

Factorizing Lexical Relatedness*

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Abstract

I discuss the problem of the morphological and semantic properties of transpositions, forms of lexical relatedness such as deverbal participles or action nominalizations which retain many of the properties of the base while still exhibiting a change in morphosyntactic category. I pay particular attention to deverbal nominalizations based on the infinitive form of verbs in languages such as German, Italian and others. I argue that such nominalizations are not true derivation because they remain, in an important sense, forms of the base verb. At the same time they are not ‘pure’ transpositions because they often involve added subtle semantic nuances (which, however, are not of the same kind as the added semantic predicates found in true derivation). I analyse these types of lexical relatedness within an approach to lexical relatedness I have called Generalized Paradigm Function Morphology.

1 Introduction

1.1 The issues

There has been a fair amount of discussion of so-called ‘mixed categories’, especially in the context of deverbal nominalizations. In this paper I address the wider issues which such constructions raise for the general question of lexical relatedness: how are words related to each other? I argue for a particular view of lexical representations in which morphological, syntactic and semantic information is separated in a fairly standard way and use this as the basis for a model of relatedness, ‘Generalized Paradigm Function Morphology’ (GPFM). In this model all morphologically relevant relationships, from ‘pure’ inflection to word formation by derivation, are defined in terms of a single general composite function operating over complete lexical representations. I first outline the model of the lexicon and then survey some of the crucial types of lexical relatedness, including some that are rarely discussed in the literature. I then introduce the crucial aspects of the GPFM model and show how it can describe the various types of lexical relatedness. Having drawn some interim conclusions I then survey some salient facts about deverbal nominalizations and use the GPFM model to sketch an analysis of a good many of the more puzzling relationships, including the interesting phenomenon of the nominalized infinitive found in a number of languages. I conclude with a brief summary of the implications of the paper, stressing that it is necessary to factor out all the different

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dimensions of a lexical representation and analyse the way these individual dimensions in a given word relate to the corresponding dimensions in another way. In other words, a proper account of lexical relatedness has to be much more explicit than is commonly the case.

1.2 Some distinctions

I shall be assuming that the lexicon is populated by abstract multidimensional representations called lexemes. Specifically, I shall assume that a lexeme is a four dimensional object consisting of attributes labelled FORM, SYNTAX, SEMANTICS attributes, and fourth attribute which I label LEXEMIC INDEX (LI). These attributes are set valued, that is, in general they take other attributes as their values. The first three attributes are relatively uncontroversial in the sense that most practical and theoretical approaches to lexical organization assume something like them.

The SEMANTICS attribute (SEM) contains information about the meaning of the word, abstracting away as far as possible from encyclopedic knowledge. Just what should be included in such a representation is a matter of some controversy, but those issues are largely tangential to my aims, so I will simply assume a relatively standard type of representation, which labels the ontological status of content words as ‘Thing’, ‘Event’, ‘Property’, (corresponding to noun, verb, adjective) and which includes popular, very general, semantic primitive predicates denoting concepts such as negation, causation, becoming, person, and so on.

The SYNTAX (SYN) attribute contains information relating to the syntactic distribution of the word, including information relevant to agreement and government dependencies. It may also contain information about the argument structure properties of the word, to the extent that these are distinct from the semantic representation. For convenience it is often useful to include an argument structure representation even if this is completely predictable from the semantic structure (for instance, if the word denotes a physical object or a prototypically transitive eventuality). In principle, we might expect the SYNTAX attribute to include the syntactic category of the word. However, it’s unlikely that crude categorial labels such as the traditional ‘Noun’, ‘Verb’, ‘Adjective’ descriptors will ever be called upon by the syntax. These cover labels generally add nothing to the representation that can’t be gleaned from the argument structure of the item and often give rise to unnecessary complications (as when we are forced to decide whether an action nominal is ‘really’ a noun or ‘really’ a verb). I discuss these issues at some length in Spencer (1999), where I argue that the argument structure representations of nouns, verbs and adjectives should include a semantic function argument role value of ‘R’ (for ‘referentiality’) for nouns, ‘E’ (for ‘eventuality’, either dynamic event or state) for verbs and a special value ‘A’ (for ‘attribute’) for adjectives in their canonical role as attributive

modifiers to nouns. These argument structure positions appear to be rather useful in defining the syntax-semantics interactions of content words, whereas syntactic labels ‘N’, ‘V’, ‘A’ are entirely superfluous (and misleading) if we have such semantic function labels.

The FORM attribute contains information relating to the morphophonological form of words. At a minimum it may contain a morphophonological representation of the root of the lexeme, but in general an important subattribute of the FORM attribute is the listing of stems and it is not always clear that there is actually any need for a separate representation of a root. In many cases, of course, the root will be the default stem (‘Stem0’) and will therefore appear in lexical representations in that guise. The FORM attribute may also include information relating to periphrastic constructions, at least where these fill cells in an inflectional paradigm, but I shall ignore that subtlety in this paper. An important innovation in my definition of the FORM attribute is that I assume that one of the values of the FORM attribute is a morphological category sub-attribute. More accurately, I assume (following Aronoff 1994) that each stem form is assigned to a morphological category. Thus, a word which behaves uniformly as a noun in the morphology will bear the attribute [FORM:[Stemn:[MorClass:Noun]]] for all stems ‘n’. Where this assignment is entirely predictable we can extract the information in the form of a default MorClass assignment, to be overridden only by exceptional lexical entries. In general, the morphological class label can be predicted from the syntactic class of the word (and hence from the syntactic class label if there is one), and that label will often be predictable from the semantic, ontological class of the word. The point of the MorClass sub-attribute is that there are often mismatches between morphological class and syntactic class, in which a verb might behave morphologically like a noun or an adjective may behave morphologically like a verb.

The fourth attribute, LEXEMIC INDEX (LI), is less familiar. It is a unique identifier, akin to the key field in a database, which identifies a lexeme as distinct from all other lexemes. For most purposes we can think of the Lexemic Index as an integer (though for exposition purposes I shall generally use the name of the lexeme in small capitals as the lexemic index). In a sense this is a house-keeping attribute, whose main function is to record our descriptive decision whether to treat a given representation as a separate lexeme or as some form of an existing lexeme. In effect, therefore, it is a shorthand for distinguishing between polysemy (same lexemic index for two different semantic representations) and homonymy (different lexemic index for two different semantic representation)¹. A simple example of a lexical representation from English is given in (1):

¹ In more elaborated versions of Generalized Paradigm Function Morphology the Lexemic Index plays a rather different and more crucial role in the organization of the grammar and lexicon. The LI is, in fact, one of the values of the FORM, SYN and SEM functions/relations which define a lexical entry. However, for the purposes of this paper it is sufficient to regard the LI as the fourth attribute of a lexical entry.

(1)	FORM	
	Stem0	<i>draw</i>
	Stem1	<i>drew</i> ('past tense')
	Stem2	<i>drawn</i> ('past/passive/perfect participle')
	MorClass	V [by default from SYN] for all Stemn
	SYN	[by default from SEM]
	SynClass	V (or 'E')
	A-str	<E <x <y>>>
		<SUBJ, (OBJ)>
	SEM	MAKE_GRAPHITE_IMAGE(x, y)
	LI	DRAW1

For convenience I assume that this verb has an optional object argument, reflecting the polysemy in *Harriet was drawing a picture* vs. *Harriet was drawing*. The lexemic index in principle is a unique integer, but for expositional convenience I shall give the LI as in (1).

This brief introduction to lexical representations covers only the most rudimentary aspects of the problem. I ignore the issues surrounding, for instance, morphemic/meaningless/indexed stems (Aronoff 1994, Stump 2001), lexemes whose basic form consists of a multiword combination e.g. Germanic particle verbs, and cases where a cell in the inflectional paradigm is filled by a word form + clitic cluster combination or by a multiword combination (periphrasis), as well as a number of difficult issues surrounding semantic representations. These are not issues which are totally irrelevant for my discussion, but to do them justice would take us well beyond normal limitations of space.

2 Types of lexical relatedness

2.1 'Canonical inflection' vs. 'canonical derivation'

In this section I set out familiar types of lexical relatedness, occupying two poles of an opposition. On the one hand, words can be related by virtue of being inflected forms of the same lexeme. Where the morphology is restricted to realizing a set of abstract morphosyntactic features we have the purest form of inflection, that is, the type of inflection that is least likely to be confused with derivation. A typical example would be agreement morphology on an adjective or verb. Following Booij (1994, 1996) I shall refer to this as contextual inflection. In our example of the lexeme DRAW, to define the 3sg present indicative form we would specify the value of the FORM attribute only for the lexeme, *draws* = 3sg PresIndic DRAW. All other attributes remain unchanged, including the lexemic index, indicating that this is a word form of a given lexeme, not a new lexeme. (I simplify here by abstracting away from the here irrelevant problem of syncretisms.) Contextual inflection is driven by the needs of morphosyn-

tactic processes such as agreement and to the extent that such processes are obligatory the morphology is also obligatory.

In (canonical) derivation all four attributes of a lexical entry are changed non-trivially. This entails that the process defines a new lexeme (with its own inflectional/syntactic category and so on). An example from English would be the lexeme DRAWABLE. Derivational morphology is a way of enriching the lexical stock and hence is not necessarily obligatory in the way that contextual inflectional morphology is. However, derivation can sometimes be extremely regular and productive (as in the case of deverbal potential adjective formation by *-able* suffixation).

There are several types of lexical relatedness that can be difficult to characterize in terms of inflection or derivation. Here I will summarize just those that are of relevance to the topic in hand. A more thorough survey can be found in Spencer (2005, 2007).

2.2 Inherent inflection

The first intermediate type of lexical relatedness is what I shall call (again following Booij 1994, 1996) inherent inflection. For Booij this is inflection which marks a category which is inherent to that class of lexeme, as opposed to an inflectional category that is imposed on the lexeme externally, so to speak (as is the case with contextual inflection). Familiar examples are plural (for nouns), past tense (for verbs) or comparative/superlative (for adjectives). In practice, all such inflection has the characteristic that it realizes an inflectional feature which has its own default semantic interpretation. For this reason, as Booij points out, it can be difficult to distinguish inherent inflection from derivation. For instance, why do we say that a word such as RE-DRAW is a derived lexeme (and hence the result of derivational morphology) rather than, say, the iterative aspect form of DRAW? Another example of inherent inflection is found in languages with semantic case forms of nouns. For instance, Hungarian has a case suffix *-ként* meaning ‘in the capacity of’. This participates in no agreement or government process whatsoever and effectively behaves like a postposition which has been fused to the noun (see Spencer 2008 for further discussion). The main reason why it is treated as a case is because it interacts with other inflectional categories (number and possession) like other case suffixes and thus seems to form part of the inflectional paradigm. Yet it clearly adds a semantic predicate to the lexical representation and in this respect is closer to derivation.

2.3 Transposition

The next type of lexical relatedness is found when the morphology changes the lexical category of the word but fails to add any semantic content. In this respect it is the mirror image of inherent inflection. This type of relatedness is called a transposition. A very clear example of a transposition is the formation of (active) participles of verb. These have the external syntax of adjectives, for instance, their main function is as attributive modifiers of nouns, they occupy the same syntactic position as adjectives, they agree with the modified noun as adjectives do and so on. Because a participle is an adjective and not a verb many linguists consider processes such as deverbal participle formation to be derivational. However, this goes against the criterion that derivation creates a new lexeme. In an expression such as *an erupting volcano* we do not want to say that *erupting* is a form of a different lexeme from ERUPT. In other languages such as Russian, where participles are much more widely used, this is particularly obvious: the participle is a form of the verb, which means that it is a kind of inflection. A clear indication of this is the fact that the participle does not add a semantic predicate to the lexical representation, that is, the relatedness is ‘a-semantic’. Yet the participle transposition creates a word with a different lexical category and a different inflectional paradigm. It is therefore neither straightforwardly inflectional nor straightforwardly derivational. The conceptual problems posed by such processes have been almost universally overlooked in recent discussion (Beard 1995 is a laudable exception). I shall devote more discussion to the matter of transpositions in §5 below.

2.4 Other types

In addition to the four types of lexical relatedness just discussed, contextual inflection, inherent inflection, transpositions, and standard derivation one could add argument structure alternations such as passives and causatives. Some of these, for instance, passives/antipassives and applicatives, typically have little or no effect on the meaning of the verb lexeme. In other words they are a form of a-semantic relatedness and do not involve the addition of a semantic predicate to the lexical representation. Others, such as causatives, do involve the addition of a semantic predicate, yet they often pattern in the same way as a-semantic alternations. Yet other alternations such as the stative (or ‘neuter’) form in Bantu languages at first sight may have the appearance of a passive-type valency reducing alternation, but such forms usually have semantic properties very similar to those of the English middle construction (as *This book reads easily*). In particular, a natural translation equivalent for such valency forms would be something along the lines ‘x is such that an arbitrary/generic subject is able to VERB x’. Arguably, such representations require the addition of a semantic predicate. Similar remarks hold of anticausatives in many languages. Finally, some argu-

ment structure alternations can appear to involve anaphoric relationships. This is true of those languages, for instance, which have a reflexive alternation or which, like Bantu languages, have a special reciprocal valence form (distinct from the reflexive form, which is mediated inflectionally through the subject/object agreement prefix system).

Now, argument structure alternations of this sort can be extremely regular and productive and there is a strong feeling that they give rise to ‘forms’ of a verb lexeme rather than creating an entirely new lexeme. This would make them a kind of (inherent?) inflection. On the other hand, where they add a semantic predicate and change the transitivity of the verb, as in the case of causatives, it seems a little perverse to regard this as inflection. The problem is compounded in the case of passive alternations expressed periphrastically by means of a participle. I will not discuss these issues in detail because they are largely tangential to the focus of the paper, the question of deverbal nominalizations. The crucial point is that we have a collection of lexically related word types which sometimes seem to involve no additional semantic predicate (e.g. passive), and which in other cases seem to require an additional semantic predicate without altering the lexemic status (productive and regular causatives) and in yet other cases involve the addition of a semantic predicate and may or may not involve the creation of a new lexeme (middles, statives, Bantu ‘stative’ or ‘neuter’ forms and so on). The matter is considerably complicated by the fact that one and the same form may appear in two categories. For instance, the reflexive construction in many languages doubles as a productive a-semantic passive. But the same passive construction also functions as a semantically enriched middle construction giving translation equivalents of *This book reads easily* and the like, bearing the hallmarks of new lexeme formation (see Spencer and Zaretskaya 2001 on the Russian stative middle, for instance).

Finally, it is worth noting briefly that the four main types of lexical relatedness do not exhaust all the possibilities. First, it is possible for a word to belong to one lexical class syntactically but to a different class morphologically. An example would be nouns in German converted from adjectives, a process that is particularly common in the case of participles. For instance, the word *Angestellte(r)* ‘employee’ is a noun derived from the passive participle *angestellt* ‘employed’. This word declines exactly like an adjective, not a noun. It even respects masculine/feminine gender morphology. Thus, a female employee is *eine Angestellte/die Angestellte* not **eine/die Angestellte* or whatever. However, its syntactic behaviour is in nearly all respects that of a noun and not an adjective. The only adjectival property that the word has in its syntactic relations is that it retains the adjectival distinction between ‘weak’ and ‘strong’ declension triggered by definite/indefinite determiners: *ein Angestellter* ‘an employee (masc.)’, strong declension after the indefinite article, *der Angestellte* ‘the employee (masc.)’, weak declension after the definite article. This type of relatedness has scarcely been discussed in the literature (but see Spencer 2002, 2005, 2007), but it is not uncommon. I have referred to this type of relatedness as ‘morphologi-

cally inert derivation' because it is as if the word has changed syntactic lexical category whilst its morphology remains 'inert'.

Another type of relatedness, which is rather more common, but even less discussed, is found when parts of a word's inflectional paradigm belong to the 'wrong' morphological class. In Spencer (2005, 2007) I discuss a number of examples of this sort, including the Russian past tense form. This looks exactly like a predicative adjective and takes agreements for adjectival features of gender and number but not person. The present tense forms, however, inflect for number/person but not gender, as is usual in the Indo-European verb system. I refer to this situation as 'morphological shift', because it is as though the word shifts its morphological class affiliation from one part of the paradigm to another. The Russian past tense form derives historically from a copula + participle perfect construction which then lost the copular/auxiliary verb component. The result is that the adjectival form was reinterpreted as a finite form expressing past tense. In all respects except agreement these forms behave like standard finite verbs, however, not like adjectives (they cannot be used as attributive modifiers, for instance). Such shifts are very common, especially in verb morphology, and they underline the independence of morphological category from syntactic category.

In a good many familiar languages much if not most of what is generally described as derivational morphology is independent of semantics. What this means is that we can identify recurrent types of morphologically complex word structure (morphological constructions in Booij's 2002, 2005 sense) which are not associated with any systematic meaning relation whatever. That is, we have a type of lexical relatedness which is defined solely over formal equivalence without any reference to semantics. In many languages, including German, this is perhaps the commonest form of lexical relatedness, though, again, it is hardly discussed in the literature. This is a form of relatedness which I call 'meaningless derivation'.

A simple example of this in English is provided by prefixed verbs of the kind *understand*. This is clearly composed of a prefix *under-* and a root *stand*, but neither component has a meaning which it contributes to the meaning of the word as a whole. Yet it is clear that the verb root, *stand*, is the same root as that of the fully fledged lexeme STAND 'assume a standing position', because they have the same irregular past tense/past participle allomorphy. Moreover, this is a recurrent pattern in English. A variety of meaningless roots which are homophonous with meaningful roots can combine with a variety of meaningless prefixes which are homophonous with meaningful prefixes, witness *undertake*, *undergo*, *withhold*, *withdraw*, *withstand*, among others. In some cases the prefix can be found with an identifiable meaning, related to that of the homophonous preposition: *underestimate*, *undershoot*. This, however, just serves to accentuate the semantic non-compositionality of examples like *understand*.

In contemporary morphology attention was first drawn to this phenomenon by Aronoff (1976) who discussed prefixed verbs which are like *understand*, but

based on Latinate prefixes and stems, such as *admit*, *commit*, *emit*, *permit*, *remit*, *transmit* and so on. One possible reaction to such examples is that both the Latinate type and the Germanic type in English may be very marginal phenomena. However, such an observation cannot be made of languages such as German or the Slavic languages where a very considerable proportion of the verb lexicon has exactly this character: a meaningless prefix attached to a meaningless root. Moreover, in languages with richer verb morphology than in English it is particularly obvious that we are dealing with verb roots which are essentially identical in all respects to real verbs, except that they have no meaning. For instance, the German verb *versprechen* ‘promise’ inherits all of its inflectional morphology from the verb *sprechen* ‘to speak’, but this meaning is not part of the meaning of ‘promise’. Again, the prefix *ver-* has a homophonous counterpart which can be associated with a specific semantics of doing badly or incorrectly, as in the alternative meaning of *versprechen* ‘to make a slip of the tongue, speak out of turn’.

3 Generalized Paradigm Function Morphology

It is clear that the standard terminology and the standard typology of lexical relatedness as defined in terms of inflection vs. derivation is quite inadequate to describe the sorts of lexical relatedness outlined here (and the types to be described below), even though many of these types of relatedness have been the subject of considerable research. It would be helpful, therefore, to have a descriptive framework for morphology and the lexicon which permitted us to state how words are related to each other without having to shoehorn the various types into a hopelessly inappropriate descriptive framework. It is for this reason that I have advocated a model of morphology which I refer to as Generalized Paradigm Function Morphology (GPFM) (see Spencer 2004, 2005, Luís and Spencer 2005).

The GPFM model is derived conceptually from the Paradigm Function Morphology of Stump (2001). In Stump’s model inflected forms of lexemes are defined by a paradigm function (PF). This function takes an ordered pair consisting of the root of a lexeme and a collection of morphosyntactic properties or features and delivers the word form which expresses those features on that lexeme. The paradigm function, PF, is itself defined in terms of sets of functions, which include functions for selecting the appropriate stem form (by default the lexical root) and functions which define which affix needs to be added in order to express a given morphosyntactic property set. Those functions are the realization rules.

In addition, there are rules of referral for defining syncretisms in the inflectional paradigm. In its simplest form, syncretism refers to a type of inflectional homophony, in which a single word form corresponds to two distinct morphosyntactic descriptions. For instance, in Latin the 1sg form of the future tense

(active and passive) of a 3rd or 4th conjugation verb is always identical to the corresponding person/number form of the subjunctive mood: from REGO ‘I rule’ we have *regam* ‘I shall rule’, rather than the form **regem*, which is what would be expected given the rest of the paradigm. In realizational models syncretisms of this kind can be handled in a variety of ways depending on the precise reason for the syncretic pattern, but where the syncretism seems totally unmotivated synchronically, as in the Latin example, we avail ourselves of the notion of a rule of referral. In Stump’s model this is a function which effectively says ‘to compute the 1sg future form for this class of verbs, first compute the corresponding subjunctive form and use that’. Specifically, a rule of referral in PFM (crudely speaking) would take the combination <VERB STEM, {1sg, Future, 3/4 conjugation}> and deliver another function <VERB STEM, {1sg, Subjunctive, 3/4 conjugation}>.

The realization rules and rules of referral are organized into blocks of rules which apply sequentially and disjunctively. For instance, a Hungarian noun takes inflectional suffixes for number, possessor agreement and case appearing in that order. This is captured by organizing realization rules into three blocks, I, II, III. In block I are the rules which define the various plural suffixes. Only one of these rules may apply in a given block (disjunctive application) capturing the notion of ‘paradigmatically opposed affix’. In block II we find rules expressing possessor agreement features and in block III are the rules expressing case features. For each block there are features expressed by the total absence of a suffix (singular number, no possessor agreement, nominative case). There are no realization rules for these properties in the grammar of Hungarian. Instead, where a feature value has to be expressed but there is no rule to express it, a general default rule applies (the ‘Identity Function Default’) which defines the current word form without change as the expression of that property set (in other words, the function that delivers the partially inflected form in that rule block is the identity function, the function that takes an object and delivers that object as its value).

The grammar of Hungarian will define the word form *házaimban* ‘in my houses’ (the inessive, 1sgPx plural form of HÁZ ‘house’) as

- (2) Paradigm function for *házaimban* ‘in my houses’
 PF(*ház*, {NUMBER:pl, POSSESSOR:1sgPx, CASE:inessive}) ⇒
házaimban

The non-possessed nominative singular form *ház*, is defined by three applications of the Identity Function Default.

- (3) Paradigm function for *ház* ‘house’
 PF(*ház*, {NUMBER:sg, POSSESSOR:none, CASE:nominative}) ⇒
 Block I *ház* (realizing NUMBER:sg)
 Block II *ház* (realizing POSSESSOR:none)
 Block III *ház* (realizing CASE:nominative) = *ház*

Paradigm Function Morphology is a purely realizational and inferential theory in the sense defined by Stump (2001: 1f). In a realizational model we start out with a full characterization of the feature content of a word form and then apply rules to determine what that word form is. The realization rules (and hence the paradigm function) cannot add a morphosyntactic property or semantic predicate to the representation, for instance. A realizational model can be contrasted with an incremental model, in which the rules add information. An inferential model is one in which the properties expressed by an inflected word form are defined by means of (something like) realization rules. This contrasts with lexical models in which an affix itself bears some feature set and this is then combined with the feature sets of the root and of other affixes (as in classical morpheme-based theories).

Classical morpheme-based theories are lexical because affixal morphemes are lexical entries in their own right with their own feature content (e.g. $-z = [\text{NUMBER:pl}]$). Those models are also incremental in the sense that a feature such as $[\text{NUMBER:pl}]$ on a word form such as *cats* is acquired by virtue of combining the $[\text{NUMBER:pl}]$ feature with the representation of the (numberless) root form *cat*. In a realizational-inferential model the fact that *cats* is the plural of CAT is a consequence of the fact that regular noun lexemes are subject to the paradigm function which says that $\text{PF}(\langle \text{root}, \text{NUMBER:pl} \rangle)$ is defined by means of the realization rule which takes the form (roughly) $\text{R}[\text{NUMBER:pl}](X) = Xz$ (for any representation X , including any lexical root).

The paradigm function in PFM is defined exclusively over morphosyntactic property sets. In particular, is difficult to generalize to any of the other types of lexical relatedness (including inherent inflection). This is because the paradigm function cannot add content to a representation, it can only realize a morphosyntactic (or morphosemantic) property. Thus, in order to capture derivational morphology Stump (2001: 252f) encodes semantic relatedness in terms of features which can be realized by realization rules.²

In order to generalize the standard PFM model to encompass all forms of lexical relatedness I have generalized the notion of paradigm function, as outlined in Spencer (2004, 2005) and Luís and Spencer (2005). The generalized paradigm function applies not just to a pairing of lexical root and morphosyntactic property sets, but to the complete lexical representation. For this reason, the generalized paradigm function, GPF, consists of four component functions f_{form} , f_{syn} , f_{sem} , f_{li} . Each of these component functions can be trivial (i.e. expressed as the identity function) or non-trivial (i.e. introducing some change in the value). In each case the function manipulates the representation, generally by adding to it. In the case of the f_{form} function, which defines the morphological form of

² More recent developments in PFM have considerably refined the conception of ‘paradigm’ by adding the distinction between ‘form paradigm’ and ‘content paradigm’, so as to capture a variety of complex relationships between types of paradigm (such as heteroclimis, deponency and periphrastic constructions), as well as periphrastic constructions (Ackerman and Stump 2004). See Stewart and Stump (2007), Stump (2002, 2005, 2006) for further discussion.

words, we can assume something similar to the standard PFM battery of realization rules. In Luís and Spencer (2005) it is argued that we need somewhat different apparatus in order to generalize affixal morphology to clitic systems. Since this refinement is irrelevant to the questions discussed here I shall ignore it and assume that the morphology is simply a function which adds appropriate allomorphs of affixes to a stem.

In slightly simplified form the generalized paradigm function takes the shape given in (4):

- (4) Generalized Paradigm Function:
 $GPF(\langle \text{LEXEME}, \sigma \rangle) =_{\text{def}} \langle \text{LEXEME}' \rangle$

I now show how each of the different types of lexical relatedness outlined in Section 2 is described using the generalized paradigm function.

(Contextual) inflection. Here, only the f_{form} sub-function introduces a non-trivial change. The syntactic and semantic properties remain unaltered, and since the function delivers an inflected form of the input lexeme the LI remains unaltered, too:

- (5) $GPF(\langle \text{WRITE}, \{3\text{sg}, \text{Pres}\} \rangle) =$

$$\begin{array}{ccc} f_{\text{form}} & & = \text{write } s \\ f_{\text{syn}} & f_{\text{sem}} & f_{\text{li}} \quad \text{identity functions} \end{array}$$

(Standard) derivation. Here, all aspects of the lexical representation undergo some change, so all four sub-functions $f_{\text{form}}, f_{\text{syn}}, f_{\text{sem}}, f_{\text{li}}$ are non-trivial:

- (6) Where $\sigma = \text{SubjectNominal}$
 $GPF(\langle \text{WRITE}, \sigma \rangle) =$

$$\begin{array}{l} f_{\text{form}}(\sigma) = \text{write } er \\ f_{\text{syn}}(\sigma) = \text{Noun} \\ f_{\text{sem}}(\sigma) = [\text{PERSON}(x), [\text{WRITE}(x,y)]] \\ f_{\text{li}}(\sigma) = \text{ER}(\text{WRITE}) \end{array}$$

This is now equivalent to a complete new lexical entry, (whose LI could equally be labelled ‘WRITER’). This derivational relationship is extremely regular and productive, and so I have followed Stump in giving it its own feature label, in this case, ‘SubjectNominal’. This label is a unary feature, however, reflecting the fact that derivation is not paradigmatic in the exactly the same sense that inflection is paradigmatic. Similarly, I have derived the new lexemic index from the input lexeme, reflecting the fact that WRITER does not exist in the lexicon in a vacuum.

Assuming that the SubjectNominal relation represented in (6) is, indeed, a regular and productive, rule-governed part of English morphology we can represent the rule that gives rise to *-er* subject nominalizations as in (7), where ‘er’ is a shorthand for the SubjectNominal property:

- (7)
- | | |
|-------------------|----------------------------|
| $f_{form}(V, er)$ | = <i>verb er</i> |
| $f_{syn}(V, er)$ | = Noun |
| $f_{sem}(V, er)$ | = [PERSON(x), [VERB(x,y)]] |
| $f_{li}(V, er)$ | = ER(VERB) |

In (8) we see an exceptional output of this process, the suppletive form *pilot*, the SubjectNominal of the verb FLY:

- (8)
- | | |
|----------------------------|---------------------------|
| GPF(<FLY, SubjectNominal>) | = |
| f_{form} | = <i>pilot</i> |
| f_{syn} | = Noun |
| f_{sem} | = [PERSON(x), [FLY(x,y)]] |
| f_{li} | = ER(FLY) |

The f_{syn} , f_{sem} , f_{li} functions are inherited from the general scheme in (7). Only the f_{form} function is overridden in (8).

Inherent inflection. In Section 2.2 I illustrated inherent inflection with the example of the Hungarian essive-formal case. In inherent inflection in the sense I adopt, the generalized paradigm function adds a semantic predicate.

- (9)
- | | |
|---|----------------------|
| Essive-formal case Hungarian | |
| GPF(<SHIP, {NUMBER:Pl, CASE:Ess-Form, POSSESSED:no}>) | = |
| f_{form} | = <i>hajó k ként</i> |
| MorClass | = N [by default] |
| f_{sem} | = AS[SHIP(x)] |

In (10) we see the general rule/schema/template for essive-formal case inflection (where N' is some legitimate, possibly inflected, form of a lexeme NOUN):

- (10)
- | | |
|--|--------------------|
| Realization rule schema for essive-formal case | |
| f_{form} | = N' <i>ként</i> |
| [MorClass] | = N -default] |
| f_{sem} | = AS[NOUN(x)] |

Transposition. The transposition relation will play an important role in what follows. Recall that a transposition is found when a process alters the morpho-syntactic category of a lexeme, complete with its own inflectional paradigm, without actually creating a new lexeme. In (11a) we see the basic lexical entry for the Russian verb KOMANDOVAT' 'to command', and in (11b) we see the result of applying the GPF for the property Present Participle (PresPart):

- (11) a. Lexical representation of KOMANDOVAT' 'to command'
- | | |
|--------------------------------|---------------------------|
| $f_{form}(\text{KOMANDOVAT}')$ | = Stem0: <i>komandova</i> |
| | Stem1: <i>komanduj</i> |
| | MorClass:V |
| $f_{syn}(\text{KOMANDOVAT}')$ | = SynClass: V |
| | A-structure: <E <x <y>>> |
| | <SUBJ, OBJ> |
| | OBJ CASE = Instrumental |

$f_{sem}(\text{KOMANDOVAT}')$	= [COMMAND(x, y)]
$f_{it}(\text{KOMANDOVAT}')$	= COMMAND
b. Present participle transposition	
$f_{form}(\text{KOMANDOVAT}', \text{PresPart})$	= Stem0: Stem1+ <i>ušč(ij)</i>
	= <i>komand-ujušč(ij)</i>
	MorClass:Adj
$f_{syn}(\text{KOMANDOVAT}', \text{PresPart})$	= SynClass: Adjective
	A-structure:
	<A ⁺ <E <(x ⁺) <y>>>>
	<(SUBJ ⁺), OBJ>
	(OBJ CASE = Instrumental)
$(f_{sem}(\text{KOMANDOVAT}', \text{PresPart}))$	= [COMMAND(x, y)]
$(f_{it}(\text{KOMANDOVAT}', \text{PresPart}))$	= COMMAND

The notation <A⁺ <E <(x⁺) <y>>>> and (SUBJ⁺) is an ad hoc way of representing the fact that the subject argument of the basic verb is not expressed as such, but rather is co-indexed with the noun modified by the participle (see Spencer 1999 for detailed justification of the 'A' semantic function). The dimensions of the representation given in parentheses are those which are inherited from the basic verb representation, and are therefore defined in terms of (the equivalent of) Stump's Identify Function Default.

4 Implications of types of lexical relatedness

There are a number of obvious conclusions arising from this perspective on lexical relatedness:

1. Usually argument-structure is predictable from semantics but not (quite) always.
2. Usually, SynClass is predictable from a-structure (perhaps always predictable, depending on how a-structure is defined; see Spencer 1999 for proposals).
3. Quite often, but by no means always, MorClass is predictable from SynClass. In many languages, MorClass is defined independently (i.e. where we have inflectional classes).

Point 3 will become important in our discussion of nominalizations. A less obvious conclusion is:

4. The components of a lexical representation can be related to other lexical representations (almost) independently.

The caveat ‘almost’ in 4. refers to the fact that it is difficult to see how one would justify treating two entries as distinct lexemes with distinct lexemic indices if they had exactly the semantics, syntax and form. (Where two lexical entries have the same values for FORM/SYN but distinct SEM/LI values we have classical homophony, e.g. *bank*; where two entries have the same SYN and SEM values, but distinct FORM and LI values we have (perfect) synonymy).

The observant reader will have noted that the generalized paradigm function approach defines a model of morphology which does not quite belong to the class of realizational-inferential models that Stump defines. Recall that in a (purely) realizational model of inflection the realization rules and the paradigm function generally serve to realize features without adding any features and without specifying any feature values and certainly without adding any semantic predicates to the lexical representation. This distinguishes the Paradigm Function model from incremental approaches, in which realization rules are allowed to specify or add content.

Now, an early example of an inferential-incremental model of morphology was the model of derivational morphology proposed by Aronoff (1976). He argued that derivation should be captured by word-formation rules (wfr) which had two effects. One was to add an affix (or perform some other morphophonological operation) and the other was to add a meaning. In my illustration of the SubjectNominal process in English, we have a realizational process, in the sense that the process is triggered by a grammatical property (labelled ‘SubjectNominal’). The process does not specify a value for an (underspecified) morphosyntactic feature SubjectNominal, rather, the process realizes that feature by specifying a morphophonological process over the verb root, just as in the case of an inflectional process. However, as in Aronoff’s original model, the subject nominalization process also serves to add a semantic predicate, as well as incrementally altering the lexemic index of the lexical representation.

I believe that Aronoff’s original conception is a more adequate way of representing derivational relationships and word stock expansion generally. However, canonical inflection is still governed by morphosyntactic property sets and involves no added featural or semantic content. The exception is what I have called inherent inflection, in which we have to accept that the inflectional relation itself serves to enrich the semantic representation. Thus, I am arguing that strictly derivational morphology is in part incremental, not purely realizational, and that some inflection is incremental too. However, these processes are incremental not by virtue of filling in feature values, but only by virtue of adding semantic content to the SEM representation (and perhaps adding information to the lexemic index). In that sense, the model retains the essential characteristics of a realizational model as proposed by Stump: where regular lexical relations are concerned, for instance, regular and semantically transparent derivational morphology, the generalized paradigm function serves to realize a derivational

feature. However, the generalized model includes additional functions which operate over semantic representations and the lexemic index. It is here that the incremental aspect of the model appears.

The resulting model cannot therefore be accurately labelled as either realizational or incremental. The more canonically inflectional a process is the 'purer' it is as a realizational process, while the more canonically derivational a process is the more it resembles an incremental process. The Generalized Paradigm Function model is therefore a mixed model, combining properties of Stump's approach to inflection with Aronoff's approach to derivation.

5 Transpositions revisited

5.1 Functions of transpositions

In this section I return to my principal focus, the class of transpositions. All three major lexical classes (noun, verb, adjective) can be the input to a transposition process and the output too can be either noun, verb, or adjective. For those transpositions that output a verb or an adjective the process is often purely a-semantic, in that no semantic predicate is added to the lexical representation of the output word. The morphology in these cases serves an essentially syntactic role, namely, to put the word (or the entire phrase that it heads) into a different syntactic category so that it can be used or modified in ways that would be difficult for the original, basic category. For instance, in most languages an ordinary verb phrase cannot be used to modify a noun. A simple way of permitting this is to create a special adjectival form of the lexical head of the verb phrase which can then be used to modify the noun. Such a form is traditionally called a participle. Its principal, and sometimes only, use is to permit a verb to act as an attributive modifier (in the absence of, or alongside of, a relative clause forming strategy).

Nominalizations of verbs (event nominalizations, action nominalizations) often fulfil such a syntactic role, but in many cases even highly productive nominalizations are accompanied by additional semantic nuances which are sometimes rather subtle. Although these nuances are well-known there has been very little attempt to assess their significance for the theory of lexical relatedness, derivational morphology or linguistic theory generally. However, before we examine the action nominalizations it will be appropriate to put the issue into its appropriate context, so I begin with a brief survey of the types of transpositions found cross-linguistically, to supplement the earlier introductory comments.

5.2 Typology of transpositions

If we assume that a language will generally have up to three major lexical categories, N, V, A, then there are logically six possible types of transpositions (see Spencer 2005):

(12) Typology of transpositions

Cat transposed to	Cat	traditional name
V	N	event/action nominalization
V	A	participle
N	A	relational adjective
N	V	predicative noun
A	N	property nominalization
A	V	predicative adjective

Note that I am assuming here that adjectives are canonically attributive modifiers, and only secondarily syntactic predicates.

The transpositions whose output categories are adjectives and verbs are relatively straightforward. These are participles and relational adjectives (output category A) and predicative nouns and adjectives (output category V). I shall have little to say about the latter. They are found in languages in which nouns and adjectives inflect for verbal features such as tense/mood/aspect and subject agreement, in the manner of verbs. Thus, they include expressions translatable as ‘... is a man/tree’ or ‘... is tall’. Note that my characterization of verb-output transpositions differs from that of Beard (1995: 179f, 191f) who regards denominal and deadjectival causatives as transpositions. These are not (pure) transpositions in my terms, however, because they involve the addition of a semantic predicate, indeed one which makes a significant contribution to the argument structure of the derived verb. Any language which permits adjectives or nouns to inflect for some or all verbal properties and hence head the predicate of the clause will instantiate the transposition to verb. I will ignore the possibility of treating copula + Noun/Adjective constructions as periphrastic transpositions, though this is in principle possible.

The transpositions whose outputs are verbs or adjectives are relatively uncontroversial exemplars of the kind of a-semantic lexical relation that I defined earlier in Section 2. Where an adjective or noun is used as the head of the predication there is clearly no (necessary) additional semantic predicate. Similarly, deverbal participles are relatively uncontroversial in a number of Indo-European languages, and many other groups, particularly where no valency alternation is involved. Thus, in Russian the verb *komandovat* ‘to command’ takes an instrumental case marked complement: *komandovat’ armij-ej* ‘to.command an.army-INSTRUMENTAL.SG’. All Russian verbs regularly form a present active parti-

1988 for use of the term ‘mixed category’ in the context of Quechua nominalizations). The problem is very clear from English nominals. In (14a) we clearly have a noun form (though one which is probably the result of conversion from the verb). In (14b) we have a nominalization which behaves as a noun syntactically. In (14g, h, i) we have uncontroversial instances of infinitive forms of verbs. In (14f) the verb *stop* takes an object and a null-subject *-ing* complement. In (14e), we have an *-ing* form of the verb after a perception predicate which denotes a witnessed event. It seems reasonable to say that such a clause is headed by a verb. In (14d) we have what seems to be a non-finite clause headed by the *-ing* form. Note that we can use the periphrastic perfect aspect of the *-ing* verb form. In (14c) we see an instance of a classically mixed category (the so-called ‘POSS-ACC’ construction, Abney, 1987). The object argument of the verb is expressed in the normal way, but the ‘subject’ argument is expressed as a ‘possessor’, and the verb itself is modified by a (prenominal!) adjective *skillful* not an adverb *skillfully*:

- (14) a. Harriet’s drive (lasted two hours)
 b. Harriet’s skillful driving/*having driven of the van (was a great relief)
 c. Harriet’s driving/having driven the van (so skillfully) (surprised us)
 d. Harriet driving/having driven the van (so skillfully) (surprised us)
 e. We saw Harriet driving the van
 f. I stopped Harriet driving the van
 g. For Harriet to drive the van (would be sensible)
 h. I encouraged Harriet to drive the van
 i. I expected Harriet to drive the van

As Koptjevskaja-Tamm (1993: 33) points out, citing Russian, it is often possible to distinguish fairly clearly between the non-finite but clearly verbal infinitive form of a verb and the nominalized form. However, in a variety of languages the form which bears closest resemblance to the Standard Average (Indo)-European type of infinitive acquires nominal properties. For instance, we find languages in which the infinitive takes possessor morphology to cross reference its subject (Hungarian, and from the Romance family, Portuguese, Sardinian and certain Italian dialects are well-known instances). I will discuss the problem of nominalized infinitives in more detail below.

Constructions such as those in (14b–f), especially where one and the same morphological form permits a variety of morphosyntactic construction types, pose very severe problems for any theory of morphology~syntax interactions, and for any model of lexical representations. Inasmuch as they are examples of transpositions they pose problems enough for linguistic theory, but given their ‘mixed’ behaviour they undermine the most basic categorization systems upon which our analyses are built and for that reason are particularly interesting.

6.2 The semantics of nominalizations

A key question for my discussion of nominalizations as transpositions will be the precise semantic interpretation of a nominalized phrase. What sets pure transpositions apart from canonical derivational morphology or inherent inflection is the fact that the transposed category does not acquire any additional semantic properties. In this respect the transposition differs from closely related (often homophonous) constructions which denote objects, or the material results of the action of a verb. For instance, the English noun *mixture* from the verb *mix* can only denote a substance that results from mixing something, it cannot denote the act of *mixing*. It is therefore a result nominalization, and it is an example of straightforward (canonical) derivational morphology. A noun such as *translation* on the other hand is ambiguous between a result nominal reading (*someone spilt coffee over my translation of 'War and Peace'*) and an action nominal reading (*the translation of the novel took three years; cf. translating the novel took three years; it took three years to translate the novel*).

A nominalization which functioned as a pure transposition would simply take a verb phrase or clause and express it as a noun phrase, without any additional meaning change. This type of transposition is found quite often in languages such as Turkish which express subordination through nominalized clauses. Koptjevskaja-Tamm (1993: 46f) cites examples (15) from the descriptive grammar of Underhill (1976). In (15) the nominalization is derived by means of suffixation of *eceğ-/diğ-* followed by a possessor agreement marker cross-referencing the genitive case marked subject, and finally affixed with an accusative case marker to indicate that it is the complement of the main verb:

- (15) Halil'in gel-eceğ-in-i
 Halil.GEN come-PTCP.FUT-3SG.POSS-ACC
- Halil'in gel-diğ-in-i
 Halil.GEN come-PTCP.NONFUT-3SG.POSS-ACC
- bili-yor-um
 know-PRES-1SG
 'I know that Halil will come/came, comes'

In (16) we see the 'short infinitive' in *-me/ma*, also followed by a possessor agreement and a case suffix:

- (16) Ahmed-in erken yat-ma-sın-a alıştı-yor-uz
 Ahmed-GEN early go.to.bed-INF-3SG.POSS-DAT get.used-PRES-1PL
 'We are getting used to Ahmet's going to bed early'

The subordinate clause is here expressed by means of a nominalized verb form (sometimes called a 'masdar') which takes a subject marked in the genitive case (rather than the nominative) and which takes possessor agreement with that subject (rather than agreeing in the manner of a finite verb). Turkish also provides

instances in which the nominalized clause functions as an adverbial (called ‘gerunds’, ‘converbs’ amongst other things). In many cases the nominal morphology adds a temporal, causal or other meaning (‘before/after/because of/despite ... doing’) but in some cases the function of the nominal is simply to subordinate the clause to the main verb. Examples are given in (17, 18) (adapted slightly from Ersen-Rasch, 2007: 151, 186):

- (17) -(y)ErEk converb (glossed ‘EREK’)
 Yasemin gül-erek odaya girdi/giriyor/girecek
 Yasemin laugh-EREK into.room came/comes/will come
 ‘Yasemin came/comes/will come into the room laughing’
- (18) -(y)Ip converb (glossed ‘IP’)
 Telefon et-me-yip mektup yazdım
 telephone do-NEG-IP letter wrote
 ‘I didn’t phone, but I wrote a letter’

However, when we look at action nominalizations in other languages we often find that, in an important sense, the nominalizations are not pure transpositions: it is not uncommon to find that even very regular action or event nominalizations acquire subtle additional meanings, or undergo subtle alterations in meaning. This observation has important consequences for any treatment of deverbal nominalizations, though it is an observation whose significance is generally overlooked.

Koptjevskaja-Tamm (1993) provides a convenient summary of the meanings typically expressed by deverbal nominals, based on the well-known taxonomy of Vendler (1967), under which subordinate clauses and nominalized phrases can denote a proposition, a fact, an event or a manner of action. A somewhat more exhaustive treatment is offered by Zucchi (1993). He argues that we need to distinguish three types of referent in our ontology: events (or better, eventualities, including states), propositions and states of affairs. Specifically, the phrases *the performance of the song* and *the performing of the song* denote eventualities while *her performing the song* is close in meaning, though not identical to, the finite subordinate clause ... *that she performed the song*, and therefore denotes something like a proposition.³ For instance, we can say *The soprano’s performance of the song lasted three minutes* or *The singing of all the songs took longer than expected*.

Zucchi (1993: 207f) argues that gerundive or POSS-ACC constructions such as *her performing the song* are different semantically from true nominals such as *performance* or POSS-GEN nominals such as *her performing of NP*. The POSS-ACC construction denotes a state of affairs. States of affairs are not events and do not have endpoints, durations and so on. Like propositions, we can be (or be made) aware of states of affairs, but unlike propositions states of affairs cannot be true or false and they cannot be objects of belief. Thus, we can

³ I replace Zucchi’s examples with somewhat more idiomatic ones; in particular, *performing of the songs* is cumbersome given the existence of the more idiomatic *performance of the songs*.

say *It is not true that the soprano performed the song* or *Mary believes that the soprano performed the song*, but we cannot say *The soprano's performing the song is not true* or *Mary believes the soprano performing the song*.

Zucchi deploys these distinctions in analysing the Italian Infinito Sostantivato. This is an infinitive verb form used as a nominal and its syntax is similar to that of the POSS-ACC gerundive nominal in English. It can take a normal direct object and it can nominalize the perfect aspect form of a clause (I use my own glossing for Zucchi's examples):

- (19) l'-avere egli scritto questa lettera
 the-have.INF he written that letter
 'his having written that letter' [S-infinitival NP]
- (20) il suo mormorare sommessamente
 the his/her whisper.INF soft-ly
 'his/her whispering softly' [VP-infinitival ADV]
- (21) il suo mormorare parole dolci
 the his/her whisper.INF sweet words
 'his/her whispering sweet words' [VP-infinitival NP]

The Infinito Sostantivato can be ambiguous, and behave more like a true noun, taking adjectival modifiers and direct object arguments expressed with a prepositional phrase:

- (22) il mormorare somnesso del mare
 the whisper.INF soft of.the sea
 'the soft whispering of the sea' [N-infinitival NP]

I have provided Zucchi's descriptive labels for the three types of infinitival he distinguishes. The S-infinitival behaves like the nominalization of an entire clause, including the subject, expressed as an ordinary (full-form) personal pronoun, *egli*, after the infinitival auxiliary. The VP-infinitival behaves like a nominalization of the VP, taking a direct object and being modified by adverbs, but expressing the verb's subject in the manner of a NP possessor with a possessive adjective, *suo*. The N-infinitival behaves like a noun.

Zucchi (1993: 248f) discusses the semantics of the Infinito Sostantivato and points out that the S-infinitival and the VP-infinitivals both have the distribution of propositions, as expressed by the translation equivalents of *the fact that NP*:

- (23) a. l'-avere egli compiuto i primi studi in Francia
 the-have.INF he finished the first studies in France
 'His having completed his first degree in France' [S-infinitival]
- b. il fatto che egli abbia compiuto i primi studi in Francia
 the fact that he had finished the first studies in France
 'The fact that he had completed his first degree in France'
- spiega come la sua attività letteraria si irradi da Parigi
 explains how his literary activity spread from Paris. (p. 248)

- (24) a. Gianni apprezzail tuo eseguire la sonata
 Gianni appreciates the your perform.INF the sonata
 ‘Gianni appreciates your performing the sonata’ [VP-infinitival]
- b. Gianni apprezza il fatto che tu
 Gianni appreciates the fact that you
 abbia eseguito la sonata
 had performed the sonata
 ‘Gianni appreciates the fact that you performed the sonata’

Neither type denotes an event. The N-infinitivals, on the other hand, do not denote propositions but they do denote events. Thus, (24a) above does not entail that Gianni appreciated the actual performance, merely the fact that a performance took place. The N-infinitival in (25), however, denotes the event itself:

- (25) Gianni apprezza la tua esecuzione della sonata
 Gianni appreciates the your performance of.the sonata
 ‘Gianni appreciates your performance of the sonata’
 [N-infinitival]

In fact, it would presumably be more accurate for Zucchi to claim that the VP-infinitival, if not the S-infinitival, denoted a state of affairs rather than a proposition (see Zucchi’s footnote 22, p. 262, where he points out that the S-infinitival is incompatible with genuinely propositional predicates such as *...is true/false*).

There are three important points about the Italian nominalized infinitive to bear in mind. First, it is a use of the infinitive form of the verb. This is somewhat obvious in the case of the Italian (and the very similar Spanish) construction, but the significance of the observation will become apparent when we consider German nominalized infinitives.

The second point is that the infinitive occurs in several different syntactic constructions in which it shows noun and verb properties to varying degrees. The question arises, therefore, whether the nominalized infinitive is ‘really’ a noun or ‘really’ a verb in constructions such as (19–22, 24) above. The same question can be asked about the POSS-ACC use of the *-ing* form of English verbs, of course. What this means for a general theory of lexical relatedness is that the rule relating the base verb (or the totality of inflected forms of the base verb) and the nominalized infinitive must be able to impose conditions on the syntax of the resulting nominal, and especially on the way it does or does not express verbal categories, noun categories and the underlying verb arguments.

The third point is that the different uses of the nominalized infinitive are associated with different types of meaning. It is not particularly relevant to our present concerns just where the semantic differences lie and how they should best be analysed. There is a general concensus that the more verb-like forms tend to express more propositional types of meaning (or perhaps states of affairs), while the more noun-like forms tend to denote something like events. The point is that there are meaning differences for different usages of one and the

same form as well as (more systematic) meaning differences between different types of nominalization.

Where do these semantic differences come from? On the basis of the Italian Infinito Sostantivato, the English POSS-ACC construction and many other such constructions cross-linguistically, it would be tempting to say that propositional semantics is an effect of the entire construction in which the nominalization participates. The more evidence there seems to be for some kind of verb phrase or even clausal structure internal to the nominal phrase the more sentential, i.e. propositional, the semantics. While there may be some statistical truth to this it cannot be held as an absolute principle, however. First, the Turkish *masdars* in (15, 16) above illustrate a highly nominal construction that expresses a proposition in much the same way as an English finite subordinate clause. Second, as Koptjevskaja-Tamm (1993) points out there are languages in which a nominalization has almost the same syntax as a finite clause but still expresses the kinds of meanings associated with nominalizations.

6.3 Nominalizations in German

German has a variety of types of nominalization. A summary is provided by Motsch (2004: 324f). The two most common and productive types are the *-ung* nominal and the nominalized infinitive. There are also minor, non-productive morphological types, such as *-e* suffixation (*fragen* ‘ask’, *Frage* ‘question’), ablaut (*fliegen* ‘fly’, *Flug* ‘flying’) or conversion (*rufen* ‘to call’, *Ruf* ‘calling’). The *-ung* nominal is a feminine gender noun which can be formed from a large number of verbs. However, in some cases an *-ung* derivative is blocked by an exceptional form. Thus, we do not find nominals of the form **Fragung*, **Fliegung* or **Rufung*. The other type of nominal is the infinitive used as a noun (variously called ‘substantivierter Infinitiv’ or ‘nominalisierter Infinitiv’). This is simply the infinitive form of the verb used as a noun. It is generally said that any verb can form a nominalized infinitive, much as in Italian, and that there are no semantic restrictions on the resulting nominal (though see Blume, 2004, for a dissenting view).

I shall ignore the exceptional types of nominal and concentrate just on the *-ung* forms and the nominalized infinitive. Motsch (2004: 329) points out that both types can denote what he calls events-as-facts (‘Geschehen als Tatsache’), processes and events in general (‘generelles Geschehen’). From his examples, it seems that ‘generelles Geschehen’ means essentially a propositional nominalization, corresponding to *the fact that S*. In (26) we see examples derived from the verb *erstürmen* ‘to (take by) storm’:

- (26) Die Erstürmung }
 Das Erstürmen } der Hauptstadt beendete den Krieg
 The storming the.GEN capital ended the war
 ‘The storming of the capital ended the war’

- (27) Die Erstürmung }
 Das Erstürmen } der Hauptstadt bedeutet meist das Ende eines Krieges
 The storming of the capital means usually the end of a war
 'The storming of the capital usually means the end of a war'

As can be seen from these examples the morphosyntax of both types of example is virtually identical, and in each case it is the morphosyntax of a noun. The direct object of the base verb is expressed as a genitive case marked complement to the noun. The noun itself is specified by a definite article. The nominalized infinitive is modified by an adjective form, *ständige*:

- (28) a. Hans liest ständig Krimis
 Hans reads continually crime.novels
 'Hans is always reading crime novels'
- b. Das ständig-e Lesen von Krimis
 the.N continual-N.SG.NOM read.INF of crime.novels
 (durch den Hans)
 (by the Hans)
 'the continually reading of crime novels (by Hans)'

Motsch points out the well-known aspectual difference between the *-ung* nominal and the infinitival nominal:

- (29) Die Erstürmung }
 Das Erstürmen } der Hauptstadt dauerte einen Tag
 The storming of the capital lasted one day
 'The storming of the capital lasted for one day'

Here, the *-ung* nominal has a telic or perfective interpretation which is lacking in the nominalized infinitive. That is, *Erstürmung* refers to the completed act of storming the city, while *Erstürmen* denotes the process itself. This is particularly remarkable given that German verbs do not grammaticalize aspect themselves. In this sense, we must regard the telic interpretation of the *-ung* nominal as an additional semantic component acquired over and above the basic verb semantics.⁴

Nominalized infinitives have received less attention in the general literature than have the *-ung* nominalizations. In particular, there is very little discussion of another use of the nominalized infinitive, which Bierwisch (in press) has recently called the 'verbal nominal'. This use is much closer to the Italian Infinito Sostantivato or the English gerundive nominal, in the sense that the nominal's arguments and modifiers retain the form they would have for the base verb. The

⁴ Shin (2001) provides a number of other interesting observations about the semantics of and semantic restrictions on *-ung* nominalizations. These all strengthen my final conclusions about lexical relatedness and nominalizations.

principal indication that the infinitive is actually a noun is the fact that it takes a determiner. Grosz (2008) provides a wealth of examples of the construction illustrating just how much of the syntactic structure of the base clause is retained in such nominals. Bierwisch (in press) provides the following examples:

- (30) a. das sich einer neuen Aufgabe Zuwenden
 the self a new task turn.to.INF
 ‘the turning to a new task’
- b. das ihm die Arbeit Überlassen
 the he.DAT the work leaving
 ‘the leaving him the work’
- c. das alles überdenken Wollen
 the all think.over.INF want.INF
 ‘the wanting to think it all over’
- d. das sich immer schon informiert Haben
 the self always already informed have.INF
 ‘the being always already informed’
- e. das In-der-Welt-Sein
 the in-the-world-be.INF
 ‘the being-in-the-world’
- f. das Geschlagen Werden vom Bären durch’n Peter
 the hit.INF BE.INF BY.THE bear BY.THE Peter
 ‘the bear’s being hit by Peter’

In (30a, d) we see reflexive pronouns as complements to the verbal nominal. In (30b) we see a dative case complement and in (30c) an infinitival complement (which itself has an object). In (30d) we also see that we can have a verbal nominal of a periphrastic *have*-perfect. In (30f) (taken from Grosz 2008) we see that the passive, too, can be turned into a verbal nominal.

The verbal nominal usage of the nominalized infinitive is particularly interesting from a typological point of view. The purely nominal usage corresponds to Koptjevskaja-Tamm’s (1993: 60f) second major type of nominalization (more specifically, her OBL-POSS subtype), while the verbal nominal usage corresponds quite closely to her first type, SENT, as illustrated by Korean and Archi. Thus, German nominalized infinitives are constructionally homophonous in the same way that English *-ing* nominalizations are. English nominalizations correspond either to the ERG-POSS, the POSS-ACC or a modified version of the SENT marking pattern (sometimes treated as a non-finite clause: *We were surprised at [Mary writing the article so quickly]*). The German fails to show the mixed POSS-ACC pattern in which the subject behaves as a possessor and the object remains an object.

When we consider the German nominalized infinitive or the verbal nominal we find that it has very much the same uses and distribution as the Italian In-

finito Sostantivato construction. This means that it typically expresses a state of affairs. Again, this means that we have a transposition which is not ‘pure’, because it involves the addition of a (subtle) aspect of meaning.

Before I propose a way of describing such a situation I turn briefly to Russian nominalizations, which help establish a similar point.

6.4 Russian nominalizations

Russian distinguishes two grammatical aspects, perfective and imperfective. Broadly speaking, perfective form verbs denote completed events while imperfective form verbs denote processes, iterated events, habitual events and so on. All verbs with telic semantics are basically perfective but also form an imperfective which is required in certain lexical and grammatical contexts. A comparatively small number of verbs have morphologically simple stems and these are mainly atelic and imperfective in aspect. Most verbs in Russian are prefixed, and nearly all prefixes (to the extent they have a meaning) induce a telic reading. Such verbs regularly form what is traditionally called the secondary or derived imperfective. Thus, the unprefixated, simplex verb *pisat'* ‘write’ denotes an activity and is imperfective. It can be used either without a direct object, or with an indefinite object, e.g. *pisat' pis'ma* ‘write letters’. From this we can use the prefix *raz-* to derive a telic verb *raspisat'* ‘write out’. This form is perfective. A regular secondary imperfective can be formed by means of the suffix *-yv-*: *raspis-yv-at'*. In addition, there is a form prefixed with *na-*, *napisat'* which also means ‘write’ but which is telic. A prefix such as *na-* in this case is generally regarded as semantically empty. The corresponding imperfective form is not, however, the expected **napisyvat'*. Rather, we find the unprefixated form used as the ‘secondary’ imperfective, which is thus homophonous with the related activity (atelic) verb.

Russian verbs are nominalized by a variety of morphological means (see Sadler, Spencer and Zaretskaya 1997 for more detailed discussion and references): conversion of the root with accompanying palatalization of the final root consonant (*rospis'* ‘mural’ from *raspisat'*), suffixation of *-ka* (*pobelit'* ‘to whitewash, bleach (perfective)’, *pobelka* ‘whitewashing, bleaching’), but most commonly by suffixation of *-anie/-enie* (the choice of allomorph is determined principally by conjugation class). Sometimes we find perfective verbs taking this suffix. The nominal can have a variety of readings. For instance, *raspisanie* from *raspisat'* ‘write out (perfective)’ has the idiosyncratic result reading ‘time-table’, while *spisanie* from *spisat'* ‘copy out’ has a regular process or action nominal reading ‘copying out’. However, secondary imperfectives derived with the suffix *-yv* invariably form a nominal with *-anie* and this nominal only ever gives rise to an action nominalization (with six lexical exceptions): *raspisyvanie* ‘writing out’, *spisyvanie* ‘copying out’ and so on. Moreover, the meaning of the action nominal is always processual, it never denotes a completed event. In this

respect, the morphology preserves the imperfective aspect of the base verb. However, this aspect preservation effect is not found with perfective verb bases. For instance, the nominalization *pobelka* ‘whitewashing, bleaching’ cited above is derived from a perfective verb but the noun is an action nominal with processual, that is, imperfective meaning. It is not generally possible to derive an action nominal from a perfective verb, preserving the underlying aspect. In this respect Russian differs from Polish, where nominalizations can preserve the aspectual contrast: *pisać* ‘to write (imperfective)’ ~ *pisanie* ‘(process of) writing’, *przepisać* (perfective) ~ *przepisanie* ‘(completed act of) writing’.

What this means is that we have a grammaticalized aspectual distinction which is (largely) preserved in Polish but which in Russian is half lost: only the imperfective verbs preserve the imperfective reading, while perfective verbs behave in a more or less unpredictable fashion with respect to aspect (and with respect to semantics generally). This situation can be contrasted with that of German. There, the *-ung* nominals acquire an aspectual nuance which is lacking in the base verb. In the case of Russian nominalizations, the semantics implied by the imperfective aspect form is preserved but not that implied by the perfective form. However, in both cases we find that the grammar and lexicon need to be able to specify semantic properties of the nominalization, so that the nominalization process cannot be said to be free of semantic specification or restriction.

7 Defining nominalizations in Generalized Paradigm Functional Morphology

The survey of nominalization properties in Italian, German, Russian and other languages makes it clear that we need a model of description which permits us to capture the following features of action/event nominalizations:

1. The nominalization process serves principally to create a noun phrase corresponding to the base verb phrase, including realization of the base verb’s arguments and modifiers.
2. The nominalization process creates a noun which may acquire only a subset of the normal noun morphosyntactic properties.
3. The nominalization process creates a noun which may retain a number of (less core or canonical) verb morphosyntactic properties.⁵

The nominalization in some cases may add no semantic content whatever to the original verb, serving simply to name the event denoted by the verb phrase or clause headed by the base verb. However, in other cases it may additionally acquire semantic nuances which do not substantively alter the conceptual meaning of the base verb but which complement it. For instance, the nominalization may

⁵ For an important cross-linguistic survey of the way that nominalizations acquire noun features and lose verb features quasi-independently see Malchukov (2004).

permit reference to otherwise inaccessible phases or may add aspectual nuances (e.g. the German *-ung* nominals). Very commonly the nominalization will additionally acquire semantic nuances which can be informally characterized as the name of a state of affairs (or perhaps proposition), the name of an event, the fact-that-S, and a number of others.

Given this summary I turn to the way in which the nominalization relation can be represented in the GPFM model. Recall that systematic lexical relatedness of all kinds is defined by the Generalized Paradigm Function, GPF, which consists of four component functions mapping FORM, SYN, SEM and LI attributes to (possibly new) values. In languages with regular nominalizations we need to set up a feature, say, Nom, which will trigger the application of the GPF for the appropriate class of lexemes. In other words, our starting point will be the function $GPF(<VERB, \{Nom\}>)$.

I will start with the semantic aspects and then discuss the syntax and morphology before finally turning to the question of whether a nominalization represents a distinct lexeme or not. The analysis, especially of the semantics, will necessarily be very sketchy and I would anticipate that there will be much better ways of analysing these phenomena, but my aim is modest, namely, to lay out the questions that ought to be answered rather than provide definitive answers.

What is the SEM value of a derived nominalization? In the simplest cases a nominalization will involve absolutely no change whatever in the semantic representation. This is what we would expect from a true or pure transposition (and is arguably what we get with participles, where the verb has the outward form of an adjective but remains a verb in every other respect). In such cases the nominalized form is simply a morphosyntactic device, say, for getting a clause embedded under a particular type of verb. Arguably one can analyse the semantically neutral ‘converbs’ or ‘gerunds’ of Turkish and other Altaic languages in exactly this way.

In many instances, however, the nominalization is best thought of as the name of the event denoted by the base verb. Linguistic theory has not devoted much attention to the semantics of naming, so I will propose a very informal descriptive procedure. First, I assume a bland semantic ontology derived ultimately from Jackendoff (1990) under which the linguistic world consists of EVENTS, THINGS and PROPERTIES. Canonically, these correspond to verbs, nouns and adjectives. A nominalization can be regarded as an event which is reified, that is, perceived as an object. Thus, for a sentence such as *The enemy stormed the city* we would have a basic semantic representation as in (31), while for the nominalization *The enemy's storming of the city* we would have (32):

(31) $[_{Event} \text{STORM}([_{Thing} \textit{enemy}], [_{Thing} \textit{city}])]$

(32) $[_{Thing} [_{Event} \text{STORM}([_{Thing} \textit{enemy}], [_{Thing} \textit{city}])]]$

Note that, although we appear to have deployed our bland notational conventions in a very obvious way there are significant assumptions underlying a representation such as (32) and it raises a number of questions. For instance, if we

can effectively coerce or type shift an EVENT to a THING, can a THING be coerced into an EVENT (and what would that correspond to)?

The representation in (32) might serve as sufficient representation for a purely eventive reading of a nominalization, as in *The enemy's storming of the city lasted two days*. To account for such a reading we just have to assume that the subject of the verb *last* denotes a THING which is also an EVENT such as *storming* or *party* (or a concrete noun which can be pragmatically coerced into an event reading, as in *The flowers lasted two days*). These representations need to be supplemented, however, in order to express factive and other semantic nuances. Let us assume that THINGS can be subtyped, for instance, into concrete things and abstract things. The abstract things, I assume, will include a subtype of 'state of affairs' (SoA) corresponding to Zucchi's notion. Thus to capture the semantics of *The enemy's storming of the city (during the ceasefire appalled us)* we assume a representation as in (33):

(33) $[\text{Thing:abstract:SoA} [\text{Event} \text{STORM}([\text{Thing} \textit{enemy}], [\text{Thing} \textit{city}])]]$

We must assume some semantic feature cooccurrence principle telling us that an object labelled $[\text{Thing:abstract:SoA}]$ has to embed a representation of the type $[\text{Event}]$. For languages in which manner-of-event is a typical reading for a nominalization we would need to include a rather more complex type of representation, the most brute force example being:

(34) $[\text{Thing:abstract} [\text{Manner}[\text{Event} \text{STORM}([\text{Thing} \textit{enemy}], [\text{Thing} \textit{city}])]]]$

However, it will probably be necessary to adopt a more sophisticated form of semantic representation in order to capture such nuances so I leave this for future research. The point is that we can modify simple notational conventions for semantic representations in order to capture the idea that languages can construct expressions which name events or states of affairs.

We have seen a number of other cases of semantic enrichment induced by the nominalization process. The German *-ung* nominal brings with it a telic aspectual meaning component absent in the basic verb. The semantics of such aspectual distinctions is somewhat controversial, but for the sake of argument I shall assume as a first approximation the possibility of adding a telicity predicate, say BOUNDED, as a modifier of events, as in (35) (Jackendoff 1996 offers detailed proposals for doing this using the descriptive framework adopted here):

(35) $\lambda x(x = [\text{Event} \text{STORM}([\text{Thing} \textit{enemy}], [\text{Thing} \textit{city}]) \ \& \ \text{BOUNDED}(x))$

The case of imperfective aspect retention in Russian *-anie / enie* nominalizations is more interesting in that in Russian the aspectual opposition is grammaticalized, a fact we can describe by deploying a morphosyntactic feature $[\text{Aspect:}\{\text{perfective, imperfective}\}]$. Now, the semantic interpretation of the perfective and imperfective forms of verbs is extremely complex and ultimately depends on a host of contextual, grammatical and lexical factors. However, the default interpretation for perfective is telic (i.e. BOUNDED) and the default in-

terpretation for imperfective is NOT(BOUNDED), so that a Russian imperfective nominalization has a representation just like (35) except with the added proposition NOT(BOUNDED(x)). For Russian, then, we must tie in the semantic enrichment shown in (35) with the [Aspect:imperfective] property. Ideally we would like to be able to deduce the NOT(BOUNDED) semantic property from the default interpretation of the [Aspect:{imperfective}] property but it isn't clear to me how to do this. I shall therefore merely assume a brute force description under which the NOT(BOUNDED) predicate is added whenever an imperfective verb form is nominalized:

$$(36) \text{ GPF(VERB, \{Nom, [Aspect:imperfective]\})}$$

$$\dots$$

$$f_{sem} = \lambda x(x = [_{\text{Event}} \dots] \ \& \ \text{NOT(BOUNDED}(x)))$$

The nominalization process will therefore have at its disposal the possibility of modifying the semantic representation of the base verb. Where such a semantic modification takes place we can ask whether the difference in meaning is such as to create a brand new lexeme or whether the semantic change is similar to that found with inherent inflection. For the present we will assume that we are dealing with inherent inflection. This means that there is no need to change the lexemic index (LI) of the lexical entry and so we are treating the nominalization as a form of the verb lexeme. From the point of view of a taxonomy of forms of lexical relatedness we now have an interesting situation. The deverbal nominalization looks like a transposition, because the verb lexeme now has the morphosyntax of a noun. But the transposition isn't pure because there's a (subtle) addition to the semantic representation. On the other hand, this isn't a pure case of inherent inflection either because we have a categorial shift. Not surprisingly, there is no traditional term for such a relation, so I shall call it a 'semantically enriched transposition'. It is characterized by overt changes in the FORM, SYN, SEM values with no change in the LI attribute.

What kind of SYN value will a derived nominalization have? Recall that I assume that the SYN attribute for the base verb specifies an argument structure representation, including the 'E' semantic function role. For the SYN value of nominalizations let us consider the simplest case first, where the nominalization assumes nominal features and loses nearly all its verbal features, retaining only its thematic arguments. For instance, the German nominalization *Erstürmung* 'storming (of a city)' will denote an event but only indirectly, via the abstract proposition of some agent being in a storming relation to some patient. I follow Spencer (1999) (see also Bresnan 1997) in representing this in the SYN field in terms of an operation over semantic function arguments. Spencer (1999) argues that this is the appropriate way to represent all instances of transposition, though in that paper I assume only the 'pure' species of transposition, and therefore do not link the SYN representation to the SEM attribute. The argument structure of a nominal corresponding to the 'name-of-event' semantics given in (36) above will be as shown in (37):

(37) STORM<R <E <ext arg, int arg>>>

In this representation we see that the word is now essentially a noun, hence the highest, most accessible semantic function argument is 'R'. However, it is a noun derived from a verb, and this is reflected in the fact that the 'E' argument and the thematic arguments are still present. In and of itself the SYN representation in (37) tells us very little about the way that the nominal behaves in the syntax. This is decided on a language-specific basis. Different languages and different constructions within one language permit the expression of these arguments as either 'E'-type arguments or 'R'-type arguments, as we have seen. Where the process of 'deverbalization' (Malchukov 2004) has proceeded more fully we will find that the thematic arguments will be expressed using the morphosyntax of a noun. This essentially means modification, either by adpositions, *the storming of the city by the enemy*, by special forms of noun phrases, for instance genitive case or the English 's-possessive form, by a compounding process, *enemy storming of the city* or by means of an adjective *Israeli/American/Allied storming of the city*. To date a good deal of effort has been devoted to accounting for the differential expression of subject/object grammatical functions (and of adverbial/adjectival modifiers to nominals). How exactly these possibilities are all specified and what kinds of syntactic structures are needed for them would require a separate (and very detailed) study. Here I am concerned solely with lexical representations of nominalizations. Given the typological complexity of the construction types I would argue that we need a model of lexical representation at least as rich as the one presented here to be able to account for all the attested possibilities. Moreover, since a regular nominalization can show almost any combination of nominal and verbal properties cross-linguistically, it seems clear that we need to adopt a maximally flexible approach to the problem.

Finally, I haven't actually specified the syntactic category of the nominalization. This is deliberate. Spencer (1999) argues that syntactic category labels are redundant if we furnish all content words with a semantic function argument. Specifically, verbs are precisely those categories which have the 'E' argument while nouns are those with the 'R' argument. To label these additionally as 'V', 'N' (or worse, by means of some combination of binary features) is completely superfluous. Moreover, in the case of category mixing it gets us into trouble. The nominalization mixed category is mixed in that it is a member of the 'R' argument type which is derived from a member of the 'E' argument type. The extent to which the 'R' and the 'E' semantic functions determine morphosyntactic behaviour is a language-particular matter (though with possibly some universal or near-universal propensities). If, for instance, we follow Bresnan's (1997) extended head-sharing proposals then we will find that the constituent structure syntax provides for positions for canonical verbs and nouns and their projections, and that the mixed category head occupies one of these, the noun position, but is linked to the empty position corresponding to the other, the verb position. Suppose we adopt essentially this mechanism, together with Bresnan's proposals for the construction of functional structure: each syntactic position contrib-

utes its features by unification to the overall f-structure. In this way we can capture the idea that a nominalization is surrounded by nominal satellites (*of*-phrases, genitive case marked phrases, adjectives) which serve to express arguments and attributes of a verbal predicate in f-structure. To be sure, there is a wealth of detail that remains to be worked out to get such proposals to work smoothly, but the general picture should be clear.

In principle the SYN representation is independent of the SEM representation. In the most straightforward cases, where we have a pure transposition, the argument structure representation for the SYN field in (31) will correspond to the unadorned semantic representation shown in (31). This corresponds nicely to the Turkish converbs or infinitive forms which have almost entirely nominal morphosyntax but which have the semantics of an ordinary proposition. However, perhaps a more natural way for the additional ‘R’ role to be interpreted is as an indication that we are dealing with the name-of-an-event/state-of-affairs interpretation, as shown in (31, 32). Since argument structure representations are generally read directly off semantic representations (at least, by default), we can perhaps suggest that this would be the default situation: where the nominalization process introduces nominal semantics by naming an event, by default we should assume that the ‘R’ role will be added by the f_{syn} function of the Generalized Paradigm Function.

We now turn to the formal, morphological side of nominalization: how are the actual forms to be accounted for? This means specifying the f_{form} function of the GPF. In the case of specialized nominalizing morphology such as the *-ung* of German or the *-anie/enie* suffix of Russian (or, indeed, the lexical nominalizations in *-azione* in Italian) we simply allow the Nom feature to define the addition of a suffix, as in (38):

$$(38) \quad \text{GPF}(\langle \text{VERB}, \{\text{Nom}\} \rangle) = \\ \begin{array}{l} f_{form} \quad \quad \quad = \text{Vroot} + \text{ung} \sim \text{anie/enie} \sim \text{azione} \sim \text{eceĝ} \text{ etc.} \\ \text{MorClass} \quad \quad = \text{N} \end{array}$$

Notice that I have defined the morphological class of the derived form to be ‘noun’ (N). In some cases this might be derivable by default from the ‘R’ semantic function argument in the SYN representation, but this will not always be true of nominalizations. Indeed, this is the crux of the problem of mixed categories. In that case it may not be entirely clear how best to label the morphological class of the resulting form. What, for instance, is the ‘correct’ morphological class label for the *-ing* form of an English verb in *the enemy’s storming the city*? The question is ill-defined, and so the MorClass attribute for such a form should remain undefined. Since the *-ing* form has no interesting morphological properties of its own⁶ this gives us the right answer.

⁶ ...in this usage. When lexicalized, say, with a result reading such as cutting, painting etc. we can have plural forms, cuttings, paintings, showing that on such a reading the word is morphologically a noun.

Where a nominalization process is expressed by some dedicated morphological operation the formal side of the problem is relatively simple. However, with the various instances of nominalized infinitive we appear to have a problem. There an inflected form of the verb lexeme is being used in the ‘wrong’ category, with (some of) the ‘wrong’ syntax. In general, any theory that relies on something like the classical morpheme concept is likely to encounter severe difficulties in finding a satisfactory and natural solution to the descriptive problem of nominalized infinitives. And yet infinitives in a great many languages acquire more-or-less nominal morphology or syntax in a variety of ways.

It is relatively unusual to find a complete inflected form of a word being converted to an entirely different word class, in the way that we find with the nominalized infinitive. Normally, such conversions involve not just a single form but a whole paradigm of forms. For instance, in the case of morphologically inert derivation mentioned above we have an adjective lexeme, say, which undergoes conversion to a noun but without changing its declension pattern. But this is not exactly what is happening with the nominalized infinitive, because there we take just one form of the verb and convert that one inflected form into a noun stem, which may then take a variety of nominal morphology, such as possessor agreement, definiteness marking, case marking or whatever depending on the language.

Although such cases are rarely discussed it is easy to see how they can be handled in a realizational-inferential model. As I pointed out in Section 3, in many inflectional systems we find that one cell of a paradigm is systematically filled by a form belonging to a different cell, the phenomenon of syncretism, as when the grammar of Latin refers the 1sg future form of a verb to its 1sg subjunctive form. The nominalized infinitive represents a kind of syncretism, but extended beyond what is normally thought of as the verb paradigm. The rule for defining a nominalized infinitive needs to be able to refer to the rules for creating infinitive forms of verbs in order to define the morphological form of the nominalization. This is irrespective of its syntactic and semantic properties.

Such a referral to a single inflected form is a non-trivial matter in a number of approaches, especially those that rely on the notion of the classical morpheme. For instance, Motsch (2004: 329) is forced to claim that the nominalized infinitive in German is the result of derivational morphology that just happens to produce a form identical to the infinitive. For German, this seems potentially workable at first, because the *-en* suffix has a great many functions already. Clearly, however, such an approach would be just plain silly for the Italian *Infinito Sostantivato*. But there seem to be very few concrete proposals in the literature for accounting for the fact that a verb form can also be a noun.

The rule of referral is perfectly suited to describe the nominalization of an infinitive. Here is such a rule in schematic form, where *NomInf* is the (unary) feature which triggers the formation of the nominalized infinitive, and [*Verb Form*] is an arbitrary form feature for verbs defining forms such as the infinitive:

subject agreement or whatever, how can a form of that same lexeme also be associated with noun or adjective properties such as number, case, gender, definiteness, as is required by nominalizations and adjectival participles?

The problem dissolves as soon as we look at morphological structure more widely. The reason for the disquiet is that we expect a verb lexeme to be always a verb, especially in its morphological paradigm. But this is simply wrong. I mentioned in Section 2 that we often observe the phenomenon of morphologically inert derivation, where a derived word in one class retains the morphology of its base. In such cases the word never has the ‘right’ morphology. I also mention the phenomenon of morphological shift, where some portions of the inflection paradigm of a given lexeme show the ‘wrong’ morphology because of the way that grammaticalization has allowed words of a different morphological category to intrude into the paradigm. Spencer (2007) outlines how spectacular such morphological mismatches can be. The upshot is that it is simply a mistake to assume that a lexeme will always be inflected in a uniform way which unambiguously identifies its word class. There is therefore no problem in adopting the traditional practice of speaking of ‘the participial forms of a verb’ or extending this to speak of ‘the (event) nominal form of a verb’. Whether such forms really are ‘forms of the verb’ will depend on their precise behaviour, and especially on their meanings and we will often find one and the same form shows dual behaviour, as is well known: *translation* as a pure event nominalization (*the careful translation of the poem over several weeks*) can therefore sensibly be taken to be a form of the verb TRANSLATE while *translation* as a result nominal (*someone spilled coffee on my translation of your poem*) is better thought of as a novel lexeme, TRANSLATION, lexically related to TRANSLATE by virtue of a derivational process which takes the nominalized form of TRANSLATE as its input.

8 Implications

Discussion of lexical relatedness has tended to be restricted to instances which are quite close to classical, canonical derivational morphology. Our discussion of deverbal nominalizations should make it plain that there are several, largely independent, ways in which words can be related, at the purely formal, morphological level, at a syntactic or semantic level, or in almost any combination. In some cases there are no traditional terms for such relationships and in the case of transpositions associated with a subtle meaning change there isn’t even a theoretical term. What this means for linguistic theory is that we must factor out the components of lexical relatedness. In principle all lexemic attributes can undergo non-trivial mappings independently of each other. A proper specification of lexical relatedness therefore has to take all these attributes into account. While it is certainly true that certain clusterings of patterns tend to come together, the ubiquity of highly problematical ‘mixed categories’ such as deverbal

nominalizations shows that it is wrong to take canonical inflection or canonical derivation as our only categories for lexical relatedness and then try to shoehorn other types into those categories.

The importance of this approach for lexicalist theories is clear from the discussion of deverbal nominalizations. By adopting the GPFM model of lexical relatedness we can readily state the crucial facts. Action nominals are essentially forms of their base verbs. The morphology and syntax show varying degrees of deverbalization on the one hand, and recategorization as noun on the other (Malchukov 2004). As a result they express the base verb's underlying argument structure in the manner of complements to a noun, though to varying degrees (even with the same language). The nominalization process can serve the purely morphosyntactic function of creating a form of a clause which has nominal morphosyntax, a 'pure' transposition, much like a deverbal participle. But the process can also show properties of inherent inflection, in being associated with a systematic meaning change. The meaning change is of a very general kind, however, and hence such nominalizations are parallel to instances of inherent inflection, in which the semantic representation is enriched by virtue of the default semantic interpretation associated with the inflectional process. As a result, we can still treat the action nominal as instantiating the same lexeme as the base verb. This is a particularly welcome result when the morphology that provides the nominalization rides off the back of inflectional processes elsewhere in the verb's paradigm, as in the case of the nominalized infinitive construction.

The more general implication over and above those drawn for action nominalizations is that 'lexical relatedness' is a complex notion. In order to establish how words are related to each other we need to factor out their basic properties (and sometimes subproperties of those basic properties) and then ask how the words relate to each other along those dimensions. Trying to ask whether a given type of word is 'really' this or 'really' that (for instance, 'really' a noun or 'really' a verb) often misses the point because the question is simply ill-defined. My aim here has been to show that this is a very general and pervasive feature of lexical representations and not some quirky feature of peripheral constructions. In other words, the factorization of the lexicon is a fact of linguistic life that needs to be properly appreciated if we are not to fall into terminological and conceptual confusion.

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