An HPSG analysis of 'a beautiful two weeks'*

Takafumi Maekawa

(Ryukoku University)

Maekawa, Takafumi. 2013. An HPSG analysis of 'a beautiful two weeks'. *Linguistic Research* 30(3), 407-433. In this article we investigate a type of noun phrase in English, which is exemplified by *a beautiful two weeks* and *a lucky three students*. We call such examples determiner-modifier-numeral-noun constructions (DMNNCs). DMNNCs look similar to what we call the numeral-modifier-noun constructions (NMNCs) such as *two beautiful weeks* and *three lucky students*, but differ in several respects: *e.g.*, an indefinite article can occur in DMNNCs but cannot in NMNCs; the numeral follows the modifier in DMNNCs but precedes the modifier in NMNCs. In this article we will mainly discuss the syntax of DMNNCs in some detail and consider how they might be analysed within Head-driven Phrase Structure Grammar (HPSG; Pollard and Sag 1987, 1994). While sketching some analyses which have been proposed for DMNNCs, we look at some data which seems problematic to these analyses. We then develop an analysis of DMNNCs in which the peculiarities of the construction are attributed to the special constructional constraints. We argue that HPSG can provide a satisfactory account of these properties of DMNNCs. **(Ryukoku University)**

1. Introduction

In this article we investigate a type of noun phrase in English, which is exemplified by the examples in (1).

---

(1) a. a beautiful two weeks
    b. a lucky three students

We call such examples determiner-modifier-numeral-noun constructions (DMNNCs). DMNNCs look similar to what we call the numeral-modifier-noun constructions (NMNCs), which is illustrated by the following examples.

(2) a. two beautiful weeks
    b. three lucky students

These two constructions look similar in that a modifier and a numeral expression appear together, but differ in the following respects. First, NMNCs cannot have an indefinite article but DMNNCs requires one though the head noun is plural. The following examples illustrate that NMNCs cannot have an indefinite article.

(3) a. (*a) two beautiful weeks
    b. (*a) three lucky students

The examples in (4) show that DMNNCs are ungrammatical without a determiner.

(4) a. *(a) beautiful two weeks
    b. *(a) lucky three students

The second difference is the order of the numeral and the modifier: the numeral precedes the modifier in NMNCs but the numeral follows the modifier in DMNNCs. DMNNCs cannot have the same order as NMNCs.

(5) a. *a two beautiful weeks
    b. *a three lucky students

In this article we will mainly discuss the syntax of DMNNCs in some detail and consider how they might be analysed within Head-driven Phrase Structure Grammar (HPSG; Pollard and Sag 1987, 1994). The following are some examples of DMNNCs from BYU-BNC.

(6) a. This shrub bed was *a full sixty yards* from where they now stood, but just over half that distance from the treeline away over to their left.

   b. Major students take *a further two units* and joint students an additional one, in Theatre Production.

   c. He must have had the equivalent of *a good twelve cups* of black coffee.

   d. Even without Jackson, Aberavon chalked up a comfortable 24-0 success to leave the Police rooted to the foot of the table having conceded *a massive 180 points* in just four games.

   e. Reggae star Shabba Ranks has finally scored his first solo hit after releasing *a staggering 30 singles* on 15 different labels since 1988.
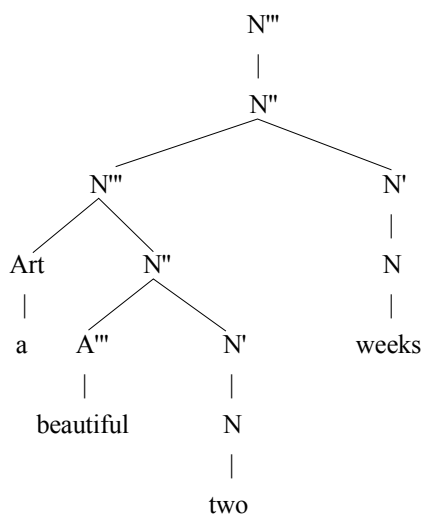
It will be argued that HPSG can provide a satisfactory account of various properties of DMNNCs.

The organisation of the article is as follows. In the next section we will sketch some analyses which have been proposed for DMNNCs and at the same time look at some data which are problematic for them. Section 3 introduces the framework of HPSG. In section 4 we will develop an analysis of DMNNCs within HPSG, and then we will look at how it might be able to deal with the facts. In section 5 we will look at some further data which we will argue is no problem to our approach. Section 6 is the conclusion.

2. Analyses of DMNNCs

There have been some discussions of DMNNCs in the syntactic literature, but it seems that there are no fully worked out analyses so far. Jackendoff (1977: 128-130) assigns the following structure to DMNNCs (See also Ohna (2003)).

(7)

```
                        N'''
                         |
                        N''
                       /    \
                    N'''      N'
                   /    \      |
                 Art     N''    N
                  |     /   \    |
                  a   A'''   N'  weeks
                       |      |
                   beautiful  N
                              |
                             two
```

Jackendoff (1977) argues that numerals are nouns. As a singular noun, the numeral *two* in (7) requires a specifier and the indefinite article plays the role. They make a constituent, which serve as a modifier of the head noun *weeks*. Examples in (8) argue against this view, however.

(8) a. Portis finished the year with *a career-low one touchdown* in eight
       games. (COCA[1])

   b. After the two point cut in interest rates since the UK's departure
      from the ERM, minimum lending rate was cut *a further one point* to
      7% from 13 November 1992, the lowest level for nearly 15 years.
      (BYU-BNC)

As singular countable nouns, *touchdown* and *point* in (8) require a specifier. However, if the indefinite article is a specifier of the numeral, as in (7), *touchdown* and *point* in (8) do not have a specifier that they require.

   In the analysis proposed by Ellsworth *et al*. (2008: 28), the adjective and the numeral make a constituent and the indefinite article is a specifier of the head noun

---

[1]   the Corpus of Contemporary American English

(See also Honda (1984)). Approaches along these lines can be schematically depicted as in (9).

(9)

```
                        NP
                  _____|_____
                 |             |
                Det            N'
                 |         ____|____
                 |        |         |
                 |        XP        N
                 |      __|__       |
                 |     |     |      |
                 a  beautiful two  weeks
```
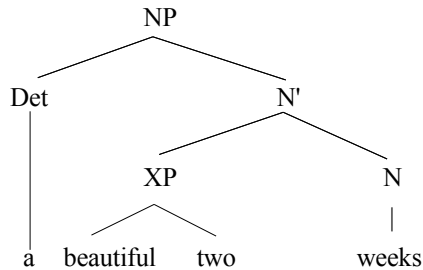
For this analysis (8) is no problem: the indefinite article is a specifier of the head noun, and it can satisfy the requirement from the head noun if it is a singular countable noun. However, there is evidence that seems problematic to this approach. First, the examples in (10) are DMNNCs with the numeral and the following noun conjoined.

(10)   a. the long [2 hours and 14 minutes]
         b. an amazing [12 performances and 602 rehearsals]
                                        (Ionin and Matushansky 2004: 111)

In (10) the adjectives *long* and *amazing* do not make a constituent with the following numerals. They clearly combine with the phrase in square brackets, in which two combinations of the numeral and the head noun are conjoined. It is difficult, if not impossible, to accommodate these examples with an analysis like (9). Second, the modifier in DMNNCs does not have to be an adjective: a relative clause can occur instead, as illustrated by the following attested examples.[2]

(11)   a. By the end of the four days, my group and I were ready to leave,
         but it was [a four days [that we will all look back on with great
   memories]].   (http://wilsonlanguagegrants.blogspot.com/)

---

[2] I would like to thank an anonymous reviewer for providing me with the data in (11).

b. Still, the internet is alive with pictures, comments, ideas, threads, and remembrances of [a three days [that we will never forget]]. (http://pulpmachine.blogspot.jp/2011/05/pulp-ark-day-three-as-doors-closed_19.html)

c. [A three days [that will include the finest assortment of Italian wines ever to be offered in Hong Kong]], including the first ever direct consignment from the cellars of Gaja. (http://www.businesswire.com/news/home/20121119005886/en/Domaine-de-la-Romanee-Conti-Dominates-Acker-Merrall)

As relative clauses, the modifiers in (11) should occur post-nominally. The numeral and the relative clause are disconnected and hence impossible to make a constituent.

Van Eynde (2006: 154, 169) assigns the following structure to the Dutch equivalent of *a good forty pages*, namely, *een geode veertig pagina's*.

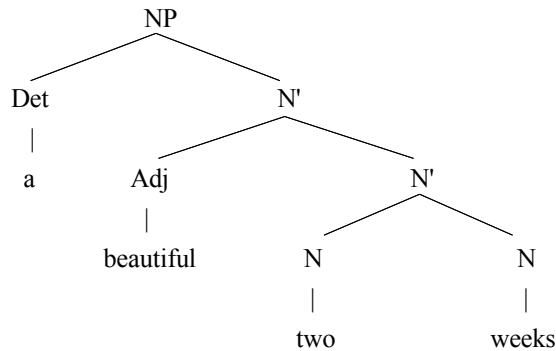(12)
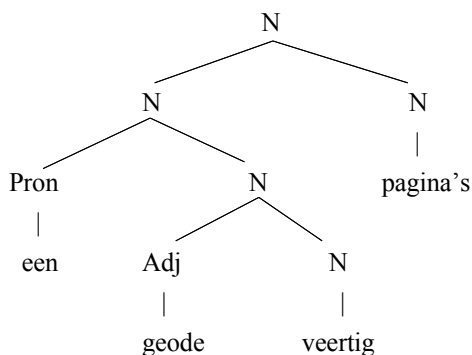
In this structure the adjective modifier and the numeral make a constituent. Therefore, the objections that we raised against the analysis along the lines of (9) are also applicable here. This analysis is incompatible with the facts shown in (10) and (11).

Gawron (2002) and Ionin and Matushansky (2004: 110ff; 2006: 323ff) claim that the numeral and the following noun make a constituent.

(13)

```
                        NP
              ┌──────────┴──────────┐
             Det                    N'
              |              ┌───────┴───────┐
              a             Adj              N'
                             |         ┌──────┴──────┐
                          beautiful    N             N
                                       |             |
                                      two          weeks
```

This structure can capture (8), (10) and (11). First, the indefinite article is a determiner of the noun in (13), so there is no problem even if the head noun is a singular count noun. Second, the numeral and the head noun make a constituent, so the data in (10) can be accommodated easily. Finally, the modifier is adjoined to the numeral-noun combination in (13): the examples in (11) can be captured by this approach because both the adjective and the relative clause can be analysed as adjoined to the numeral-noun combination: the only difference is that the adjective is a pre-nominal adjunct while a relative clause is a post-nominal adjunct.

Thus, the structure in (13) can capture the relevant data quite nicely and we will also assume this constituent structure. However, Gawron's (2002) and Ionin and Matushansky's (2004: 110ff; 2006: 323ff) analyses are problematic in details. Gawron (2002) argues that the numeral and the following noun make a measure phrase, which is unspecified for number and therefore allows *a*. For Ionin and Matushansky (2004: 110ff; 2006: 323ff) the numeral is the head noun and the following noun is its complement. Like other nouns, numerals allow adjectival modification. In their analysis the numeral is singular in number, so an indefinite article is allowed in this construction. For both of these analyses, it is not clear why the indefinite article occurs only in the presence of a modifier. Moreover, Ionin and Matushansky's analysis cannot accommodate the cases where the determiner is plural.[3]

---

[3] For Gawron (2002) this is no problem. Measure phrases can take a plural determiner, as the following examples from BYU-BNC show.

(i) *These* two groups of children have quite different characteristics, care histories, prognoses and

(14) a. While this therapist has been working away to make things better for ***these*** *lucky 30 people*, in this country another 600,000 babies have been born.

(http://www.orgonomyuk.org.uk/Self-Regulation.html)

  b. ***Those*** *busy nine days* of snow we had were beginning to stretch us to say the least.

(http://norfolkwinter.com/2013/02/08/meet-the-gritters/)

In addition, Ionin and Matushansky largely depend on the idea that the numeral is the head noun. This would be an exceptional case where a noun takes a nominal complement without a preposition. Other things being equal, it is preferable not to have such an exception.

It seems, then, although right-branching structures like (13) can capture all the data observed in this section, the particular analyses by Gawron (2002) and Ionin and Matushansky (2004, 2006) contains some problems.

In the following sections we will consider how the data should be analysed. We will first present the theoretical assumptions of HPSG which are relevant to the present study. Then we will see how they can deal with the rather peculiar properties of DMNNCs.

3. HPSG

In HPSG linguistic expressions have a complex feature makeup encoding their syntactic, phonological and semantic properties. Within the version of HPSG assumed in this article, syntactic properties include the features HEAD, which encodes information shared between a phrase and its head, such as information about part of speech, and MARKING (MKG), which indicates whether the expression involves a determiner or a numeral, or whether it can stand alone without these elements (Van Eynde 2006, etc.). Within this framework numerals denoting numbers larger than 1, such as *two*, will have the partial lexical description in (15).

---

needs for social work support.

(ii) *These* two pieces of legislation provide interesting contrasts in approaches to the provision of social security.

(15)

$$two: \begin{bmatrix} \text{HEAD} & \begin{bmatrix} noun \\ \text{SEL} & \begin{bmatrix} \text{HEAD} & noun \\ \text{MKG} & \begin{bmatrix} bare \\ \text{AGR|NUM} & pl \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{MKG} & numeral \end{bmatrix}$$

Here the value of the feature HEAD identifies *two* as a noun. The MKG feature has a value whose type is *marking*. Much HPSG work assumes that linguistic objects are typed and organised into a hierarchy. We can propose that MKG values can be organised into the following type hierarchy.

(16)
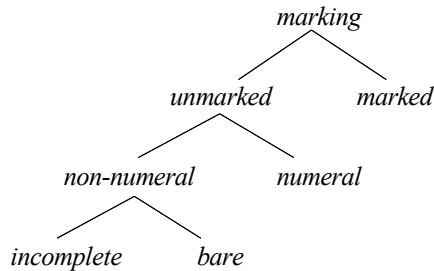
The MKG value is *marked* if the expression contains a determiner or it itself is a determiner, and *unmarked* otherwise. The distinction between *numeral* and *non-numeral* is to differentiate between nominals with a numeral and those without. Numerals themselves are [MKG *numeral*], like *two* in (15). Plural nouns and abstract nouns are [MKG *bare*] because they can stand alone without a determiner. Singular countable nouns such as *week* and *student* have an *incomplete* value because they require a determiner.[4]

---

4 Here we are assuming a constraint like the following.

(i) [ARG-ST *nelist*(⊡)] → ⊡[MKG ¬*incomplete*]

The ARGUMENT-STRUCTURE (ARG-ST) feature contains information about the word's subcategorisation. This constraint states that if the ARG-ST list is a non-empty list (indicated as *nelist*), then the MKG value of the members of the list should not be *incomplete*. This constraint will exclude sentences like those in (ii), where singular countable nouns *girl* and *park* appear without a determiner.

(ii) a. *Paul met *girl*.

We further assume that elements such as determiners, numerals and adjectives are 'functors': non-heads that select their head (Allegranza 1998; Van Eynde 2006, 2007; etc.). SEL(ECT) is a part of the HEAD value, specifying what kind of word/phrase it selects: (15) indicates that *two* selects a bare plural nominal. Following Ellsworth *et al*. (2008: 32), we assume that the feature AGR(EEMENT) is a part of the MKG value. AGR represents morphosyntactic properties of the expression. The NUMBER (NUM) feature indicates whether a sign is singular or plural. The AGR|NUM values in (15) shows that the expressions that *two* selects are morphosyntactically plural. NP-internal agreement is based on the AGR value (Kathol 1999, Kim 2004, Wechsler and Zlatić 2000).

The combination of the functor and the head is ensured by the constraint imposed on the phrase type *head-functor-phrase* (*hd-funct-ph*). The constraint on this phrase type is given below.

(17)

$$hd\text{-}funct\text{-}ph \quad \rightarrow \quad \begin{bmatrix} \text{HD-DTR} & \begin{bmatrix} \text{SYNSEM} & \boxed{1} \end{bmatrix} \\ \text{NON-HD-DTRS} & \langle \begin{bmatrix} \text{SEL} & \boxed{1} \end{bmatrix} \rangle \end{bmatrix}$$

(Van Eynde 2006, 2007)

Phrases in general are composed of the head daughter and some non-head daughters. The HD-DTR (HEAD-DAUGHTER) feature refers to the head daughter of a phrase and the NON-HD-DTRS (NON-HEAD-DAUGHTERS) to the non-head daughters.[5] The value of the SYNTAX-SEMANTICS (SYNSEM) feature contains the sign's syntactic and semantic information. The constraint in (17) states that in phrases of type *hd-funct-ph* the SEL value of the non-head daughter is required to be token-identical to the SYNSEM value of the head daughter. This means that the non-head daughter selects the head daughter.

Following Van Eynde (2006, 2007), we assume that the *hd-funct-ph* is a subtype of a *head-adjunct-phrase* (*hd-adj-ph*) type, which in turn is a subtype of a *headed-phrase* (*hd-ph*) type. The constraints for *hd-ph* is given below.

---

b. *There are many children in *park*.

5   Following Sag (1997) the head daughter and the non-head daughters are listed separately.

(18)

$$hd\text{-}ph \rightarrow \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{HD-DTR} & \left\langle \begin{bmatrix} \text{HEAD} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

Constraint in (18) states that the HEAD value of a headed phrase (a phrase of the *hd-ph* type) is structure-shared with the HEAD value of the head daughter. (Pollard and Sag 1994: 34). This means that information about parts of speech is shared between the phrase and the head daughter. Head-adjunct phrases (phrases of the *hd-adj-ph* type) are subject to the constraint in (19).

(19)

$$hd\text{-}adj\text{-}ph \rightarrow \begin{bmatrix} \text{MKG} & \boxed{1} \\ \text{NON-HD-DTRS} & \begin{bmatrix} \text{MKG} & \boxed{1} \end{bmatrix} \end{bmatrix}$$

This constraint states that in head-adjunct phrases the MKG value is shared between the mother and the non-head daughter.

Given the above lexical item and constraints we have structures like (20) for *two weeks*.

(20)
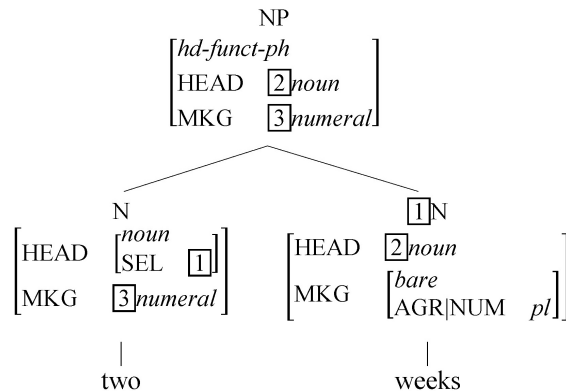
The combination of *two* and *weeks* in (20) is a structure of a head-functor phrase (a phrase of the type *hd-funct-ph*), where the functor *two* selects and combines with

weeks via the feature SEL. Constraint (18) ensures that the HEAD value of a mother is inherited from a head daughter. The MKG value of a head-functor phrase comes from the functor daughter, as specified by constraint (19). Therefore, the MKG value of the mother node is *numeral* although that of the head daughter is *bare*.

One point of note here is that (20) is an informal representation. As the constraints in (17) and (18) show, the structure of phrases is analysed in terms of the features HD-DTR and NON-HD-DTRS. In the rest of this article, however, constituent structures will be represented in the form of traditional syntactic trees.

Adjectives normally select nominals which do not include a numeral expression. The following examples illustrate this.

(21)   a. beautiful [(*two) weeks]
       b. lucky [(*three) students]

Given this fact, we can propose that adjectives have the following syntactic properties.

(22)

$$
\textit{beautiful}: \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{adjective} \\ \text{SEL} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{MKG} & \boxed{1}\textit{non-numeral} \end{bmatrix} \end{bmatrix} \\ \text{MKG} & \boxed{1} \end{bmatrix}
$$

Here the value of SEL specifies that the nominal selected by an adjective is [MKG *non-numeral*], indicating that it does not include a numeral expression. Note also that the MKG value of the adjective comes from the noun it selects. This ensures that, for example, the MKG value of *beautiful* in *beautiful weeks* is *bare* because that of *weeks* is.

We have structures like (24) for the NMNCs in (2).

(23)   a. four beautiful days
       b. three lucky students [= (2)]

(24)

$$
\begin{array}{c}
\text{NP} \\
\begin{bmatrix}
\textit{hd-funct-ph} \\
\text{HEAD} \quad \boxed{2}\textit{noun} \\
\text{MKG} \quad \boxed{4}\textit{numeral}
\end{bmatrix}
\end{array}
$$

$$
\begin{array}{cc}
\begin{array}{c}
\text{N} \\
\begin{bmatrix}
\text{HEAD} & \begin{bmatrix}\textit{noun} \\ \text{SEL} \quad \boxed{5}\end{bmatrix} \\
\text{MKG} & \boxed{4}\textit{numeral}
\end{bmatrix}
\end{array}
&
\begin{array}{c}
\boxed{5}\text{NP} \\
\begin{bmatrix}
\textit{hd-funct-ph} \\
\text{HEAD} \quad \boxed{2}\textit{noun} \\
\text{MKG} \quad \boxed{3}
\end{bmatrix}
\end{array}
\end{array}
$$

$$
\begin{array}{cc}
\begin{array}{c}
\text{A} \\
\begin{bmatrix}
\text{HEAD} & \begin{bmatrix}\textit{adjective} \\ \text{SEL} \quad \boxed{1}\end{bmatrix} \\
\text{MKG} & \boxed{3}
\end{bmatrix}
\end{array}
&
\begin{array}{c}
\boxed{1}\text{N} \\
\begin{bmatrix}
\text{HEAD} & \boxed{2}\textit{noun} \\
\text{MKG} & \boxed{3}\begin{bmatrix}\textit{bare} \\ \text{AGR|NUM} \quad \textit{pl}\end{bmatrix}
\end{bmatrix}
\end{array}
\end{array}
$$

two   beautiful   weeks

The combination of *beautiful* and *weeks* in (24) is a structure of a head-functor phrase, where the functor *beautiful* selects and combines with *weeks* via the feature SEL. The MKG value of the plural noun *weeks* is *bare*, which is a subtype of *non-numeral*, conforming to the selection restriction of adjectives indicated in (22). The HEAD value of a mother is inherited from a head daughter. The MKG value of a head-functor phrase comes from the functor daughter. The MKG value of *beautiful weeks* originally comes from *weeks*, as specified in the description of *beautiful* given in (22). The numeral *two* selects and then combines with this phrase via SEL, again constituting a head-functor phrase.

   Having introduced relevant features and constraints of HPSG, we will now see how the apparently puzzling data observed above can be accounted for in this framework.

4. 'A beautiful two weeks' in HPSG

   In this section we will provide an analysis which can provide a satisfactory account of the data. However, we will first consider an analysis in which the

properties of a lexical item are important in determining the properties of DMNNCs. It will be argued that this analysis seems unsatisfactory.

As indicated above, we are assuming a right-branching structure for DMNNCs (See (13)). The structure can be schematically represented in the following way.

(25)   [a [beautiful [two weeks]]]

(25) shows that the modifier fist combines with the numeral-noun combination, and then the resulting constituent combines with the indefinite article. In structures other than DMNNCs, such as NMNCs, a modifier selects a nominal without a numeral expression, as shown in (26).

(26)   a. two beautiful [weeks]
       b. *beautiful [two weeks]

Thus, it might be possible to say that the modifier in DMNNCs has a special syntactic property whereby it modifies, and therefore selects, an NP with a numeral expression (cf. Ellsworth *et al.* 2008: 28). From this perspective, it would be possible to say that the indefinite article is required by the modifier in DMNNCs: the indefinite article never occurs with the numeral-noun combination unless there is a modifier, and the indefinite article has to occur if there is a modifier.
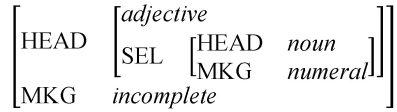
(27)   a. a *(beautiful) two weeks
       b. a *(lucky) three students

(28)   a. *(a) beautiful two weeks
       b. *(a) lucky three students   [= (4)]

Thus, one might argue that the modifier is the most significant element in building up DMNNCs.

On this approach, the lexical description of the modifier of DMNNCs would be something like the following.

(29)

$$
\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{adjective} \\ \text{SEL} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{MKG} & \textit{numeral} \end{bmatrix} \end{bmatrix} \\ \text{MKG} & \textit{incomplete} \end{bmatrix}
$$

(29) indicates that the adjective with this information selects a nominal with a numeral expression in it and its MKG value *incomplete* necessitates the appearance of the determiner. Given (29), we will have structures like (30).

(30)
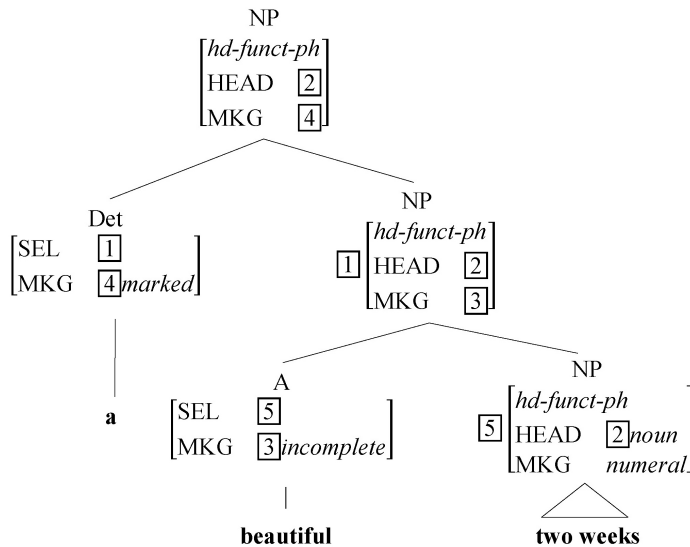
An analysis of *two weeks* was given in the last section. The combination of *beautiful* and *two weeks* in (30) is a head-functor phrase, in which the adjective selects the NP with a numeral in it. Note that the MKG value of the adjective is specified as *incomplete*. This value is inherited to the phrase node and necessitates the occurrence of a determiner.

There is an objection to this analysis. It is incompatible with the sound generalization that a determiner is something required by nominal elements: there are no other cases in English where a determiner is required by an adjective. One might suppose that the following phenomenon is such a case. The examples are cited from

Swan (2005: 132).

> (31)   a. We need a secretary with *(a) first-class knowledge of German.
>   b. My parents wanted me to have *(a) good education.

Uncountable nouns *knowledge* and *education* are not normally used with a determiner, but in these examples, where they are modified by the adjectives *first-class* and *good*, respectively, the determiner is obligatory. Swan (2005: 132) states, however, that most uncountable nouns cannot be used with the indefinite article even when they have an adjective. The following examples are again Swan's (2005: 132).

> (32)   a. My father enjoys (*a) very good health.
>   b. We're having (*a) terrible weather.

It is obvious, then, that these cases are entirely different from DMNNCs, where the determiner is always obligatory. It looks as if the DMNN were the only case in which the adjective requires the determiner. As stated above, approaches like this miss an important generalisation that a determiner is required by nominal elements. We conclude, then, that this is not a satisfactory analysis.

We turn now to an analysis which does not miss any important generalisation. This is an analysis in which a special construction is proposed for DMNNCs.

As stated above linguistic expressions are classified and organised into a hierarchy in HPSG. We can propose that the classification of phrase includes the following types.[6]

---

6 Only the portion of the hierarchy which will be relevant for our discussion is given here. Among other subtypes of *hd-ph* are *head-subject-phrase* and *head-complement-phrase*, which are responsible for combining a head with a subject and with some complements, respectively.

(33)
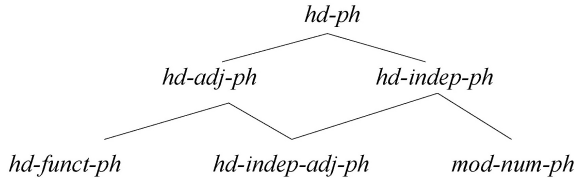
We introduced the *hd-ph*, *hd-adj-ph* and *hd-funct-ph* types in the last section: the *hd-funct-ph* type is a subtype of the *hd-adj-ph* type, which in turn is a subtype of the *hd-ph* type. Here we have a *head-independent-phrase* (*hd-indep-ph*) type, which is another subtype of the *hd-ph* type. Moreover, the *hd-indep-adj-ph* type is an immediate subtype of both the *hd-adj-ph* and the *hd-indep-ph* type. The Big Mess construction such as *so big a mess*, discussed by Van Eynde (2006. 2007), are subtypes of the *hd-indep-adj-ph* type. Finally, the *modifier-numeral-phrase* (*mod-num-ph*) type is a subtype of the *hd-indep-ph* type.[7]

As argued above, the modifiers in DMNNCs are unusual in that they combine with an NP with a numeral expression. We will assume that a type *hd-indep-ph* (Van Eynde 2006, 2007), which is subject to the following constraint, licenses such combination.

(34)

$$\textit{hd-indep-ph} \Rightarrow \begin{bmatrix} \text{HD-DTR} & \begin{bmatrix} \text{INDEX} & \boxed{1} \end{bmatrix} \\ \text{NON-HD-DTRS} & \langle \begin{bmatrix} \text{HEAD|SEL} & \textit{none} \\ \text{INDEX} & \boxed{1} \end{bmatrix} \rangle \end{bmatrix}$$

This is a subtype of *hd-ph*, but not of *hd-funct-ph*. Therefore the non-head daughter of this phrase type does not lexically select its head sister: The SEL value is *none*. The combination of the daughters is guaranteed merely by the identification of the indices.

Especially for DMNNCs, we will propose a *mod-num-ph* type, which is a subtype of *hd-indep-ph*.

---

[7] This type hierarchy is slightly different from Van Eynde's (2006, 2007). In his model the *hd-indep-ph* is a subtype of the *hd-adj-ph* type, and asymmetric coordination and apposition in Dutch and the Big Mess construction in English are subtypes of the *hd-indep-ph*.

(35)

$$mod\text{-}num\text{-}ph \Rightarrow \begin{bmatrix} \text{MKG} & incomplete \\ \text{HD-DTR} & \begin{bmatrix} \text{HEAD} & noun \\ \text{MKG} & numeral \end{bmatrix} \\ \text{NH-DTRS} & \langle[\text{MKG} \quad non\text{-}numeral]\rangle \end{bmatrix}$$

Constraint (35) states that in a phrase of the *mod-num-ph* type a nominal with a numeral expression combines with the non-head which does not contain a numeral expression. Phrases of this type require a determiner because the constraint specifies that its MKG value should be *incomplete*.

We assume that a lexical description of the indefinite article *a(n)* is something like (36).

(36)

$$a(n)\text{:} \begin{bmatrix} \text{HEAD} & \begin{bmatrix} determiner \\ \text{SEL} & \begin{bmatrix} \text{HEAD} & noun \\ \text{MKG} & \begin{bmatrix} non\text{-}numeral \\ \text{AGR|NUM} & sg \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{MKG} & marked \end{bmatrix}$$

This states that the indefinite article *a(n)* selects a nominal whose MKG value is *non-numeral* and the AGR|NUM value is *sg*. The combination with the head daughter is licensed by a constraint on the *hd-funct-ph* given in (17). The lexical description of an adjective was given in (22), but we will modify it slightly.
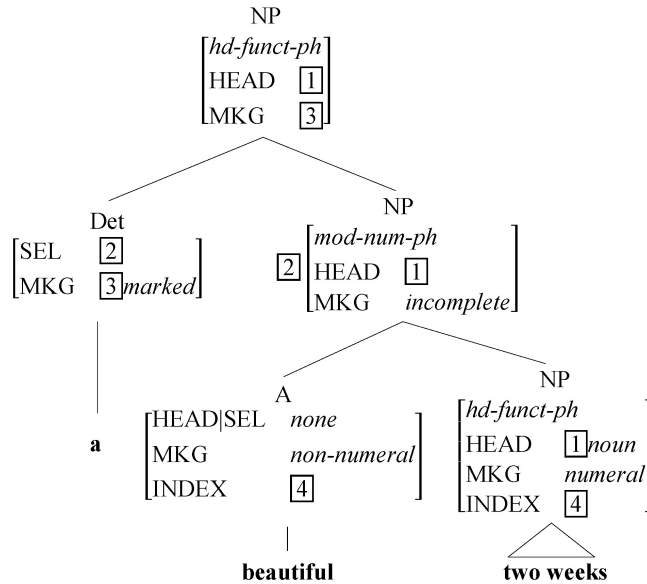
(37)

$$beautiful\text{:} \begin{bmatrix} \text{HEAD} & \begin{bmatrix} adjective \\ \text{SEL} & none \quad \vee \quad \begin{bmatrix} \text{HEAD} & noun \\ \text{MKG} & \boxed{1}non\text{-}numeral \end{bmatrix} \end{bmatrix} \\ \text{MKG} & \boxed{1} \end{bmatrix}$$

Here the value of SEL is amended so that it can be *none*. This means that the adjectives either select the nominal with the [MKG *non-numeral*] specification or do not select anything. The latter option enables it to appear in the phrases of the *hd-indep-ph* type.

The above constructional constraints and lexical descriptions work together for

characterising DMNNCs. Our analysis of *a beautiful two weeks* is given in (38).

(38)

$$
\begin{array}{c}
\text{NP} \\
\begin{bmatrix}
\textit{hd-funct-ph} \\
\text{HEAD} \quad \boxed{1} \\
\text{MKG} \quad \boxed{3}
\end{bmatrix}
\end{array}
$$

Det
$$
\begin{bmatrix}
\text{SEL} & \boxed{2} \\
\text{MKG} & \boxed{3}\textit{marked}
\end{bmatrix}
$$

NP
$$
\boxed{2}\begin{bmatrix}
\textit{mod-num-ph} \\
\text{HEAD} \quad \boxed{1} \\
\text{MKG} \quad \textit{incomplete}
\end{bmatrix}
$$

a

A
$$
\begin{bmatrix}
\text{HEAD|SEL} & \textit{none} \\
\text{MKG} & \textit{non-numeral} \\
\text{INDEX} & \boxed{4}
\end{bmatrix}
$$

beautiful

NP
$$
\begin{bmatrix}
\textit{hd-funct-ph} \\
\text{HEAD} & \boxed{1}\textit{noun} \\
\text{MKG} & \textit{numeral} \\
\text{INDEX} & \boxed{4}
\end{bmatrix}
$$

two weeks

An analysis of *two weeks* was given in the last section. The combination of *beautiful* and *two weeks* is an instance of a type *mod-num-ph*. As a subtype of *hd-indep-ph* it is constrained by the constraint in (34): the indices of the two daughters are identified. This phrase type is a subtype of *hd-ph*, so the mother node has the same HEAD value as its head daughter. Note also the MKG value is *incomplete*: unlike the *hd-adj-ph* type and its *hd-funct-ph* subtype, the MKG value is not inherited from the non-head daughter. Thus, *a* can combine with *beautiful two weeks* although the latter contains a plural nominal head.

We will now look at how the above analysis can deal with the idiosyncratic properties of DMNNCs observed in the earlier sections. First of all let us consider the fact that the determiner is obligatory in DMNNCs. The data, observed in (4), are repeated in the following.

(39) a. *(a) beautiful two weeks
      b. *(a) lucky three students [= (4)]

Phrases of the *mod-num-ph* type require a determiner because constraint (35) specifies that its MKG value is *incomplete*.

Second, as we saw in (27) the modifier is also obligatory.

(40) a. a *(beautiful) two weeks
      b. a *(lucky) three students [= (27)]

This fact can also be accommodated by the constraint on the *mod-num-ph* type given in (35). This constraint specifies that the MKG value of the non-head daughter is *non-numeral*. Without an adjective, the non-head daughter of the modifier-numeral phrases in (40) would be the indefinite article. However, the indefinite article whose partial description was given in (36), does not conform to this combination. The description of the indefinite article is repeated in (41).

(41)

$$
a(n): \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{determiner} \\ \text{SEL} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{MKG} & \begin{bmatrix} \textit{non-numeral} \\ \text{AGR|NUM} & \textit{sg} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{MKG} & \textit{marked} \end{bmatrix} \qquad [= (36)]
$$

This shows that the MKG value of *a*(*n*) is *marked*. This means that it cannot fit in as a non-head daughter of numeral-modifier phrases.

Note also that structures like **a two weeks* and **a three students* are not licensed as a *hd-funct-ph* type either. As the description in (41) states, *a*(*n*) selects a nominal whose MKG value is *non-numeral*. This means that the indefinite article cannot combine directly with *two weeks* or *three students* as in (40), whose MKG value is *numeral*. The ungrammaticality of the examples in (3) can be accounted for in the same way. The relevant data are repeated below.

(42) a. (*a) two beautiful weeks
      b. (*a) three lucky students [= (3)]

These examples show that NMNCs, unlike DMNNCs, do not require a determiner and exclude an indefinite article. As discussed in section 3, the MKG value of

NMNCs is *numeral*. Therefore the indefinite article cannot select them.

Third, this analysis can capture the fact that the indefinite article can occur with the plural head noun. In our analysis the indefinite article and the noun do not have to agree in number because the indefinite article is required by the phrase (*mod-num-ph*), not its head noun. A plural noun occurs simply because the numeral is larger than 1: if the numeral is *one* then a singular noun appears, as illustrated by the examples in (8). The relevant parts of the data are repeated here for convenience.

(43)   a. a career-low one touchdown in eight games (COCA)
　　　　b. a further one point (BYU-BNC)

In these examples the head noun needs to be singular because the numeral is *one*.

Fourth, the constraint on *mod-num-ph* stated in (35) only licenses the combination of the adjective and the numeral-noun combination. Therefore, cases like (5), where the adjective intervenes between the numeral and the noun, are not licensed. The data are repeated below.

(44)   a. *a two beautiful weeks
　　　　b. *a three lucky students   [= (5)]

Note also that the constraint for *hd-funct-ph* does not license this structure either, as stated above,

Fifth, it is not difficult for this analysis to capture the instances of DMNNCs with a relative clause, observed in (11). (11a) is repeated here for convenience.

(45)   By the end of the four days, my group and I were ready to leave, but it was [a four days [that we will all look back on with great memories]].   [= (11a)]

The order between the modifier and its head daughter is underspecified in the constraints of both *hd-indep-ph* in (34) and *mod-num-ph* in (35). Given the general constraint on the constituent order in English, the adjective modifier occurs pre-nominally while the relative clause appears post-nominally.

Finally, it is possible to accommodate the DMNNCs with determiners other than

a, as in (14).

(46) a. *these* lucky 30 people
      b. *those* busy nine days   [= (14)]

The constraint for *mod-num-ph* in (35) does not specify the AGR value. As stated above, AGR represents morphosyntactic properties of the expression and NP-internal agreement is based on the AGR value. The underspecification of the AGR value in constraint (35) enables DMNNCs to have either singular or plural agreement with the determiner. The following data show that DMNNCs can take all sorts of determiners, such as *the*, *this*, *that*, *each*, *every* and *another*.

(47) a. As with all TV, there were scores of people across a number of departments who have participated in one way or another, both in the lead up to filming and during ***the** busy two days* the team were with us.
        (http://blog.ordnancesurvey.co.uk/2013/07/ordnance-survey-features-on-cbbcs-blue-peter/)
      b. Now these rare images, ***this** scant 800 feet* of film, rushed through the projector. (COCA)
      c. Forget that the budget for ***that** extra fifty copies* used to be spent on lower-profile movies. (COCA)
      d. At altitudes of more than 1,000 feet, add 1 minute to processing time for ***each** additional 1,000 feet* of altitude. (COCA)
      e. If your army includes sixteen or more Snotling bases then the possible number of units goes up by one for ***every** extra five bases*. (BYU-BNC)
      f. Vampire World 2: The Last Aerie (Roc original (Penguin), 5.99, 26th) ***Another** staggering 784 pages* of nerve-shattering horror from the author of the Necroscope series. (BYU-BNC)

We have now provided an account of the DMNNC data which gets all the facts observed in the earlier sections right.

5. Further data

There are some further relevant data that should be considered. First, (48) illustrate that not only a determiner and a modifier, but a numeral is also obligatory in DMNNCs.

(48) a. a beautiful *(two) weeks
      b. a lucky *(three) students

The constraint on the *mod-num-ph* type given in (35) and repeated below states that in this type of phrase the head daughter is a nominal with the [MKG *numeral*] specification.

(49)

$$
mod\text{-}num\text{-}ph \Rightarrow
\begin{bmatrix}
\text{MKG} & incomplete \\
\text{HD-DTR} & \begin{bmatrix} \text{HEAD} & noun \\ \text{MKG} & numeral \end{bmatrix} \\
\text{NH-DTRS} & \langle [\text{MKG} \quad non\text{-}numeral] \rangle
\end{bmatrix}
\qquad [= (35)]
$$

Without a numeral the head daughters of the modifiers, namely *weeks* and *students* in (48), do not have the *numeral* value for MKG. Moreover, the constraint for *hd-funct-ph* does not license this structure either. If *beautiful* and *weeks* and *lucky* and *students* formed a head-functor phrase, the MKG value of the head nouns (*weeks* and *students*) would be inherited to the mother node via the adjective (See (22)). Therefore, the AGR|NUM value, which we assume is a part of the MKG value, of *beautiful weeks* and *lucky students* would be *pl*, which is not compatible with the SEL value of the indefinite article (See (36)).

Second, when a DMNNC is a subject, the verb can show either singular or plural agreement. In (50a) *an estimated 3.3 million people* has plural agreement with the verb whereas *an estimated 43,000 people* in (50b) shows singular agreement.

(50) a. **An estimated 3.3 million people** *have* died as a result of the war
         making it the "tragedy of modern times", according to a report
         issued by the International Rescue Committee aid agency.
         (http://news.bbc.co.uk/2/hi/africa/2928127.stm)

b. **An estimated 43,000 people** *has* already died since 1979 due to asbestos exposure and thousands more continue every year despite serious efforts from local and federal government to ban and or/limit the use of asbestos.

(http://www.asbestos-attorney-center.com/asbestos-attorney-cancer-m esothelioma)

Plural agreement in (50a) occurs simply because the head of *an estimated 3.3 million people* is a plural noun *people*. Following much HPSG work we assume that subject-verb agreement in number is dependent on the information encoded in the value of the CONTENT (CONT) feature of the subject (*e.g.*, Kathol 1999, Kim 2004, Wechsler and Zlatić 2000). The CONT feature indicates what kind of semantic properties the linguistic expression has. The CONT value includes the INDEX feature, which represents what it refers to in the actual world. The INDEX value includes the NUMBER (NUM) feature, which indicates whether it is singular or plural in meaning. The partial description of *people* in (50a) is given in (51).

(51)

$$
people: \begin{bmatrix} \text{HEAD} & \boxed{1}\textit{noun} \\ \text{MKG} & \boxed{2}\begin{bmatrix} \textit{bare} \\ \text{AGR}|\text{NUM} & \textit{pl} \end{bmatrix} \\ \text{CONT} & [\text{INDEX}|\text{NUM} \quad \textit{pl}] \end{bmatrix}
$$

The CONT|INDEX|NUM value of the head noun *people* is *pl* (*plural*), so *an estimated 3.3 million people* is semantically plural and shows plural agreement with the verb.

What about singular agreement in (50b), then? Let us observe the fact that in English plural nouns sometimes show singular agreement with the verb.

(52) a. Five pounds is/*are a lot of money. (Hudson 1999: 174)
      b. Most of us can agree that 8 million people *is* too many to be receiving disability payments from the government.

(http://www.startribune.com/printarticle/?id=177023831)

In (52) *five pounds* and *8 million people* refer to a group of people conceived as a whole rather than discrete entities (Kim 2003: 1117-1118). Let us assume that *pounds* and *people* in (52) have the following lexical description.

(53)

$$
\begin{bmatrix}
\text{HEAD} & \boxed{1}\,noun \\
\text{MKG} & \boxed{2}\begin{bmatrix} bare \\ \text{AGR|NUM} & pl \end{bmatrix} \\
\text{CONT} & [\text{INDEX|NUM} \quad sg]
\end{bmatrix}
$$

These nouns are normally countable nouns which are both morphologically and semantically plural, but in (52) they are morphologically plural but semantically singular. In (53) the MKG|AGR|NUM value indicates that the word is morphologically plural, while the CONT|INDEX|NUM value is *singular* (*sg*), indicating that it is semantically singular. Likewise, we can propose that the head noun of *an estimated 43,000 people* in (50b) is morphologically plural but semantically singular, and its semantic singularity causes singular agreement with the verb.

In English even singular words such as *family*, *team*, and *government* can have either singular or plural agreement with the verbs, depending on the context. Verbs take a plural form when the group is seen as a collection of people and take a singular form when the group is seen as a unit (Swan 2005: 526). Therefore, we can conclude that the facts observed in (50) are nothing special: they just conform to the general patterns of subject-verb agreement in English.

6. Conclusion

Let us summarise the discussion. In this article we have first looked at some analyses which have been proposed for DMNNCs and argued that they are not successful. We have then developed a fairly detailed analysis within HPSG in which the peculiarities of DMNNCs are attributed to the special constructional constraints. We have argued that our HPSG analysis can provide a satisfactory account of the properties of DMNNCs.

The use of hierarchically organised network of phrasal types in (33) allows us to

have constraints of any level of generality. Our HPSG analysis accommodates not just the construction-specific properties of DMNNCs but also the regularities that they share with other constructions, such as NMNCs such as *two beautiful weeks* and the Big Mess construction such as *so big a mess*. This approach can thus capture the distinctive properties of DMNNCs without missing any generalisations.

References

Allegranza, V. 1998. Determiners as functors: NP structure in Italian. In S. Balari and L. Dini (eds.), *Romance in HPSG*, 55-108. Stanford: CSLI Publications.

Davies, M. 2004. BYU-BNC. (Based on the British National Corpus from Oxford University Press). http://corpus.byu.edu/bnc/.

Davies, M. 2008. The Corpus of Contemporary American English: 450 million words, 1990-present. http://corpus.byu.edu/coca/.

Ellsworth, M., R. Lee-Goldman, and R. Rhodes. 2008. A paradox of English determination: the construction of complex number. *Proceedings of the 38th Western Conference on Linguistics*.

Gawron, J. M. 2002. Two kinds of quantizers in DP. Handout given at the Linguistics Society of America.

Honda, M. 1984. On the syntax and semantics of numerals in English. *Journal of Osaka Jogakuin 2-year College* 14: 97-115.

Hudson, R. 1999. Subject-verb agreement in English. *English Language and Linguistics* 3: 173-207.

Ionin, T. and O. Matushansky. 2004. A singular plural. *Proceedings of WCCFL 23*, 399-412. Ithaca, NY: Cascadilla Press.

Ionin, T. and O. Matushansky. 2006. The composition of complex cardinals. *Journal of Semantics* 23: 315-360.

Jackendoff, R. 1977. *X-bar Syntax: A Study of Phrase Structure*. Cambridge, MA: MIT Press.

Kathol, A. 1999. Agreement and the syntax-morphology interface in HPSG. In R. Levine and G. Green (eds.), *Studies in Contemporary Phrase Structure Grammar*, 223-274. Cambridge: Cambridge University Press.

Kim, Jong-Bok. 2004. Hybrid agreement in English. *Linguistics* 42: 1105-1128.

Ohna, T. 2003. *A beautiful two weeks*: its syntactic structure and the semantic relations of the adjective to the numeral and head noun. In S. Chiba, et al. (eds.), 23-40. *Empirical and Theoretical Investigations into Language*.

Pollard, C. and Ivan A. Sag. 1989. *Information-Based Syntax and Semantics*. Stanford: CSLI

Publications.

Pollard, C. and Ivan A. Sag. 1994. *Head-driven Phrase Structure Grammar*. Chicago: University of Chicago Press.

Sag, I. A. 1997. English relative clause constructions. *Journal of Linguistics* 33: 431-484.

Swan, M. 2005. *Practical English Usage*. Oxford: Oxford University Press.

Van Eynde, F. 2006. NP-internal agreement and the structure of the noun phrase. *Journal of Linguistics* 42: 139-186.

Van Eynde, F. 2007. The Big Mess Construction. In S. Müller (ed.), *Proceedings of the HPSG07 Conference*, 415-433. Stanford: CSLI Publications.

Wechsler, S. and L. Zlatić. 2000. A theory of agreement and its application to Serb-Croatian. *Language* 76: 799-832.

Takafumi Maekawa
Department of Clinical Social Welfare
Ryukoku University
E-mail: maekawa@soc.ryukoku.ac.jp