^>x \neq \emptyset \wedge smf^>x \neq \emptyset$$

$$\text{Ax 9 } x \in Dct \rightarrow \bigvee_y (y \in mr^<x \wedge lkf^>y = lkf^>x)$$

$$\text{Ax 10 } x \in Mof \rightarrow \bigvee_y (y \in Dct \wedge x \in mf^<y)$$

$$\text{Ax 11 } x \in Dct \rightarrow \bigwedge_y (y \in mf^<x \wedge y \neq x \rightarrow y \notin Dct)$$

$$\text{Ax 12 } x, y \in Dct \wedge x \neq y \rightarrow mf^<x \cap mf^<y = \emptyset$$

$$\text{Ax 13 } mfq \subset Mof \times Mof$$

$$\text{Ax 14 } x \text{ } mfq \text{ } y \rightarrow x \neq y$$

$$\text{Ax 15 } x \text{ } mfq \text{ } y \rightarrow \neg y \text{ } mfq \text{ } x$$

$$\text{Ax 16 } x \text{ } mfq \text{ } y \wedge y \text{ } mfq \text{ } z \rightarrow \neg x \text{ } mfq \text{ } z$$

$$\text{Ax 17 } x \text{ } mfq \text{ } z \wedge y \text{ } mfq \text{ } z \rightarrow x = y$$

$$\text{Ax 18 } x \in Dct \wedge y \in mr^<x \wedge y \neq x \rightarrow \bigvee_z [z \in mf^<x \wedge (y \text{ } mfq \text{ } z \vee z \text{ } mfq \text{ } y)]$$

$$\text{Ax 19 } x \in Dct \rightarrow \bigvee_y (x \text{ } mrqmi \text{ } y)$$

$$\text{Ax 20 } x \in Dct \rightarrow mrgru^>x \neq \emptyset$$

$$\text{Ax 21 } x \text{ } mfq \text{ } y \rightarrow (sgm^<x \cap Mor) \cap (sgm^<y \cap Mor) = \emptyset$$

$$\text{Ax 22 } x \text{ } mfq \text{ } y \rightarrow mtf^<(x, y) \in Mot$$

$$\text{Ax 23 } x \text{ } mfq \text{ } y \rightarrow x \in mfp^< mtf^<(x, y)$$

$$\text{Ax 24 } x \text{ } mfq \text{ } y \wedge mtf^<(x, y) \text{ } mfq \text{ } z \rightarrow \neg y \text{ } mfq \text{ } z$$

$$\text{Ax 25 } x \text{ } mrq \text{ } y \wedge lkf^>y = \emptyset \rightarrow \neg \bigvee_z (y \text{ } mfq \text{ } z)$$

3.2. Explanation of axioms

The first axiom on our list states that the set of all utterances is finite and non-zero. To put it differently, the number of its elements is more than 0, and at the same time less than the power of the set of all natural numbers. A similar statement is made by axiom 2 concerning the linguistically relevant segments to be distinguished within utterances. The finitude of the set *Seg* should be understood in the way that solely certain segmentations of utterances are linguistically relevant. The segmentation of utterances cannot be continued endlessly. According to axiom 3, utterances can be viewed as a kind of segments, and according to axiom 4, each segment is ultimately a constituent part of an utterance. The fifth and sixth axioms state, respectively, that the relations of homophony and homosignification are equivalences, the former on the set of all segments and the latter on the set of all signs.

In light of axiom 7, dictons are but segmental constituents of utterances. In other words, dictons do not occur outside of utterances, and the latter should be viewed as defective or indefective manifestations of sentences. It is tacitly assumed here that by virtue of occurring in an utterance each dicton is capable of occurring in the corresponding sentence, where its syntactic properties cannot be not signified. According to axiom 8, each dicton obligatorily both lexifies and semifies meanings. Among the latter there must be syntactic ones. However, it does not follow from this axiom, that each dicton necessarily consists of two segmental morphons differing in their signification mode. Axiom 9 has been included in our system, in order to exclude the composita from our present considerations here. It states that in each dicton there is exactly one morphon functioning as the lexificator therein. Thus, each dicton has only one lexical morphon. Axiom 10 says that no morphaton exists outside the corresponding dicton, and axiom 11 adds that no such constituent morphaton can again be a dicton. This, in turn, is in agreement with our intuitions about dicton. All subdictonal units must be subordinate to dictons conceived of as the maximal units of morphology. Axiom 12 says that no two different dictons have common morphatons.

Axioms of the third group express some general properties of the relation *mfq*, which in light of axiom 13 binds morphatons. What is more, this relation is irreflexive, asymmetric, and antitransitive, which is, respectively, stated by axioms 14-16. And according to axiom 17 no morphaton can qualify more than one qualificatum.

In light of axiom 18 there are no subdictonal morphons, which would not be involved in the relation *mfq*. In other words, no morphon can occur outside this relation. The content of this axiom may be controversial, since it is not certain whether each dicton consists of at least two segmental morphons. For the same reason, the next two axioms, 19 and 20, cannot be incontrovertible either. They say, respectively, that each dicton has exactly one initial morphonal qualificatum, and at least one ultimate qualificator. According to axiom 21, a morphaton qua

qualificatum has no morphon in common with a morphaton qua its qualificator. Any two morphatons bound by the relation *mfq* form together, in light of axiom 22, a morphotacton. What is more, the qualificatum of such a morphotacton is always its proper submorphaton, and this is the content of axiom 23. According to axiom 24, if the whole morphotacton is qualified by a morphaton, then the latter never qualifies the qualificator in the former. Related in content to this axiom is the next, which turns out to be the final axiom on our list, and which states that a delexicalized qualificator cannot be further qualified. In conformity with this, neither affixons nor desineneces can appear as qualificata. Consequently, the qualificational structure of a dicton is much shallower than the qualificational structure of a sentence, if considered in terms of strata.

4. Subdictonal categories

A morphological typology of languages can be founded upon the mph-structure of dictons. This structure is specified by the mph-systems that operate within dictons, and which are describable in terms of subdictonal units and their corresponding properties. With these systems at our disposal the subdictonal categories, and ultimately the types of dictons themselves can also be defined. The identification of these categories, by which only the categories of morphologically relevant subdictonal units are meant, is the first necessary step towards establishing dictonal typology.

Dictons are not sets of subdictonal units but wholes *sui generis*. They diverge structurally, and with respect to their internal structure they may exhibit different degrees of compactness or mph-connexity. Some dictons are intermediate between syntagmas and dictons proper. Even in one and the same language dictons as well as subdictonal units are fairly differentiated, which is due, among other factors, to grammaticalization processes, which continually operate in any language and which transform morphological units and structures or create new ones. As a result of these processes syntagmas may be turned into dictons, and dictons into morphons.

In what follows, we shall deal with such fundamental subdictonal categories as: dictoidon, auxilion, positional, affixon, bason, and radicon. These categories, which do not exhaust all mph-relevant ones, will be introduced in terms of the corresponding relations. The very possibility of defining them within our theoretical system, provided the definitions being formulated are adequate, would seem to justify the choice of the primitive terms.

For reasons of space, the typology of dictons will not occupy us here. However, while distinguishing dictonal types, one will necessarily be confronted first of all with the question of whether there are segmentally simple dictons, that is, whether the subdivision into morphologically simple and composite dictons is warrantable. And, within the latter it should be possible to define such subtypes as: isolating, agglutinative, and fusional, among others.

5. Dictoidon

One kind of subdictonal units is that, which could be termed quasidicton or *dictoidon*. We shall distinguish proper and improper dictoidons, which will be introduced, respectively, in terms of the following two auxiliary concepts, namely:

- (i) the *relation of being a proper dictoidon of (ddp)*, and
- (ii) the *relation of being an improper dictoidon of (ddi)*.

The definitions of these relations will be formulated as follows:

$$\text{Df 5.1} \quad ddp = \{(x, y): y \in \text{Dct} \wedge (x \in mfp^< mfqm^< y \vee x \in mfp^< mqr^< y) \wedge \bigwedge_z (z \in \text{Dct} \wedge z \neq y \wedge z \text{ hfn } x \wedge z \text{ hlk } x)\}$$

$$\text{Df 5.2} \quad ddi = \{(x, y): y \in \text{Dct} \wedge (x \in mfp^< mfqm^< y \vee x \in mfp^< mqr^< y) \wedge \bigwedge_z (z \in \text{Dct} \wedge z \neq y \wedge \neg z \text{ hfn } x \wedge z \text{ hlk } x)\}$$

In light of definition 5.1, x is a proper dictoidon of dicton y , in symbols: x *ddp* y , iff x is a proper morphaton of the maximal qualificatum or of the maximal qualificator of y , and there is dicton z , different from y , and such that it is homophonous and homolexical with x . And, in light of definition 5.2, x is an improper dictoidon of dicton y , in symbols: x *ddi* y , iff x is a proper morphaton of the maximal qualificatum or of the maximal qualificator of y , and there is dicton z , different from y , and such that it is not homophonous with x but it is homolexical with x .

Ex: For the sake of exemplification of the concept of dictoidon let us briefly consider a few dictons from English, Vietnamese and German. In the English dictons: (i) *misleading*, (ii) *is reading*, (iii) *has come*, (iv) *towards the river*, the following proper dictoidons, respectively, can be identified: (i) *mislead-*, *-lead-*, (ii) *reading*, *read-*, (iii) *come*, (iv) *the river*. All of these dictoidons have the corresponding dictons, which are homophonous and homolexical with them. In Vietnamese dicton *cho-mẹ* 'to mother, for mother' morphon *me* is also a proper dictoidon (cf. *Tôi viết một cái thư cho mẹ tôi* 'I am writing a letter to my mother'; *mẹ* 'mother', *cho* 'to give'). On the contrary, in the German dicton *ist-gekommen* 'has come' morphaton *gekommen* is an improper dictoidon.

Thus, although a dictoidon resembles the corresponding dicton, it is not a dicton itself. It has lost its dictonal independence to some degree by being turned into a constituent of a dicton, within which it assumes the status of a qualificatum or qualificator.

In terms of the relations *ddp* and *ddi* the *relation of being a dictoidon of (dd)* will be defined as follows:

$$\text{Df 5.3} \quad dd = ddp \cup ddi$$

The set of all dictoidons, symbolized as *Dtd*, can now be introduced in the following manner:

Df 5.4 $Dtd = dd \langle Dct$

The following simple corollaries, among others, can be inferred:

$$5.1 \quad x \in Dtd \rightarrow x \notin Dct$$

$$5.2 \quad x \, dd \, y \rightarrow x \in mfp^< \, mfqm^< y \vee x \in mfp^< \, mfqr^< y$$

$$5.3 \quad x \, dd \, y \rightarrow x \, hlk \, y$$

Theorem 5.1 conforms to axiom 11. And, according to 5.3, each dictoidon is homolexical with the dicton, which it is a constituent of.

6. Auxilion

Similarly to dictoidons, auxilions will also be subdivided as proper and improper. However, in addition to this we shall distinguish co-auxilions. These three sub-categories of morphatons will be introduced, respectively, in terms of the following relations:

- (i) the *relation of being a proper auxilion of (aup)*,
- (ii) the *relation of being an improper auxilion of (aui)*, and
- (iii) the *relation of being a co-auxilion of (cau)*.

The definitions of these relations will be formulated in the following manner:

$$\begin{aligned} \text{Df 6.1} \quad \text{aup} = \{ (x, y) : y \in Dct \wedge (x \in mfp^< \, mfqm^< y \vee x \in mfp^< \, mfqr^< y \vee \\ \vee x = mfqr^< \, mfqm^< y) \wedge \bigvee_z [z \in Dct \wedge z \neq y \wedge z \, hfn \, x \wedge \\ \wedge z \, hsm \, x \wedge \bigwedge_{\sigma} (\sigma \in sgf^> x - smf^> z \rightarrow \sigma \in smf^> x \wedge \sigma \in lkf^> z)] \} \end{aligned}$$

$$\begin{aligned} \text{Df 6.2} \quad \text{aui} = \{ (x, y) : y \in Dct \wedge (x \in mfp^< \, mfqm^< y \vee x \in mfp^< \, mfqr^< y \vee \\ \vee x = mfqr^< \, mfqm^< y) \wedge \bigvee_z [z \in Dct \wedge z \neq y \wedge z \, hfn \, mfqm^< x \wedge \\ \wedge z \, hsm \, mfqm^< x \wedge \bigwedge_{\sigma} (\sigma \in sgf^> mfqm^< x - smf^> z \rightarrow \\ \rightarrow \sigma \in smf^> mfqm^< x \wedge \sigma \in lkf^> z)] \} \end{aligned}$$

$$\text{Df 6.3} \quad \text{cau} = \{ (x, y) : y \in Dct \wedge \bigvee_z (z \in aui^< y \wedge x = mfqr^< z) \}$$

According to definition 6.1, x is a proper auxilion of dicton y , in symbols: $x \, aup \, y$, iff x is a proper morphaton of the maximal qualificatum or of the maximal qualificator of y , or x is identical with the maximal qualificator of the maximal

qualificatum of y , and there is dicton z , different from y , and such that it is homophonous and homosemical with x , and each meaning of x , which is not identical with any semified meaning of z , is semified by x and has a lexified counterpart in the meanings of z . And according to definition 6.2, x is an improper auxilion of dicton y , in symbols: $x \text{ aui } y$, iff x is a proper morphaton of the maximal qualificatum or of the maximal qualificator of y , or x is identical with the maximal qualificator of the maximal qualificatum of y , and there is dicton z , homophonous and homosemical with the maximal qualificatum of x , and each meaning of this qualificatum, which is not identical with any semified meaning of z , is semified by this qualificatum and has a lexified counterpart in the meanings of z . Finally, on the strength of definition 6.3, x is a co-auxilion in dicton y , in symbols: $x \text{ cau } y$, iff x is the maximal qualificator within the improper auxilion of y .

Ex: Morphon *has-* in the dicton *has-written* is a proper auxilion, since *has-* = *mfqm*'*has-written*, and there is dicton *has* (cf. *He has a car*) such that it is homophonous and homosemical with *has-*, and each meaning of *has-*, which is not identical with any meaning semified by *has*, is semified by *has-* and possesses a lexified counterpart in the meanings of *has*. In the dicton *has-been-written* morphaton *has-been* is an improper auxilion, and morphaton *-been* is a co-auxilion. On the contrary, morphaton *-been* in the dicton *has-been* is an improper dictoidon (cf. *He has been a teacher for some time*). In the Polish dicton *mam-napisać* 'I am supposed to be writing; I should write' morphaton *mam-* is a proper auxilion. It results from the auxiliarization of the verb *mieć* 'to have; to possess', but it expresses a sort of obligation (cf. *Mam napisać list* 'I am supposed to be writing a letter'; I have to write a letter vs. *Mam psa* 'I have a dog').

In terms of the relations *aup* and *aui* the *relation of being an auxilion of (au)* will be defined as follows:

Df 6.4 $au = aup \cup aui$

The set of all auxilions, symbolized as *Aux*, can be introduced in the following way:

Df 6.5 $Aux = au \langle Dct$

The following corollaries, among others, can be inferred:

6.1 $x \in Aux \rightarrow x \notin Dct \cup Dtd$

6.2 $x \in au \langle y \rightarrow x \in mfp \langle mfqm \langle y \vee x \in mfp \langle mqr \langle y \vee x = mqr \langle mfqm \langle y$

6.3 $x \in aup \langle y \rightarrow lkf \rangle x = \emptyset$

Thus, despite certain similarities, an auxilion is neither a dicton nor dictoidon. It has already lost its lexical independence by being delexicalized to a certain degree, and in order to be fully understandable it requires a lexical complementation, that is a dictoidonal qualificator.

7. Positional

The category of positionals or adpositionals will also be dichotomized as either proper or improper, in addition to which, co-positionals will be distinguished. These three subcategories of morphatons will be formally introduced, respectively, in terms of the following relations:

- (i) the *relation of being a proper positional of (pop)*,
- (ii) the *relation of being an improper positional of (poi)*, and
- (iii) the *relation of being a co-positional of (cpo)*.

The definitions of these relations will be formulated as follows:

$$\begin{aligned} \text{Df 7.1 } \textit{pop} = \{ & (x, y) : y \in \textit{Dct} \wedge (x = \textit{mfqm}'y \vee x = \textit{mfqm}'\textit{mfqm}'y \vee \\ & \vee x = \textit{mfqm}'\textit{mfqr}'y) \wedge \bigwedge_{\sigma} \{(\sigma \in \textit{sgf}^>x \rightarrow \sigma \in \textit{smf}^>x) \wedge \\ & \wedge \neg \bigvee_z [z \in \textit{Dct} \wedge z \textit{hfn} x \wedge (\sigma \in \textit{smf}^>x \rightarrow \sigma \in \textit{lkf}^>z)]\} \} \end{aligned}$$

$$\begin{aligned} \text{Df 7.2 } \textit{poi} = \{ & (x, y) : y \in \textit{Dct} \wedge x = \textit{mfqm}'y \wedge \textit{mfqm}'x \in \textit{pop}'y \wedge \\ & \wedge \bigwedge_{\sigma} \{(\sigma \in \textit{sgf}^>\textit{mfqr}'x \rightarrow \sigma \in \textit{smf}^>\textit{mfqr}'x) \wedge \\ & \wedge \bigvee_z [z \in \textit{Dct} \wedge z \textit{hfn} \textit{mfqr}'x \wedge (\sigma \in \textit{smf}^>\textit{mfqr}'x \rightarrow \\ & \rightarrow \sigma \in \textit{lkf}^>z)]\} \} \end{aligned}$$

$$\text{Df 7.3 } \textit{cpo} = \{ (x, y) : y \in \textit{Dct} \wedge \bigvee_z (z \in \textit{poi}'y \wedge x = \textit{mfqr}'z) \}$$

In light of definition 7.1, x is a proper positional of dicton y , in symbols: $x \textit{pop} y$, iff x is the maximal qualificatum of y or of the maximal qualificatum of y or of the maximal qualificator of y , and each meaning signified by x is semified by it at the same time, and there is no dicton z , which would be homophonous with x , and which would lexify the meanings of x . According to definition 7.2, x is an improper positional of dicton y , in symbols: $x \textit{poi} y$, iff x is the maximal qualificatum of y , and the maximal qualificatum of x is a proper positional, whereas the maximal qualificator of x conveys only semified meanings, and there is dicton z homophonous with the maximal qualificator of x and lexifying all the meanings of the latter. Finally, according to definition 7.3, x is a co-positional of dicton y , in symbols: $x \textit{cpo} y$, iff x is the maximal qualificator within an improper positional of y .

Ex: In the dictons *on-the-table*, *up-the-hill*, *toward-the-river*, *for-him*, *of-the-readers* the morphons *on-*, *up-*, *toward-*, *for-*, and *of-* are proper positionals. On the contrary, in such dictons as:

- (i) *by-means-of-a-ferry*,
- (ii) *with-the-help-of-wire/a knife*,

(iii) *through-the-use-of-a-computer*

the morphatons *by-means*, *with-the-help*, *through-the-use* are improper positionals, and their constituents *-means*, *-the-help*, and *-the-use* are co-positionals. However, if it turned out that these constituents are dictoidons rather than auxiliions, then *by-means*, *with-the-help*, and *through-the-use* should be considered as independent dictons rather than improper positionals. Thus, before a mph-analysis is begun, it must be decided whether a given unit is a dicton or a syntagma.

In terms of the relations *pop* and *poi* the *relation of being a positional of* (*po*) will be introduced by means of the following definition:

$$\text{Df 7.4 } po = pop \cup poi$$

The set of all positionals, symbolized as *Pos*, can be defined as follows:

$$\text{Df 7.5 } Pos = po \langle Dct$$

The following corollaries can be inferred:

$$7.1 \quad x \in Pos \rightarrow x \notin Dtd \cup Aux$$

$$7.2 \quad x \in poi^< y \rightarrow mfm^< x \in pop^< y \wedge mfr^< x \in au^< y$$

$$7.3 \quad x po y \rightarrow \bigvee_z [z \in dd^< y \vee z \in au^< y \wedge (x mfg z)]$$

$$7.4 \quad x \in Pos \rightarrow lkf^> x = \emptyset$$

$$7.5 \quad x po y \rightarrow \neg \bigvee_z (z \in mf^< y \wedge z mfg x)$$

The first of these theorems states that positionals are neither dictoidons nor auxiliions. And, according to the last one, no positional can qualify a morphaton within a dicton.

8. Affixon

In contrast to the three categories of morphatons already introduced above, affixions can occur within dictons exclusively as qualifiers. What is more, they are usually morphons rather than morphotactons. Affixions can also be subdivided into proper and improper ones, and in addition, affixoidons can be distinguished. However, for the purposes of this paper these distinctions are of no special relevance, and will be ignored here. In order to somewhat simplify the definition of the *relation of being an affixon of* (*af*) we shall avail ourselves of an auxiliary concept, namely that of a *dictadon*. The *set of all dictadons*, symbolized as *Dta* will be introduced as follows:

$$\text{Df 8.1 } Dta = Dct \cup Dtd \cup Aux$$

Thus, a dictadon can be either a dicton, a dictoidon, or an auxiliary.

The definition of the relation *af* will be given in the following manner:

$$\text{Df 8.2 } af = \{(x, y): y \in Dta \wedge x \in mrqru^<y \wedge \bigwedge_{\sigma} \{(\sigma \in sgf^>x \rightarrow \sigma \in snf^>x) \wedge \\ \wedge \neg \bigvee_z [z \in Dct \wedge z hfn x \wedge (\sigma \in snf^>x \rightarrow \sigma \in lkf^>z)]\}\}$$

On the strength of this definition, x is an affixon of dictadon y , in symbols: $x \text{ } af \text{ } y$, if x is an ultimate morphonal qualificator, which conveys only semified meanings, and there is no dicton z , which would be homophonous with x and would lexify the meanings of x .

Ex: In the dictons: *untrue, dislike, helper, readable, dogs, oxen, looked, artist* the morphons *un-, dis-, -er, -able, -s, -en, -ed, and -ist*, are affixons. The articles should also be counted among the affixons.

The *set of all affixons*, symbolized as Afx , will be defined as follows:

$$\text{Df 8.3 } Afx = af \langle Dta$$

As can be easily inferred, the following corollaries hold:

$$8.1 \quad x \in af^<y \rightarrow x \in mrqru^<y$$

$$8.2 \quad Afx \cap Pos = \emptyset$$

$$8.3 \quad x \in Afx \rightarrow lkf^>x = \emptyset$$

Affixons could probably be subdivided, among other ways, as simplex or complex. Thus, for instance, in the dicton *analogical* two components seem to be distinguishable within the suffixon *-ical*. However, it is doubtful whether these components could be viewed as different morphons.

What is usually called a desinence could be conceived of as an affixon conveying a syntactically relevant meaning, that is, information on the syntactic category of the dicton. This information can be conveyed dicton-internally or dicton-externally. In the former case, it is recognizable by a segmental morphon of the dicton, independently of other dictons, whereas in the latter case it is recognizable by the dicton's linear position or by the shape or linear position of other dictons, together with which the dicton forms a sentence. And, it is in this latter case, that the term 'segmentally vacuous' or 'zero morphon' suggests itself. Thus for instance, the syntactic category of the English dicton *the dog* remains unspecified, when considered outside a sentential context. Obviously, no dicton can dispense with a desinence in the sense determined, since otherwise it would be impossible to decide upon its syntactic category. Therefore, even the morphodicton seems to require a zero desinence.

9. Bason: morthematon and radicon

For the mph-analysis of certain morphotactons the concept of *bason* or *stem* seems to be indispensable. This concept will be introduced in terms of the *relation of being a bason of (bs)*, which is defined as follows:

$$\text{Df 9.1 } bs = \{(x, y): y \in Dta \wedge x \in mfp^<y \wedge \text{card}(mf^<y \cap Dta) = 1 \wedge (x = y \leftrightarrow \leftrightarrow y \in Dcm)\}$$

On the strength of this definition, x is a bason of dictadon y , in symbols: $x \text{ } bs \text{ } y$, iff x is a proper morphaton of y , and y consists of only one dictadon, and x is identical with y only when y is a morphodicton. The symbol $bs^<y$ denotes the set of all basons of dictadon y .

Ex: The English dicton *activitiless* exhibits the following basons: *activiti-*, *activ-*, and *act-*. In the Polish dicton *ponapisywali* 'they wrote it in different places' the following basons can be distinguished: *ponapisywal-*, *-napisywal-*, *-pisywal-*, *-pisyw-*, and *-pis-*. Thus, a dicton may have more than just one bason. And, the bason of a morphodicton is always identical with the segmental component of the latter. Accordingly, such Polish morphodictons as *dom* 'a/the house', *kot* 'a/the cat', or *dym* 'the smoke' have, respectively, the following basons: *dom-*, *kot-*, *dym-*.

The following corollaries can be easily deduced:

$$9.1 \quad bs^<x \neq \emptyset \rightarrow x \in Dta$$

$$9.2 \quad x \in bs^<y \rightarrow x \in mfp^<y$$

$$9.3 \quad x \text{ } dd \text{ } z \wedge y \text{ } au \text{ } z \rightarrow bs^<z = \emptyset$$

$$9.4 \quad x \in Dcm \rightarrow x \text{ } bs \text{ } x$$

As theorem 9.3 says, no dicton consisting of a dictoidon and an auxilion, that is, of two dictadons, has a bason as a whole. Thus, there are non-basonal dictons. And, according to 9.4, the morphodicton and its bason are indistinguishable. It should be, however, remembered that each bason is always deprived of syntactic information.

The first of the definitions given below introduces the *relation of being a hypobason of (ba)* and the second – the *relation of having as ultimate bason (bsu)*.

$$\text{Df 9.2 } ba = \{(x, y): \bigvee_z (z \in Dta \wedge x, y \in bs^<z \wedge x \in mfp^<y)\}$$

$$\text{Df 9.3 } bsu = \{(x, y): y \in bs^<x \wedge \neg \bigvee_z (z \neq y \wedge z \in bs^<x \wedge y \in ba^<z)\}$$

In accordance with definition 9.2, x is a hypobason of y , in symbols: $x \text{ } ba \text{ } y$, iff both x and y are basons of dictadon z , and x is a proper submorphaton of y . The symbol $ba^<y$ denotes the set of all hypobasons of bason y . And, in accordance with definition 9.3, dictadon x has y as its ultimate bason or, equivalently, y is the ultimate bason of x , in symbols: $x \text{ } bsu \text{ } y$, iff y is a hypobason of no bason of x .

Ex: The dictons *misleads*, *cars*, and *a pen* have, respectively, the following ultimate basons: *mislead-*, *car-*, and *a-pen-*.

The ultimate bason can also be called the *morthematon*. Since each dictadon

x has exactly one ultimate bason, the symbol $bsu^<x$ will be used for its denotation. We shall distinguish the initial bason or radicon in addition to the ultimate one. The *relation of having as a radicon* (rd) will be defined as follows:

$$\text{Df 9.4} \quad rd = \{(x, y): y \in bs^<x \wedge \bigwedge_z (z \in bs^<x \rightarrow y \in ba^<z)\}$$

In light of this definition, dictadon x has y as its radicon or, alternatively, y is the radicon of x , in symbols: $x rd y$, iff y is a hypobason of each bason of x . The radicon of dictadon x will be denoted by the symbol $rd^<x$.

Ex: The bason *-act-*, is the radicon of the dicton *inactivity*, and the bason *-cover-* is the radicon of the dicton *rediscovering*.

The concept of the dictonifiable bason as well as the relations of basonal and dictonal derivation will not be dealt with here.

10. Synsemanticon

In elucidating the concept of dicton, we have tried to justify the association of the mph-units, delexicalized to a certain degree, with those corresponding ones, which appear to be carriers of lexical meanings. Subsequently, we have distinguished three categories of such delexicalized units. Now we shall gather all them under one category to be termed here synsemantica. Following are definitions, which formally and in due order introduce:

- (i) the *set of all synsemantica* (Ssn), and
- (ii) the *relation of being a synsemanticon of* (sse).

$$\text{Df 10.1} \quad Ssn = Aux \cup Pos \cup Afx$$

$$\text{Df 10.2} \quad sse = \{(x, y): x \in Ssn \wedge y \in Dct \wedge x \in mf^<y\}$$

In accordance with the first definition, synsemantica contain morphatons of the three subdictonal categories, that is, auxiliions, positionals, and affixions. However, these categories may not exhaust all the subcategories of synsemantica. And, in accordance with the second definition, x is a synsemanticon of dicton y , in symbols: $x sse y$, iff x is an element of Ssn and constituent morphaton of y .

The following theorem concerning the mph-status of synsemantica can be deduced:

$$10.1 \quad x \in Ssn \rightarrow \bigvee_y (y \in Dct \wedge x \in mf^<y)$$

This theorem gives formal expression to the intuition that synsemantica do not have an independent semantic or syntactic existence, but they are always constituents of the corresponding dictons. In other words, they cannot manifest themselves fully unless they are constituents of dictons.

The synsemantica are subdividable as proper and improper. These two categories will be introduced in terms of the following relations:

- (i) the *relation of being a proper synsemanticon of* ($ssep$), and

(ii) the *relation of being an improper synsemanticon of (ssei)*.

Df 10.3 $ssep = \{(x, y): x \in sse^<y \wedge mfq^>x = \emptyset\}$

Df 10.4 $ssei = \{(x, y): x \in sse^<y \wedge mfq^>x \neq \emptyset\}$

In light of definition 10.3, x is a proper synsemanticon of dicton y , in symbols: x *ssep* y , iff x is a synsemanticon of y and is qualified by no morphaton of y . And, in light of definition 10.4, x is an improper synsemanticon of dicton y , in symbols: x *ssei* y , iff x is a synsemanticon and is qualified by some other morphaton of y . Thus, the relations *ssep* and *ssei* reflect the qualificational status of synsemantica within dictons.

The following corollaries are among the immediate consequences of the last two definitions:

10.2 $x \in ssep^<y \rightarrow x \in af^<y$

10.3 $x \in ssei^<y \rightarrow x \in au^<y \vee x \in po^<y$

The proper synsemantica turn out to be affixons, and the improper ones either auxiliions or positionals. Affixons exhibit the highest degree of delexicalization, and they are incapable of functioning as qualificata.

Since synsemantica occur solely within the corresponding dictons the morphological distinction between them is of necessity projected upon dictons themselves. Consequently, the latter may also be subdivided as proper or improper. Generally speaking, the differentiation among the synsemantica forms a basis, which may be used for developing a dictonal typology. Within such a typology isolating, aglutinative, fusional, and some other types of dictons, as has already been hinted at above, should lend themselves to being defined.

11. Concluding remarks

Morphology belongs to those linguistic subdisciplines, which have so far successfully escaped any attempts at axiomatization. However, inquiry into the applicability of the axiomatic method to the morphological domain of language seems to be an urgent issue for theoretical morphology in view of the rapid progress of the morphological research.

What has been put forward within the limits of the present article amounts to nothing more than a preliminary axiomatic approach to a relatively small fragment of morphology, which does not even include many fundamental morphological concepts, among which, those of morphological opposition, allomorphy, or morpheme could be mentioned. Nevertheless, the axiomatic treatment of this fragment has required a relatively numerous set of primitive terms and a relatively rich axiomatics. This, in turn, may be viewed by some as a disquieting if not discouraging factor for the axiomatic enterprise in morphology. Such an atti-

tude may not necessarily prevail, if one remains aware of the complexity of morphological reality. And bearing this complexity in mind should not give rise to the suspicion that the existence of an easy method to be applied in order to establish theoretical morphology is not an illusion.

Furthermore, we would like to reiterate that we are not completely certain, whether the direction of axiomatization, which has been taken, is already correct, that is, whether the primitive terms are appropriate, and the axioms well-chosen. In fact, doubts which arise seem to indicate that other directions are also possible.

Be so as it may, in spite of various objections which may be raised, it seems that both the applicability of the axiomatic method to morphology as well as its relevance for this discipline can be defended convincingly. Apart from this, it would be nice to hope that the approach proposed here can contribute to straightening out the path leading to more perfect formulations of morphological theories, and thereby to the foundation of axiomatic morphology, which, in turn, may also become a source of inspiration to research many old problems in a new light.

Notes

The meaning of logical terms will be explained as follows. The propositional connectives of *negation*, *conjunction*, *disjunction*, *implication* and *equivalence* will be denoted, respectively, by the symbols: \neg , \wedge , \vee , \rightarrow , \leftrightarrow . The universal quantifier *for every (all) x* and the existential quantifier *there is (exists) an x such that*, which bind a variable x , are abbreviated, respectively, with the symbols \bigwedge_x and \bigvee_x . The symbol \bigvee_x is reserved for the phrase *there is exactly one x such that*. *Identity* will be symbolized by $=$, and *diversity* by \neq .

The set whose elements are x, y, z, \dots will be denoted by $\{x, y, z, \dots\}$. Thus, $X = \{x, y, z, \dots\}$ means that x, y, z are elements of the set X . The formula $x \in X$ reads x belongs to X , or x is an element of X . The formula $x \notin X$ reads: x does not belong to X . In order to express *inclusion* of a set X in a set Y we shall write $X \subset Y$. The *empty set* is denoted by \emptyset . A set whose elements are sets will be called a *family of sets*. The symbol $\text{card}(X)$ stands for the *cardinal number* or *power* of a set X , and it tells us how many elements the set X contains. There are finite and infinite sets. The set of all natural numbers \mathcal{N} is infinite. The number of its elements is symbolized by \aleph_0 . The inequality $\text{card}(X) < \aleph_0$ always indicates that X is finite. The operations of *sum*, *intersection*, *difference*, and *Cartesian product*, defined on two sets X and Y , will be symbolized, respectively, by $X \cup Y$, $X \cap Y$, $X - Y$, and $X \times Y$. The Cartesian product of a set X will be designated as $X \times X$. The symbol $\bigcup X$ designates the sum of a family X of sets.

The Cartesian product $X \times Y$ of two sets X and Y is the set of all ordered pairs (x, y) with $x \in X$ and $y \in Y$. The subsets of $X \times Y$, where X and Y are any sets will be

called *binary relations* in the product $X \times Y$. The fact that R is a binary relation in $X \times Y$ will be expressed in the form $R \subset X \times Y$. In order to state that x bears the relation R to y we shall write $x R y$ or, alternatively, $(x, y) \in R$.

The *image of an element* x under the relation R , i.e., the set of all successors of x in the ordered pairs $(x, y) \in R$ will be denoted by $R^{\rightarrow}x$, and the *converse image of an element* x under the relation R , i.e., the set of all predecessors of x in the ordered pairs $(y, x) \in R$ will be denoted by $R^{\leftarrow}x$. The set $R^{\rightarrow}X$ is called the *image of a set* X given by the relation R . It contains those objects y which are successors in the pairs $(x, y) \in R$, where $x \in X$. The set $R^{\leftarrow}X$ is called the *converse image of a set* X given by the relation R . It contains those objects y which are predecessors in the pairs $(y, x) \in R$, where $x \in X$.

A relation which is *reflexive*, *symmetric*, and *transitive* will be called an *equivalence relation*. The set of all equivalence relations on a set X will be denoted by $\text{aeq}(X)$. Any equivalence relation on a set X specifies a *classification* of X . If X is a set and R an equivalence relation on X , then by X/R will be symbolized the classification of X induced by R .

A relation $R \subset X \times Y$ is called a function from X to Y , if for every $x \in X$ there is exactly one $y \in Y$ such that $x R y$. The expression $R: X \rightarrow Y$ will always mean that R is a function from X to Y . The unique element $y \in Y$ which is associated with an element $x \in X$ under the function R will be designated by $R^{\leftarrow}x$.

Besides purely logical terms, we shall also avail ourselves of two mereological ones, namely, the *relation of being a part of*, symbolized as **P**, and the *relation of mereological sum*, symbolized as **S**. The former of these relations belongs to the primitive terms of mereology and the latter to its defined terms. The formula $x \mathbf{P} y$ means that an object x is a part of an object y . The relation **P** is reflexive, antisymmetric, and transitive. The formula $y \mathbf{S} X$ means that y is the whole composed of all and only of the elements of the set X (cf. Batóg 1967: 17ff.).

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