NUMERALS AS GRAMMATICALISED NOUNS: A GENERATIVE APPROACH

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1. Introduction

The syntax of Polish numerals has been widely studied in current generative literature (see S. FRANKS 1995, A. PRZEPIÓRKOWSKI 1996, among others). It usually attracts researchers' attention because of its complicated pattern of case assignment/agreement. P. RUTKOWSKI (2001) and P. RUTKOWSKI and K. SZCZEGOT (2001), drawing on work by L. VESELOVSKÁ (2001), attempt to explain this mixed case pattern by assuming that numerals are generated in a functional position above the noun (i.e. in the same DP). However, in 16th-century Polish, the syntax of numerals differed substantially from what it is now (see, e.g., Z. KLEMENSIEWICZ, T. LEHR-SPŁAWIŃSKI and S. URBAŃCZYK (1964)). In terms of case assignment, numerals behaved like regular nouns. The aim of this paper is to show that the diachronic difference between 16th century and Modern Polish is a side effect of the process of grammaticalisation. I. ROBERTS and A. ROUSSOU (1999) argue that all processes that have traditionally been referred to as grammaticalisation involve reanalysis of lexical material as functional material. This sort of reanalysis leads to structural simplification. In the present paper, I will attempt to show that, in 16th-century Polish, an expression containing a numeral consisted of two separate DPs. On the other hand, modern numeral expressions are monophrasal (as proposed in P. RUTKOWSKI 2001 and P. RUTKOWSKI and K. SZCZEGOT 2001). This means that Polish numeral structures have undergone a process of structural simplification, which, for independent reasons, has resulted in a new pattern of case assignment.

2. Basic synchronic data

P. RUTKOWSKI and K. SZCZEGOT (2001) divide Polish cardinal numerals into three distinct syntactic groups: *A-numerals*, *N-numerals* and *Q-numerals*. The first two classes contain only a few lexical items, namely the numerals corresponding to the lowest (from *jeden* 'one' to *cztery* 'four') and the highest (*tysiąc* 'thousand', *milion* 'million', *miliard* 'billion') cardinalities. They will not be discussed in the present paper since their syntactic behaviour is identical with the syntactic behaviour of adjectives and nouns, respectively. A-numerals always agree in case with the noun they quantify, whereas N-numerals always assign genitive to the noun that follows. What I will focus on here will be the third group – Q-numerals (i.e. all other numerals). They exhibit an intriguingly mixed pattern with respect to case. Polish Q-numerals (such as, e.g., *pięć* 'five') assign genitive to the noun they quantify when the whole expression is assigned a structural case value from outside (nominative or accusative), whereas they agree in case with the noun in the context of inherent cases (genitive, dative, instrumental or locative). The two situations are shown in (1) and (2), respectively (the verb *lubić* 'like' assigns accusative, while the preposition *z* 'with' assigns instrumental):

(1)　　　*Marta lubi pięć osób.*
　　　　Martha likes five:ACC people:GEN
　　　　'Martha likes five people.'
(2)　　　*Marta przyszła z pięcioma osobami.*
　　　　Martha came with five:INSTR people:INSTR
　　　　'Martha came with five people.'

The difference between the three classes of Polish numerals mentioned above can be illustrated with the table in (3):

(3) Three classes of Polish numerals (adapted from P. RUTKOWSKI and K. SZCZEGOT 2001)

Case Context	A-numerals	Q-numerals	N-numerals
Nom	*trzy*:NOM *psy*:NOM	*pięć*:NOM *psów*:GEN	*tysiąc*:NOM *psów*:GEN
Gen	*trzech*:GEN *psów*:GEN	*pięciu*:GEN *psów*:GEN	*tysiąca*:GEN *psów*:GEN
Dat	*trzem*:DAT *psom*:DAT	*pięciu*:DAT *psom*:DAT	*tysiącowi*:DAT *psów*:GEN
Acc	*trzy*:ACC *psy*:ACC	*pięć*:ACC *psów*:GEN	*tysiąc*:ACC *psów*:GEN
Instr	*trzema*:INSTR *psami*:INSTR	*pięcioma*:INSTR *psami*:INSTR	*tysiącem*:INSTR *psów*:GEN
Loc	*trzech*:LOC *psach*:LOC	*pięciu*:LOC *psach*:LOC	*tysiącu*:LOC *psów*:GEN
Gloss	'three dogs'	'five dogs'	'(one) thousand dogs'

The tripartite division presented above is parallel to the one suggested by G. GIUSTI and N. LEKO (1996) in their description of Bosnian. The terms they employ (*quantifiers proper*, *quantity adjectives*, and *quantity nouns*) can be easily translated into the ones proposed by P. RUTKOWSKI and K. SZCZEGOT (2001). For ease of exposition, I will omit the classes of A-numerals and N-numerals in the subsequent discussion and refer to the biggest class (Q-numerals) simply as *numerals*.

3. Numerals as functional heads

Since S. P. ABNEY (1987), it has been often argued in generative literature that NPs are dominated by some functional material, headed by a determiner (therefore, this approach is usually referred to as the *Determiner Phrase (DP) hypothesis*). Furthermore, many researchers (e.g. E. RITTER 1991, U. SHLONSKY 1991) show that it is reasonable to postulate at least one more functional projection above NP (in the region between NP and DP). The role of functional projections is to anchor the denotatively contentful lexical elements (e.g. nouns or adjectives) in a sentence with respect to

grammatical or relational features. This anchoring is reflected in c-command (functional categories c-command lexical categories). According to P. RUTKOWSKI (2001) and P. RUTKOWSKI AND K. SZCZEGOT (2001), Polish numerals should be interpreted as heading one of the functional phrases above NP. It is important to say that there are some non-syntactic arguments to support this view. Items that occupy functional positions are usually said to be semantically unsubstantive and to belong to closed classes. Numerals fulfil both of these criteria. Their meaning is unsubstantive in the way that it can be reduced to basic arithmetic oppositions and cannot be understood without the knowledge of mathematics. Numerals are interpretable only by means of referring to an independent extralinguistic system – thus, their denotative content differs from the content of nouns or verbs. Numerals do not belong to the core vocabulary of the world's languages (apart from the lowest ones, which constitute a separate syntactic and lexical class in many languages, including Polish – see J. R. HURFORD 2001). There are languages that do not have them at all (cf. B. HEINE 1997). Moreover, numerals always form a closed class (although the set of numbers is infinite, human languages name only some of them). Once created, it does not expand or change – new numerals do not suddenly appear in the lexicon. Therefore, the class of numerals seems to be a good candidate for a functional category. In syntactic terms, the functional character of cardinals could be interpreted as anchoring the denotative content of nouns with respect to number (in the same way as determiners anchor the denotative content of nouns with respect to reference).

The view that numerals in Polish have to be interpreted as residing in a functional head in the region between NP and DP is illustrated in (4) below (following P. RUTKOWSKI AND K. SZCZEGOT 2001, the functional head in question is marked with F). Being syntactic heads, cardinals can assign genitive (often referred to as the *Genitive of Quantification GEN(Q)* – see, e.g., A. PRZEPIÓRKOWSKI 1996) to their complements (the lexical material that follows). In such a phrase structure, the numeral and the quantified noun belong to the same extended nominal projection. Therefore, I call this model *monophrasal*.

(4) A monophrasal model of Polish numeral expressions
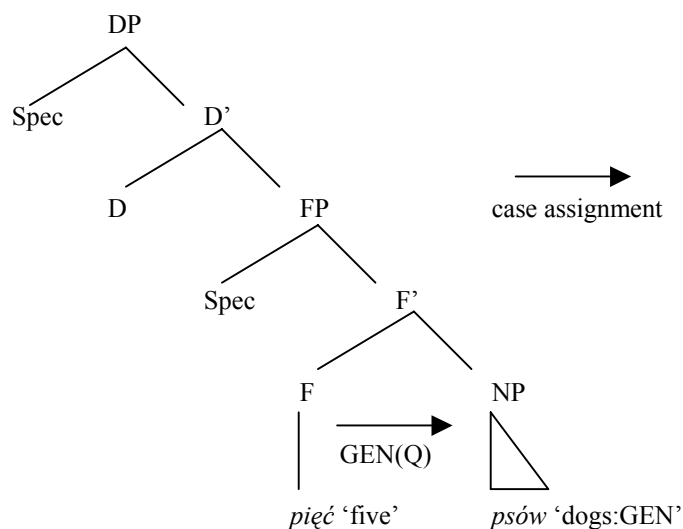
If we accept the above phrase structure, the syntactic behaviour of Polish numerals can be explained in the way originally proposed by L. VESELOVSKÁ (2001) in her account of Czech numeral constructions. The basic assumptions we have to make are the following: lexical elements are inserted into the syntactic derivation at a relatively early stage (D-structure), whereas functional elements are

inserted into the syntactic derivation as late as at S-structure (cf. J. E. EMONDS 2000). On the other hand, it has often been argued (see, e.g., N. CHOMSKY 1986) that inherent case assignment takes place at D-structure, whereas structural case assignment is driven by the S-structure conditions. It is not my aim here to discuss these assumptions. The crucial point is to note that the insertion of functional elements should be considered a surface syntactic phenomenon. Following this line of reasoning, it could be claimed that Polish numerals cannot assign genitive in the context of inherent cases (such as instrumental or locative) because, being functional elements, they are inserted into the syntactic derivation after inherent case assignment takes place (which means that, at that stage, the noun has already been assigned an inherent case value). Therefore, numerals act as case assigners only in structural contexts (nominative and accusative – see a detailed discussion in P. RUTKOWSKI 2001 and P. RUTKOWSKI AND K. SZCZEGOT 2001). Note that, for reasons completely independent from what will be argued for in the next part of this paper, the above analysis is possible only if we assume that the structure of Polish numeral expressions is monophrasal.

4. Diachronic data

Now a few words about the diachronic development of Polish numerals are in order. In the 15th and 16th centuries, the syntax of Polish cardinals was very different from what it is now (see, e.g., Z. KLEMENSIEWICZ, T. LEHR-SPŁAWIŃSKI and S. URBAŃCZYK 1964). In terms of case assignment, numerals behaved like regular nouns – they assigned genitive to quantified nouns in all contexts. This is illustrated in the table in (5), in which the historical examples are juxtaposed with the modern ones.

(5) Diachronic change in the syntax of Polish numerals

Case context	Diachronic data	Century	Modern Polish	Gloss
Structural cases				
Nom	*siedm*:NOM *grzechow*:GEN	XVI	*siedem*:NOM *grzechów*:GEN	'seven sins'
Acc	*sześć*:ACC *świadkow*:GEN	XV	*sześciu*:ACC *świadków*:GEN	'six witnesses'
Inherent cases				
Dat	*sześcidziesiąt*:DAT *dział*:GEN	XVII	*sześćdziesięciu*:DAT *działom*:DAT	'sixty cannons'
Instr	*siedmią*:INSTR *ran*:GEN	XV	*siedmioma*:INSTR *ranami*:INSTR	'seven wounds'
Loc	*ośmi*:LOC *lat*:GEN	XV	*ośmiu*:LOC *latach*:LOC	'eight years'

We can clearly see that, in Old Polish, numerals were not sensitive to the structural/inherent case dichotomy. If we follow the analysis presented in the previous section, we are forced to conclude that Old Polish numerals could not be functional elements. Thus, the structure of numeral expressions could not be monophrasal (numerals can be interpreted as part of the extended projection of the noun only if they occupy a functional position). Instead, numerals must have been regular lexical elements (nouns) that projected their own extended projections (DPs) and took other

DPs as complements. Therefore, from the point of view of phrasal structure, the Old Polish numeral expressions were not different from today's nominal constructions such as (6):

  (6)   *grupa ludzi*
          group:NOM people:GEN
          'a group of people'

As the structure in question consists of two separate DPs, I will refer to it as a *biphrasal* model. It is illustrated in (7).

(7) A biphrasal model of Old Polish numeral expressions – two separate DPs

```
        DP
       /  \
   Spec    D'
          /  \
         D    FP
             /  \
          Spec   F'
                /  \
               F    NP
                   /  \
                Spec   N'                    the division line between the two DPs
                      /  \
                     N    DP
                     |   /  \
                     | Spec  D'
                     |      /  \
             siedm 'seven' D    FP
                                /  \
                             Spec   F'
                                    /  \
                                   F    NP
                                       grzechow 'sins:GEN'
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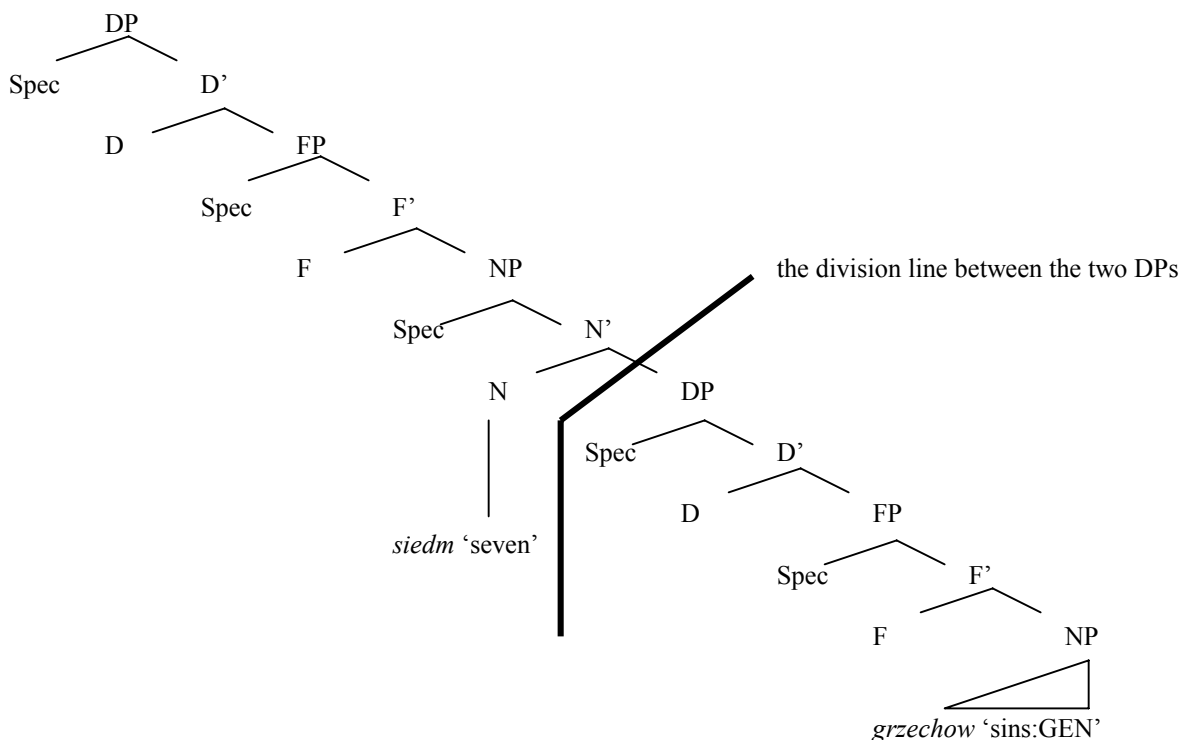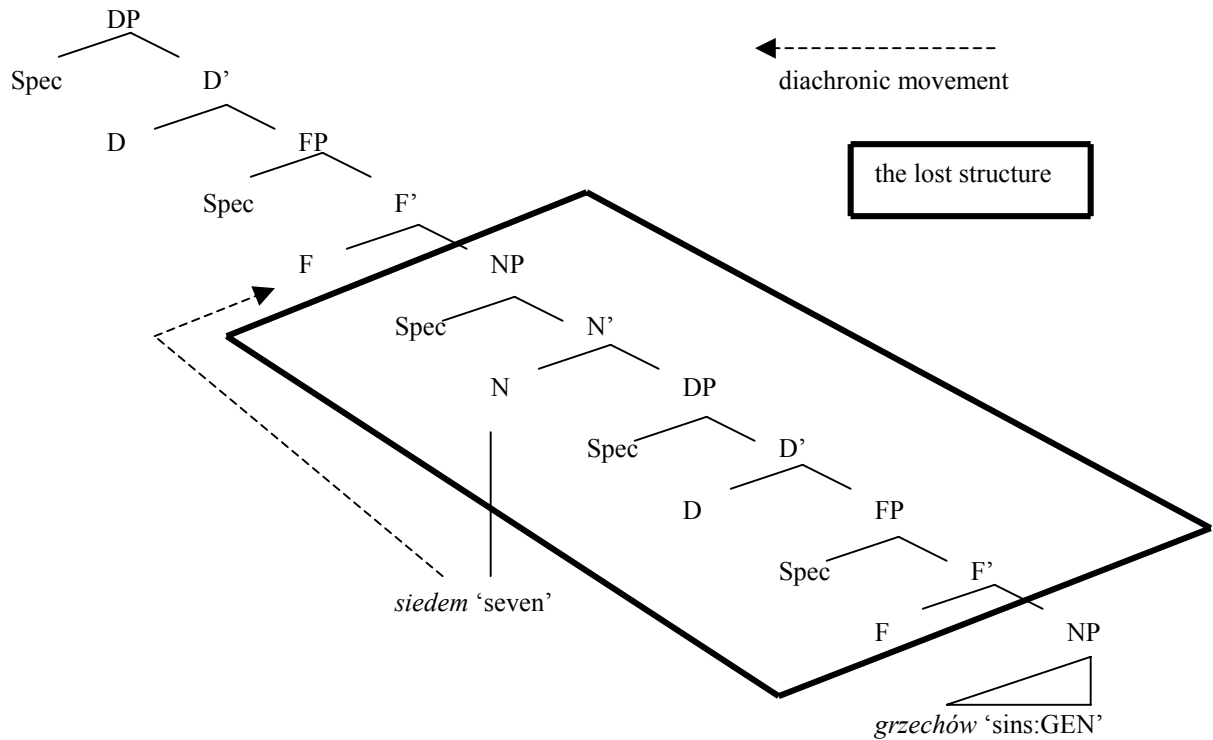
By postulating the two phrase structure models presented in (4) and (7), we obtain a tool to account for the diachronic difference in case assignment between the 16th century and Modern Polish.

5. A generative analysis of grammaticalisation

The above discussion inevitably leads to a question about the origin of the diachronic phrase structure difference between Old and Modern Polish. The assumption that present-day numerals occupy a functional position means that, from the diachronic point of view, they must have been moved to it from the lexical position N. Such a change might be explained if we treat it as an example of grammaticalisation.

According to I. ROBERTS and A. ROUSSOU (1999), all cases of what has traditionally been described as grammaticalisation involve the categorical reanalysis of lexical material as functional material. As shown in (8), this type of reanalysis involves substantial structural simplification: two separate extended projections are replaced with only one. The tendency to simply structure is precisely what I. ROBERTS and A. ROUSSOU (1999) consider the driving force of grammaticalisation.

(8) Diachronic loss of structure in Polish numeral expressions

```
              DP
           /      \
       Spec        D'
                /      \
              D          FP
                      /      \
                  Spec        F'
                          /      \
                        F          NP
                                /      \
                            Spec        N'
                                     /      \
                                   N          DP
                                          /      \
                                      Spec        D'
                                              /      \
                                            D          FP
                                                    /      \
                                                Spec        F'
                                                        /      \
                                                      F          NP
```

diachronic movement

the lost structure

siedem 'seven'

grzechów 'sins:GEN'

One of the examples that I. ROBERTS and A. ROUSSOU (1999) illustrate their analysis with is based on the development of structures with the Ancient Greek verb *thélo* 'want'. In Ancient Greek, *thélo* took a CP complement, whereas its continuant in Modern Greek (*tha*) takes only a VP. This is a typical case of grammaticalisation: a regular verb changes to an auxiliary. The Ancient Greek structure was biclausal: both the verb *thélo* 'want' and its complement were associated with full functional projections. On the other hand, the Modern Greek *tha* is part of the CP projected above the lower verb (thus, the structure is monoclausal). This diachronic change of structure is shown in (9).

(9) Diachronic loss of structure in the Greek construction with *thélo* 'want'
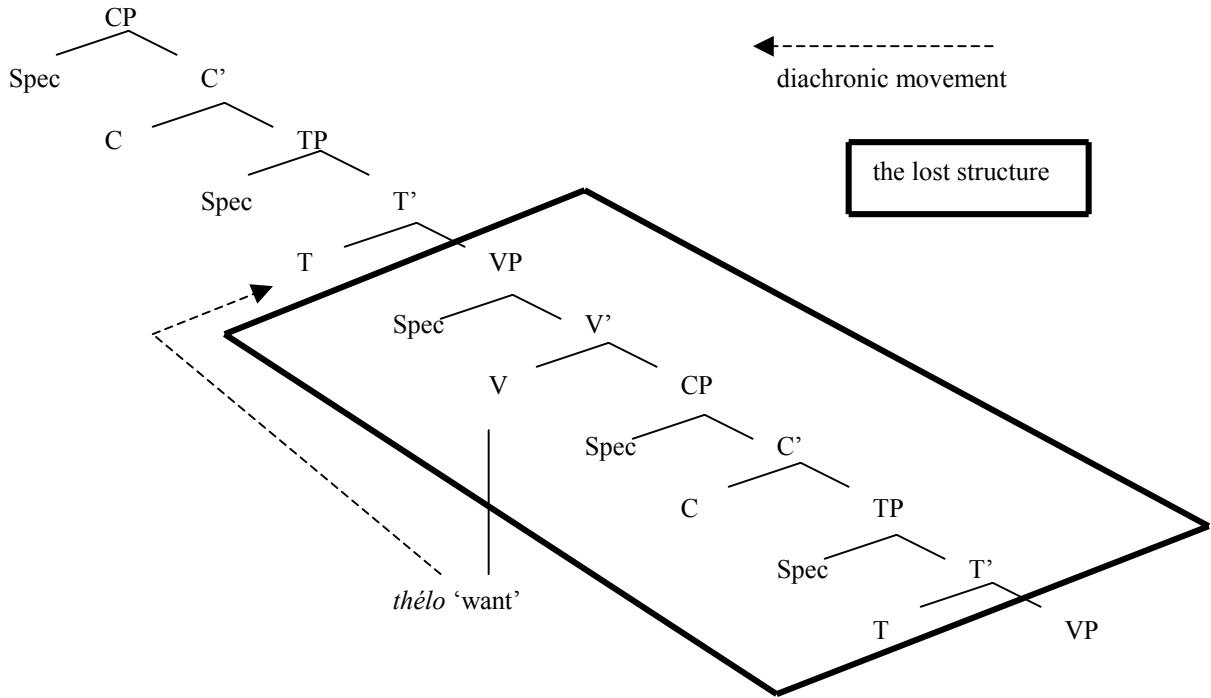
As it can easily be noticed, the Greek process is a verbal counterpart of what has happened in Polish numeral phrases:

(10)   [$_{DP}$ … [$_{NP}$ *siedm* [$_{DP}$ … [$_{NP}$ *grzechow*]]]] (Old Polish) >
         [$_{DP}$ *siedem* … [$_{NP}$ *grzechów*]] (Modern Polish)
(11)   [$_{CP}$ … [$_{VP}$ *thélo* [$_{CP}$ … [$_{VP}$ …]]]] (Ancient Greek) >
         [$_{CP}$ *tha* … [$_{VP}$ …]] (Modern Greek)

Following a wider theory of language learning and language change presented in R. CLARK and I. ROBERTS (1993), I. ROBERTS and A. ROUSSOU (1999) view the parameter-setting device of the language faculty as preferring simpler structures over more complex ones. If we adopt their argumentation, we have to say that the diachronic development of Polish numerals is an example of grammaticalisation and that it has been driven by a natural mechanism of structural simplification.

6. Is it really grammaticalisation?

It is a well known fact that, in many languages, numerals have developed from nouns by means of conceptual transfer. The process in question leads from the concrete (the noun) to the abstract (the numeral). B. HEINE (1997) illustrates it with examples of semantic changes such as 'hand' > 'five', 'man' > 'twenty' (based on the number of digits), 'hair' > 'four hundred' etc., taken from languages of Africa and South America. This seems to pattern with the data from Polish shown in the present paper: it could be said that, at some stage of language development, numerals «gained semantic independence» from the class of nouns and they formed a separate class of functional items. However, the question I want to address now is if it is really justified to refer to the change from the noun to the numeral as grammaticalisation. In other words, can we support the syntactic analysis presented in the previous section on independent (non-generative) grounds?

If we have a close look at the diachronic development of present-day numerals in Polish, we will actually find out that many of them have undergone processes described by researchers such as C. LEHMANN (1982), B. HEINE and M. REH (1984) and W. CROFT (2000) as typical of grammaticalisation. These processes could be divided into three groups: phonological, morphosyntactic and functional (semantic/pragmatic). According to W. CROFT (2000:157), the first group subsumes phenomena such as attrition (reduction and erosion that, ultimately, leads to phonological loss), coalescence (grammaticalised free morphemes tend to cliticise, become affixes or even disappear altogether) and adaptation (including assimilation). Morphosyntactic processes include what W. CROFT (2000) calls obligatorification (a morpheme becomes obligatory in a given construction, optimality is eliminated), paradigmaticisation (an open-class element is moved to a closed lexical class and becomes invariant, which means that its form becomes independent from the context) and rigidification (the word order of a structure gets fixed due to loss of independent syntactic status of its elements, this often leads to morphological fusion or loss). The third group of processes that accompany grammaticalisation has to do with meaning: extension of semantic range and idiomaticisation (the meaning of the whole construction ceases to be a function of the meanings of its parts, it becomes noncompositional and unanalysable).

All of the processes mentioned above can be easily illustrated with examples taken from the diachronic development of Polish numerals. For instance, the development of cardinals such as *dwanaście* 'twelve' or *trzynaście* 'thirteen' conforms to the pattern of what W. CROFT (2000:163) refers to as phonological erosion. According to him, these are only invariant elements in a given construction that may be phonologically eroded as a result of grammaticalisation. It is exactly the case with numerals such as *dwanaście* 'twelve'. As shown in (12), they derive from an expression consisting of two numerals linked by a preposition:

      (12)   *dwanaście* 'twelve' (modern Polish) < *dъva na desęte* 'two on ten' (Old Slavic)

Only the word *desęte* 'ten' has been subject to phonological erosion and assimilation (*desęte > dźeśęće > dźeśće > dźće > ście* – see, e.g., K. DŁUGOSZ-KURCZABOWA and S. DUBISZ 1998) because it was the most invariant element – present in the whole series of 'teens', as shown in the examples (13-16):

      (13)   *jedenaście* 'eleven' (modern Polish) < *jedinъ na desęte* 'one on ten' (Old Slavic)
      (14)   *trzynaście* 'thirteen' (modern Polish) < *tri na desęte* 'three on ten' (Old Slavic)
      (15)   *czternaście* 'fourteen' (modern Polish) < *četyri na desęte* 'four on ten' (Old Slavic)
      (16)   *piętnaście* 'fifteen' (modern Polish) < *pętь na desęte* 'five on ten' (Old Slavic)

In terms of morphosyntax, the above examples illustrate how certain elements lose independent status in a grammaticalised construction: the words *na* 'on' and *desęte* 'ten' are fused in the modern Polish *–naście*. Semantically, the meaning of the whole construction changes from compositional to unanalysable – in Modern Polish, the expression is perceived as a fixed unit. The diachronic development of words such as *dwanaście* 'twelve' could be seen as a psychological phenomenon, as a result of which their meaning has become conventionalised (it is not a function of the elements that the numeral is composed of).

Also rigidification finds a good illustration in the syntax of Polish numerals. The fact that the word order in structures containing numerals is fixed can be exemplified by the noun/pronoun asymmetry with respect to cardinals. What is notable about the syntax of numeral expressions containing personal pronouns is that numerals always follow pronouns (whilst they normally precede nouns). This word order is rigid and cannot be changed (unless under an emphatic reading):

      (17)   *Siedmiu chłopców płakało.*
                seven boys:GEN cried
                'Seven boys cried.'
      (18)   *Ich siedmiu płakało.*
                they:GEN seven cried
                'Seven of them cried.'

(19)   *_Siedmiu ich płakało._
         seven they:GEN cried

The above asymmetry becomes straightforward if we assume (following, e.g., P. POSTAL 1969) that personal pronouns occupy the D position, whereas nouns are generated in N. As argued in this paper, Modern Polish numerals reside in a functional position in between DP and NP – thus, the word order cannot be different from what is presented in (17) and (18).

Quoting K. L. ADAMS (1989), W. CROFT (2000:162-163) mentions an example of paradigmatisation (another process connected to grammaticalistaion) that involves numerals. In many Austroasiatic languages (such as Wa), a numeral has to be combined with a particular numeral classifier, depending on the noun class that the quantified noun belongs to. However, in some languages of this family (e.g. Vietnamese), one classifier is used with all noun classes. This means that one classifier has become an invariant element of all numeral constructions. A somewhat similar phenomenon can be noticed in the development of Polish numerals. A few centuries ago, numerals such as _pięć_ 'five' declined like nouns such as _pięść_ 'a fist': they took the same case endings. In the present-day Polish the number of different case endings has been reduced to an (almost) invariant ending –_u_. This is shown below:

(20) Numeral case endings

Case Context	Old Polish	Modern Polish
Nom	_pięć_	_pięciu_
Gen	_pięci_	_pięciu_
Dat	_pięci_	_pięciu_
Acc	_pięć_	_pięciu_
Instr	_pięcią_	_pięciu/pięcioma_
Loc	_pięci_	_pięciu_
Gloss	'five'	'five'

Therefore, it could be said that the case ending –_u_ has become a paradigmatised element of Modern Polish numeral constructions.

Theorists of grammaticalisation usually assume that different aspects (phonological, morphological, syntactic) of one diachronic change tend to occur together. All of them seem to be driven by the underlying need for reduction and tighter integration of form. Therefore, it seems justified to say that the above examples of phonological and morphological reduction support the syntactic analysis of numerals as grammaticalised nouns presented in the previous section.

7. Conclusion

The analysis argued for in this paper combines assumptions made independently in two linguistic frameworks, namely generative grammar and grammaticalisation theory. Only this combination makes it possible to describe both the synchronic and diachronic syntax of Polish numerals in a consistent way. The two theories could be said to complement each other: the generative idea that grammaticalisation involves diachronic development of lexical material into functional material helps to formalise the notion of grammaticalisation. The structural difference between monophrasal and biphrasal numeral expressions is used to motivate the diachronic difference in patterns of case assignment. On the other hand, thanks to the idea that language change is driven by the force of

simplification, reduction and tighter integration of form, we do not have to consider the syntactic development of Polish numeral expressions random and unexplainable.

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