ANAPHORIC ONE AND ITS IMPLICATIONS*

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The nominal anaphoric element one has figured prominently in discussions of linguistic nativism because of an important argument advanced by C. L. Baker (1978). His argument has been frequently cited within the cognitive and linguistic sciences, and has provided the topic for a chain of experimental and computational psycholinguistics papers. Baker’s crucial grammaticality facts, though much repeated in the literature, have not been critically investigated. A corpus investigation shows that his claims are not true: one does not take only phrasal antecedents, but can also take nouns on their own, including semantically relational nouns, and can take various of-PP dependents of its own. We give a semantic analysis of anaphoric one that allows it to exhibit this kind of freedom, and exhibit frequency evidence that goes a long way to explaining why linguists have been inclined to regard phrases like the one of physics or three ones as ungrammatical when in fact (as corpus evidence shows) they are merely dispreferred relative to available grammatical alternatives. The main implication for the acquisition literature is that one of the most celebrated arguments from poverty of the stimulus is shown to be without force.

1. INTRODUCTION. Suppose it were the case that English anaphoric one was required to have a phrasal antecedent headed by N, and was not allowed to take just a noun as antecedent. Suppose further that positive evidence for the possibility of phrasal antecedents existed but was too scarce in children’s input to affect acquisition, and that negative evidence provided to children for the prohibition on noun antecedents was nonexistent. And suppose children acquired tacit knowledge of these facts rapidly and easily nonetheless. It would be reasonable to see the situation as enhancing the plausibility of LINGUISTIC NATIVISM—the view that at least some linguistic knowledge is innate. Specifically, we would have support for innate knowledge of certain facts about noun phrase structure, anaphoric elements, and their antecedents.

The idea of an argument along these lines was set out more than three decades ago in a scientifically serious and well-regarded textbook on transformational grammar by C. L. Baker (1978:413–425; see also 1979:571–574), before the coining of the term ‘argument from poverty of the stimulus’ (Chomsky 1980:34). Baker’s argument is clearly presented, and worthy of close attention.

Unfortunately it has not received close attention. Instead, the voluminous linguistic literature on linguistic nativism has simply repeated in abbreviated form what Baker said, virtually always giving the same three or four invented example sentences that Baker relied on in his textbook. There has been no effort to verify the crucial facts about antecedence possibilities, there has been hardly any effort to support the claim that the allegedly scarce data is indeed scarce, or that it is crucially needed; and there has been little attention to the crucial matter of the semantics of anaphoric one.
Moreover, the substantial psycholinguistic literature over the last ten years that has attempted to confirm Baker's conjectures empirically has also been based on uncritical adoption of his data and analysis, and has neither probed the reliability of his claims nor developed an accurate picture of what it is that gets acquired.

In section 2 of this paper we review Baker's argument in detail. In section 3 we distinguish three distinct items pronounced one, noting that Baker confused two of them in his argument, and we go on to exhibit corpus evidence that Baker's key claim about the facts is false: phrases like the one of physics (with student as antecedent for one) are grammatical and copiously attested. This leads to a further observation: that the empirical facts show the distinction between complements and modifiers of nouns to be unfounded. There is no rational way to motivate drawing the distinction between them.

In section 4 we provide a new syntactic and semantic analysis of anaphoric one. We assume no structural differentiation of the phrases formerly classified as either complements or adjuncts: all nouns are treated grammatically as non-relational until they combine with a dependent. The semantic relationship holding between head and dependent in any given context of utterance is determined by a mixture of world and contextual knowledge. Certain relations are more probable than others, and these are the ones which have given rise to the notion of some nouns being inherently relational and taking complements. Anaphoric one is just a regularly-inflected noun with a special anaphoric role, and can itself have either a non-relational or a relational meaning depending on the meaning of its antecedent.

In section 5 we consider why linguists have been so ready to believe that expressions such as the one of physics are ungrammatical. The explanation lies largely in frequency effects. In a variety of contexts, anaphoric one competes with other anaphoric expressions, and the expressions that are deemed ungrammatical are simply the ones in which anaphoric one is a generally less successful, though not impossible, competitor. This explanation applies not only to expressions like the one of physics, but also to a variety of other expressions which have at some point been deemed ungrammatical, for instance expressions such as three ones, where anaphoric one occurs with a numeral determiner.

In section 6, we return to the issue of acquisition, and point out that the falsity of the factual basis is not the only problem: investigators have repeatedly altered their assumptions about what has to be acquired, so they are frequently at cross purposes. None of the works in question have assumed the correct adult system. We conclude (in section 7) with some remarks about the working relationship between the linguistic and psychological sciences that will be needed if we are to develop a proper understanding of the details of first-language acquisition.

2. The received wisdom. Baker (1978) holds that anaphoric one can never have a lone N as antecedent. Rather, it must have an antecedent that is a phrasal constituent of a category that he calls Nom (for NOMINAL): the N' of X-bar theory. We follow his notation, which happens to coincide with that of Huddleston & Pullum et al. 2002.¹

We take phrases like the student of chemistry to be labeled noun phrase (NP). An NP has a Nom as head, and student of chemistry is a Nom. We posit a category of determinatives (D),² to which the belongs. Thus the structure of the student of chemistry would be as in 1.
In an NP like the student of chemistry with short hair, the PP of chemistry is standardly taken to be a complement, but with short hair is a modifier. Modifiers are not sisters of N, but sisters of Nom, so the structure of this second NP would be as in 2, with an additional Nom constituent.

Crucially, Baker claimed there was a grammaticality difference between the two sentences in 3.

(3) a. The student of chemistry was more thoroughly prepared than the one of physics. [example 14b in Baker 1978:415]
   b. The student with short hair is taller than the one with long hair. [example 23 in Baker 1978:419]

The difference is that 3a is supposed to be ungrammatical because it has no Nom to act as antecedent for one. The sole Nom constituent in the subject NP (see 1) includes not only the head noun student but also the complement, of chemistry. By contrast, 3b does have a suitable Nom, because student with short hair has the structure [Nom [Nom [N student ] [pp with short hair ] ]], and the inner Nom can serve as antecedent so 3b is grammatical.

Baker had actually made his observations almost a decade earlier, and pointed them out to
George Lakoff, who used them as part of the data for section II of his paper ‘Global rules’ (1970). Jackendoff (1977:59), agreeing with Lakoff, proposes a constraint banning a Nom consisting of ‘one(s) of NP’. However, he notes, crediting a personal communication from Noam Chomsky, that no similar constraint holds for PP complements headed by prepositions other than of. For example, sentences like 4 are grammatical:

(4) Arguments with Bill are less fruitful than ones with Harry. [example (i) in footnote 4 of Jackendoff 1977:61]

If the with-PP after a noun like argument is a complement, as the parallel with VPs like argue with Bill suggests, then Baker’s general claim that one cannot have a complement-taking noun as antecedent had already been shown to be false before he published it. Throughout more than four decades of literature, however, the alleged ungrammaticality of 3a was taken to be secure.

3. The syntactic facts.

3.1. The three items spelled one. English has three distinct lexemes with one as their orthographic base form. They differ morphologically, syntactically, and semantically. We summarize their properties in 5.

(5) The three items spelled one in English
a. Pronoun
   CATEGORY: Regular third-person singular indefinite pronoun
   INFLECTION: one (plain case), one’s (genitive case), oneself (reflexive)
   MEANING: ‘An arbitrary person’ (compare French on, German man)
   NOTES: As with pronouns generally, no plural form.

b. Determinative
   CATEGORY: Indefinite cardinal numeral determinative
   INFLECTION: Uninflectable
   MEANING: ‘1’ or ‘some’ or ‘a(n)’ or ‘sole’
   NOTES: Obligatory when functioning as determiner. Omissible when functioning as modifier with the meaning ‘sole’. Anaphoric to a whole NP when used with no head noun.

c. Noun
   CATEGORY: Regular common count noun
   INFLECTION: one (plain sg.), ones (plain plur.), one’s (gen. sg.), ones’ (gen. plur.)
   MEANING: Anaphoric; something like ‘instance thereof’, referring back to some type or class referred to in the discourse or salient in the context.

The item we are concerned with is 5c, the count noun, which is referred to as onect in Huddleston & Pullum et al. 2002 (where the determinative is tagged one). Like any other regular noun, onect has four inflected forms (three of them pronounced identically). Its anaphoric use is illustrated in 6.
(6) a. The art museum in Bilbao is the most impressive one I’ve seen.
    b. An honest local government official is harder to find than a corrupt one.
    c. The long, gently curved Victorian railway station building in York is the finest one in the whole of England.

In 6a the most plausible assumption about the antecedent for one would be art museum — surely not art museum in Bilbao (to call the Guggenheim the most impressive museum in Bilbao would be an understatement). In 6b, the plausible antecedent is local government official (not honest local government official, which would involve a contradictory interpretation). And in 6c it is Victorian railway station building, or perhaps just railway station building, but not long, gently curved Victorian railway station building in York, which would render 6c trivially true.

These examples illustrate a point to which we will return when considering the arguments for linguistic nativism: the antecedent of anaphoric one can indeed be a multi-word Nom, but it does not have to be the largest Nom available.

3.2. CONFUSION OF COUNT NOUN WITH DETERMINATIVE. It has gone unremarked in the linguistic literature, so far as we know, that Baker confused two of the items listed in 5. Although the quantity of data he considered was very small, his original example illustrating a multi-word Nom as antecedent involves the wrong lexical item. The invented sentence he gave was 7:

(7) John has a blue glass, but Alice doesn’t have one.

The occurrence of one in 7 is not the noun; it is the determinative. Notice that it does not have a plural form (*Alice doesn’t have ones). The constituent whose repetition it avoids is not the Nom glass or the Nom blue glass, it is the entire NP a blue glass. Baker has used the anaphoric noun onect to illustrate the claim that onect cannot take just a noun without its complement as antecedent, but has used the indefinite determinative oned to illustrate the claim that onect can have a multi-word antecedent. The sentence in 7 has no bearing on this second claim.5

It is not possible to treat onect and oned as a single lexeme: they are of different syntactic categories, and (as Jackendoff notes) one inflects and the other does not. But in any case, collapsing them would mean changing the claim about anaphoric one to a different one: that the antecedent is either a Nom or a full NP. This is not what Baker was proposing.

This descriptive error is not of primary importance: Baker’s argument could be rebuilt with different examples (e.g., John has a blue glass, but we couldn’t find another one for Alice, where the point would be that another one can mean “another blue glass”). However, Baker also makes a different descriptive error that is much more serious. It concerns not the permissibility of multi-word Nom antecedents but the alleged impermissibility of noun antecedents.

3.3. CORPUS INVESTIGATION. Jackendoff observed that onect can indeed replace a lone N before preposition phrases headed by with (as in 4). He proposes to preserve Baker’s claim about lone N antecedents by narrowing it to PPs headed by of (henceforth of-PPs). One might think of going further, in fact, and hypothesizing that of-PPs are the only true complements of nouns. This
would preserve Baker’s claim that nouns on their own can never be antecedents for $onet$, provided sentences like 3a are genuinely ungrammatical. Unfortunately there is no possibility of maintaining such a thesis: corpus data refute it overwhelmingly.

Payne and Berlage (2009) undertook an extensive study of the relevant data. They had independent reasons — the nativism issue was not on their agenda. They were interested solely in gaining insight into the complement/adjunct distinction. What they found was that nouns serving as antecedents of $onet$ in isolation from their $of$-PP complements were abundant. The semantic relation between the head noun and the $of$-PP had clear effects on the frequency of such constructions, as we shall review below, but they concluded that there was no clear place to draw a line between complements and modifiers.

Payne & Berlage’s corpus investigation was based on the British National Corpus (henceforth BNC), a 100-million-word corpus of British English (henceforth BrE) from the later part of the 20th century. Approximately 90% of the texts are written, from a wide-ranging variety of sources, and 10% are spoken. For the purposes of this investigation, the version used of the BNC was BNCweb (CQP Edition).

Two searches were employed. The first extracted all occurrences of the plural form $ones$ followed by $of$. After spurious hits were eliminated, this yielded 127 plural tokens of $onet$. Searching for singular tokens of $onet$ in the same environment is complicated by the potential confusion with $oned$: examples of the type $oned$ of the $X$ are extremely common. But since $onet$ is a count noun it must be preceded by a determiner when singular, and also the form $oned$ generally cannot represent $oned$ if preceded by an adjective. Isolating all sentences containing the sequence ‘determinative + adjective + $one + of$’ yielded a further 408 genuine singular tokens of $onet$.

From the total of 535 they excluded 6 examples in which $onet$ was a non-anaphoric subcomponent of an invented proper name, as in the Great Ones of the land. They also excluded 11 examples in which $onet$ was followed by an oblique genitive, i.e. an $of$-PP in which the dependent NP stands in the genitive case, since these represent an entirely distinct construction. Each of the remaining 518 tokens of $onet$ followed by $of$ was then examined to isolate the semantic relation between the antecedent noun and the $of$-PP.

We use the conventions of Huddleston & Pullum et al. (2002: 474–7) as an informal notation for the semantic relations involved:

\[(8) \quad \text{eyes of the team manager} \]
\[\quad h \ (\text{head}) \quad d \ (\text{dependent}) \]
\[\quad d \ \text{has body-part} \ h \]

In an example such as 8, eyes is the head noun, symbolized by $h$, and the team manager is the dependent NP, symbolized by $d$. The term DEPENDENT covers both complements and modifiers, and avoids the necessity for making any prejudgment at this stage as to which semantic relations underlie the syntactic relation of complement. In 8, the semantic relation is then a body-part one: $d$ has body-part $h$.

In total, the 518 examples of $onet$ followed by a dependent $of$-PP were analysed as representing, at a relatively coarse level, 35 distinct semantic relations between head and dependent. For illustrative purposes, we make the simplification of grouping these into 14 broader
semantic fields, each of which is represented by examples 9–22 below. The antecedent, together with the semantic relation identified between head and dependent, is indicated in braces following each example, followed by the BNC locator in square brackets.

(9) Object-like dependent
   a. This interpretation is contrary to an accepted [one of wrestling] as a sport.
      \{interpretation; $d$ is undergoer of $h$\} \[CGY 1,308\]
   b. How the printers had got hold of her photograph she did not know, but they had, and now it was being sold all over London, along with \{ones of Lillie Langtry and other noted belles\}.
      \{photographs; $d$ has depiction $h$\} \[HGE 1,398\]

(10) Function noun
   a. Nephrite contains a high proportion of magnesia and a considerable [one of lime].
      \{proportion; $h$ is amount of $d$\} \[FBA 470\]
   b. Seventy years of Byrd on record must have given us a good 50 versions of Ave verum corpus but not a single [one of Deus venerunt gentes].
      \{version; $h$ is type of $d$\} \[J1A 1,344\]

(11) Part-whole
   a. … she gently raised her eyebrows until her eyes met the disconcerted \{ones of the team manager\}.
      \{eyes; $d$ has body-part $h$\} \[HGM 204\]
   b. I hope this little titbit of news about the crews that were formed and especially the \{ones of Rosie’s Riveters\}…
      \{crews; $d$ has associated part $h$\} \[H5J 59\]
      (Rosie’s Riveters was a World War 2 US airplane)

(12) Agentive
   a. Suddenly the river was full of plunging bodies going to the rescue, barking dogs and screaming girls mingling their cries with the masterful \{ones of the menfolk\}.
      \{cries; $d$ is performer of $h$\} \[ACK 2,535\]
   b. The German keyboard tablatures – Elias Ammerbach’s (Leipzig, 1571 and 1575), those of Bernhard Schmid the elder (Strasbourg, 1577) and Jacob Paix (Lauingen, 1583), and the manuscript \{ones of Christoph Loeffelholtz (Tuebingen, Univ . Bibl., Mus. ms. 40034) and August Noermiger (1598, idem, 40098) – consist almost exclusively of vocal transcriptions and dances of various nationalities.
      \{German keyboard tablatures; $d$ is creator of $h$\} \[GUH 755\]

(13) Control
   … and to shift the costs from the more visible \{}budgets\{} of the services to the less visible \{ones of the individual\} …
   \{budgets; $d$ is controller of $h$\} \[AS6 944\]

(14) Content
   … the decision whether to categorize such questions as \{ones of law or fact\} is a matter on which opinion, both judicial and academic, differs.
(15) Human properties
a. … we invest hospital medicine with technical powers additional to those more home-spun [ones of the GP], but we attribute those powers to the institution rather than the person.

b. … his attitude to women and their problems had always been the conventional [one of the young aristocrat he had once been].

(16) Context
a. It is surprising to find that the soft-bodied jellyfish have any fossil record at all, but in fact they have the longest [one of the phylum].

b. … they point us away from the epistemological frame of reference of this chapter towards the socio-cultural one of the next.

(17) Physical content
a. … and doors in which the original toughened glass panels have been replaced by more serviceable [ones of sturdy plywood].

b. … drinking from skin water-bottles and smaller stone [ones of ale or whisky].

(18) Time and space
a. … constituting a trigger for the crash which separates the period of overheating from the subsequent [one of mass unemployment and stagnation].

b. … that lies between the outer road of St Helen’s and the inner [one of Spithead].

(19) Representative
Jesus is the Christ, the anointed [one of God].

(20) Causation
… the tears, Dexter felt, were as much [ones of laughter] as of despair.

(21) Categorization
a. The new commercial brewery will be the only [one of its kind] in Worcestershire.

b. It might take in all the farms in valley, parish or district. I have been on [ones of 100,000 acres].
(22) Partitive

a. She scooped up the bits of spilt polystyrene in her hand and dropped them into the waste-paper basket. I’ll get a new [one of these] when we move.

\{waste-paper basket; h is subset of d\} [ABX 3.324]

b. The administrator, Tilahu Walle, says they are the lucky ones of the 200,000 people in the area who need assistance.

\{people in the area who need assistance; h is subset of d\} [B73 1.179]

To summarize, there is an abundance of examples in which one\textsubscript{ct} is anteceded by a single noun (or indeed multi-word Nom) followed by an of-PP to which it stands in some kind of semantic relation. In order to save a vestige of Baker’s claim that one\textsubscript{ct} cannot have a complement-taking noun as its antecedent and take complements of its own (already, we remind the reader, delimited by restriction to the preposition of), it would be necessary to claim that none of these of-PPs is licensed by the antecedent noun or Nom, and that they are all to be treated as modifiers rather than complements.

3.4. *Of*-PPs and semantic relations. A defender of Baker might propose that only those of-PPs which stand in an appropriate semantic relation to an inherently relational noun are genuine complements. Thus student in Baker’s original example 3a would be inherently relational because it is a nominalization of the verb study, and study is a two-place predicate, one of whose arguments is the entity studied. And indeed, it has occasionally been argued in the post-Baker syntactic literature on one\textsubscript{ct}, notably by Oga 2001 and Panagiotidis 2003, that there are two distinct prepositions of: the first would be functional/semantically empty and introduce complements of nouns which themselves are claimed to be inherently relational, and the second would be lexical/meaningful and itself denote the appropriate semantic relation with an inherently non-relational noun. Only this second type of of would be compatible with one\textsubscript{ct}.

However, this defense does not work. If the noun student is inherently relational, then nouns such as interpretation in our example 9a must also surely be relational. The noun interpretation is a nominalization of the verb interpret, and what is interpreted presumably has the same argument role for the noun as it does for the verb. Nominalizations such as these have been unequivocally considered as relational in the semantic literature from Grimshaw (1991: 66) onwards.

The same might be said of photograph in example 9b: a photograph is an image of something, the thing that has been photographed. So why is photograph not also an inherently relational noun? Syntacticians since Jackendoff (1977) have in fact long been aware of the fact (an embarrassing one for Baker’s argument) that picture nouns (picture, photograph, portrait, etc.) readily serve as antecedents to one\textsubscript{ct} with a dependent of-PP denoting the depicted image. The usual response has been not to reconsider Baker’s claim, but rather to suggest that the of-PP must be a modifier rather than a complement; see e.g. Panagiotidis (2003: 285-6). However formal semanticists, e.g. Vikner & Jensen (2002: 197), who tend not to focus on or even mention the properties of one\textsubscript{ct}, have no hesitation in considering picture nouns as relational. Just like other relational nouns, they lexically encode a relationship between two entities.

In fact, if we turn to the substantial semantic literature on relational nouns (for a sampling, see DeBruin & Scha 1988, Barker & Dowty 1993, Barker 1995, and Barker 2011), it is not just
nouns in 9 that are treated as standard examples of relational nouns, but also nouns in 10 and 11. These would be nouns which denote functions, e.g. *proportion* in 10a and *version* in 10b,9 and nouns which are involved in part-whole relationships, including specifically body-part terms, e.g. *eyes* in 11a, and more general part-whole relations, e.g. *crew* in 11b.

Consider next a noun like *cries* in 12a: this takes an agent argument, just like the verb *cry*. Agents, as opposed to patient/theme arguments, are often conceived of as ‘external’ rather than ‘internal’, i.e. standardly realized by subjects in clause structure and ’s genitives in NP structure rather than by objects in clause structure and of-PPs in NP structure. That is, in X-bar theory and its derivatives they would be specifiers rather than complements. But this ignores the fact that agent arguments can be, and often are, expressed by of-PPs in NP structure. An example like the *cries of the menfolk* is a case in point. The alternation between the ’s genitive and of constructions is known to be motivated by a variety of disparate factors, of which the semantic relation involved is only one (see for example Rosenbach 2002, Hinrichs & Szmrecsanyi 2007). Other important factors are the length, animacy, and discourse status of the dependent. Payne & Huddleston (2002: 473-8) argue that the set of semantic relations in principle expressible by of-PPs is in fact a proper superset of that expressible by the ’s genitive construction, i.e. there is no ’s genitive semantic relation which cannot also be expressed by an of-PP, given an appropriate combination of other factors.

There is less consensus in the semantic literature as to the status of the other nouns in 12 and 13 where the of-PPs stand in a creator or controller relation to the head.10 At first sight, it might seem that nouns like *tablatures* in 12b or *budget* in 13 must be inherently non-relational, and that the appropriate creator or controller relation is contextually supplied by the of-PP. This is indeed the essence of the pioneering analysis of creator and controller relations in ’s genitive constructions by Barker (1995: 51), and the basis of many formal semantic treatments of creator and control relations since (in particular a series of papers by Partee and Borschev: see their 2003 for discussion).

It is worth pointing out that it is typically assumed that the dependent in such relations must be expressed by an ’s-genitive. Thus in a simple example like *John’s car*, the noun *car* is taken to be inherently non-relational, and it is the dependent *John’s* which supplies the controller relation. Nouns considered to be non-relational are incorrectly assumed to be unable to take an of-PP: thus examples like the *car of John* are asterisked, and contrasted with *John’s car*. This is essentially the same fallacy as the one holding that agents cannot be expressed by of-PPs. The reason that the *car of John* seems somewhat unacceptable is simply that one-word dependents generally, but especially in the controller relation, strongly favor the ’s genitive rather than the of construction. Longer and/or indefinite dependents are just fine (e.g. *Gunmen in the Philippines ambushed the car of a university president who police had accused of harboring communist rebels*, from the Wall Street Journal, 1987).

We might therefore simply remedy this error and make the claim that of-PPs, as in the proposed analysis of ’s-genitives, contextually supply an appropriate semantic relation to an inherently non-relational head. Note that in 12b, the *tablatures* example, the identical creator relation is expressed first by an ’s-genitive (*Elias Ammerbach’s*) and then subsequently twice by an of-PP, including the one headed by one (the manuscript ones of Christoph Loeffelholtz…).

However, the non-relational analysis is insecure even with this revision. Vikner & Jensen
argue that creator and controller relations are too automatic to have to be created anew on each occasion of utterance. For example, Melissa’s dissertation is automatically interpreted in isolation as involving a creator relation (the dissertation that Melissa wrote), and Melissa’s car is automatically interpreted in isolation as the controller relation (the car that Melissa controls). More importantly, however, they also argue that these relations cannot simply be supplied by the dependent: they must be allowed to be inherent to the head.

One crucial observation is that a phrase like Mary’s former mansion has two interpretations. The first (and arguably less likely) interpretation would be straightforwardly obtainable by composing the non-relational meaning of mansion with the meaning of former, deriving a meaning corresponding to ‘entity that used to be a mansion’. That meaning could then be composed with Mary’s to derive the controller relation: the whole NP would then mean ‘the entity under Mary’s control which was formerly a mansion’. However, the second (and arguably more likely) interpretation is ‘the mansion which Mary formerly controlled’. This cannot be derived compositionally unless the noun mansion itself is allowed to have a relational interpretation corresponding to ‘mansion controlled by x’. The adjective former can then apply to the controller relation rather than the building. In other words, there is good reason to think that nouns with control or creation readings must have the potential for a relational interpretation within their semantic representation.

We could discuss further whether the nouns illustrating our other semantic relations are inherently relational or not. In some cases, the relation seems to be quite saliently associated with the noun: questions (example 14) do not exist in the absence of their content, and powers (example 15a) do not exist without the entity in which they are invested. On the other hand, it is perhaps less saliently a property of a brewery (example 21a) that it should belong to a particular type, or of a farm (example 21b) that it should have a particular size. But rather than prolong the exposition by working through all these examples, we propose to move straight to our main conclusion in this section.

We claim that it is simply untenable to argue that all the of-PPs in examples 9–22 are modifiers. Wherever anyone might decide to draw a line between complements and modifiers, there will still be examples which are incontrovertibly complements. Baker’s claim that one of cannot precede complements is simply indefensible.

3.5. TROUBLE FOR THE COMPLEMENT/MODIFIER DISTINCTION. We now note a deeper and more radical issue raised by the corpus data. As we have noted, examples in which one of is most plausibly treated as having a multi-word antecedent are not at all infrequent; note German keyboard tablatures (12b), attitude to women and their problems (15b), fossil record (16a), frame of reference (16b), and in the partitive construction waste-paper basket (22a) and people in the area who need assistance (22b). However, these are examples which, if viewed syntactically (as Baker viewed them), would require a radically different interpretation of the Nom constituent to the one envisaged by Baker, and indeed all syntacticians who follow the basic tenets of X-bar theory. In Baker’s analysis, head nouns combine first with their complements to form a Nom constituent which can then in principle be modified; it is impossible for a complement to be the complement of a Nom. But in the data just noted the of-PP which follows one of must be external to an already formed multi-word unit, whether the dependents involved are themselves
construed as complements or modifiers. None of the proposals we might envisage to handle this data allow Baker’s analysis to survive in its intended form.

One possibility is simply to abandon X-bar theory principles concerning the structural distinction between complements and modifiers, and allow dependents of any kind to combine not only with N but also with already formed Noms. The constituent Nom is then simply an NP-internal phrasal category containing a head noun and any number of dependents (except the determiner). This is, for instance, the syntactic structure for English NPs proposed by Payne & Huddleston (2002). In this conception, one<sub>ct</sub> can potentially have any single-word N or multi-word Nom as antecedent. The analysis of 12b is 23:

\[
(23) \quad [\,[D\,the\,][Nom\,[Nom\,German\,[Nom\,keyboard\,[N\,tablatures]]]\,of\,Christoph\,Loeffelholtz…]]
\]

But this bears little resemblance to the conception of syntactic structure at the heart of Baker’s claim, namely that Nom is a category which in itself structurally encodes a distinction between complements and modifiers.

X-bar theory principles concerning the order in which complements and modifiers combine might be preserved if one<sub>ct</sub> were treated as anaphoric to a unit of a purely semantic nature. In this case 12b would be analysed as having the X-bar-consistent structure in 24, and one<sub>ct</sub> would be anaphoric to the logical form of German keyboard tablatures (which would not, however, correspond directly to syntactic constituency and would have to be derived by higher-order logical operations).

\[
(24) \quad [[D\,the\,][Nom\,German\,[Nom\,keyboard\,[Nom\,tablatures]]\,of\,Christoph\,Loeffelholtz]]
\]

By the time Baker published his discussion of one (1978), the possibility that anaphoric elements might in general best be analysed as having logical forms rather than syntactic constituents as antecedents had already been proposed by Sag (1976), and this principle forms the basis of many modern theories of anaphor resolution, e.g. Dalrymple et al. (1991). It is a move which we endorse but which Baker did not envisage, and it destroys the basis of any argument based on one<sub>ct</sub> concerning the innateness of syntactic structure.

4. SYNTACTIC AND SEMANTIC ANALYSIS. Our syntactic and semantic analysis of one<sub>ct</sub> is based on the assumption that it is futile, at least on the basis of the behaviour of one<sub>ct</sub>, to draw a binary division at a syntactic level between complements and adjuncts, or correspondingly at a semantic level between inherently relational and non-relational nouns. In conformity with this principle, we will treat all nouns and nominals grammatically as non-relational until combined with a dependent. The semantic relationship which then holds between head and dependent in any given context of utterance is determined by a mixture of world and contextual knowledge. In this conception, then, certain relations are just more probable than others, and these are the ones which have given rise to the notion of nouns as inherently relational and complement-taking.

4.1. THE OPTIONALITY OF NOMINAL DEPENDENTS. As an initial observation, we note that our
analysis will neatly account for a fact which is often ignored and which clearly distinguishes nouns as a category from verbs, namely that there are no convincing cases of nouns taking syntactically obligatory dependents.\textsuperscript{11} Thus \textit{king} is a classic ‘relational’ noun, but nothing about the grammar of English forces us to specify the king’s realm in a dependent. The BNC examples in 25 illustrate this property:

(25)  
\begin{enumerate}
\item Along the north Antrim coastal path, you can admire the work of a giant, see the place where a witch turned a \textit{king}’s daughters into swans and sample the local delicacy, dulce, which resembles burnt tagliatelle but is in fact dried seaweed. \[A5X 263\]
\item A sculpture representing a \textit{king} and queen was broken by the builder’s labourer who found it, revealing that the metal of the faces was only about a millimetre thick. \[B71 470\]
\item For example: each soloist need not begin with a formal bow to a \textit{king} or to the audience, nor end with another bow or considered pose; but such behaviour may be included if the choreographer wishes to locate dance in a particular century and probably a palace in which the story unfolds. \[A12 968\]
\end{enumerate}

The fact that kings are conventionally associated with a particular state is part of world knowledge about kings, not something which necessarily forms part of the argument structure of the noun \textit{king}. The particular state involved, in this case Antrim, may be retrievable contextually rather than from a syntactic dependent, as in 25a. But the state itself may not be important, even when there is specific reference. In 25b, a particular king and queen are represented by a sculpture, but what is relevant is simply their royal status, perhaps identifiable by properties such as their regalia. And it is always possible to have non-referential statements about kings, as in 25c, where all that is relevant is the property of being a king, not the properties of a particular king.

Although examples such as 25 show that this is generally not the case, it is sometimes argued that ‘relational’ nouns are odd when presented as first-mention indefinites without an appropriate accompanying dependent. Vikner & Jensen (2002: 209), for example, contrast 26a, to which they prefix a question mark, with 26b:

(26)  
\begin{enumerate}
\item A brother was standing in the yard.
\item A car was parked in the yard.
\end{enumerate}

In specific reference, the most likely clue to the identification of a brother is the identification of a relevant sibling. Brothers are not, like kings, identifiable by properties such as their regalia. But this, we argue, is not a \textsc{grammatical} fact. Attested examples of the same type as illustrated in 25 are not hard to find, even with a noun like \textit{brother}. Consider the examples in 27, likewise drawn from the BNC:

(27)  
\begin{enumerate}
\item Another friend, whose husband is a farmer, shares the care of her parents, who live in a neighbouring village, with a married sister, who also lives nearby. Between them
they give their mother the support she needs since their father has had a stroke. But her mother is always distressed when she leaves, and dismayed that she has to go before doing just one more job to help. Fortunately, a brother and his wife take responsibility at nights, when the mother will often ring for reassurance about her husband.

[BLW 761]

b. One old couple who were village publicans used their house as a shelter for ‘a very composite family’ which included a daughter who did the pub cooking, a brother, and a son who used two rooms as his tailor’s shop.  

[AP 7 852]

c. A trust can be charged on a brother’s posthumous child: for intention alone is relevant in trusts, and the opinion of Gallus prevailed that the posthumous children of others can also be our own intestate heirs.  

[B2P 514]

In 27a, the preceding context indeed supplies some information about who the siblings are. However, this contextual information is not even contained within the same sentence as the first-mention indefinite. In 27b, the contextual information that is supplied is not even sufficient to identify precisely whose brother it is: certainly one of the ‘old couple’, but we do not know, or need to know, which one. And in 27c, we have a non-referential statement about a legal property of brothers as such, and no contextual information is necessary.

We therefore regard the optionality of noun dependents as further evidence, on top of the behaviour of one in 27a, that a uniform treatment is required for all the semantic relations observed in the corpus. In this treatment, in essence a radical extension of the ideas of Pustejovsky (1991) concerning a generative lexicon, and more specifically the treatment of the control and creator relations in Vikner & Jensen (2002), all nouns can be given either a non-relational or an inherently relational interpretation. The resolution of the semantic relation involved on any particular occasion depends on world knowledge about the relative likelihood of the different types of relation that can hold between the head and dependent, and the precise context.

4.2. Syntactic and semantic analysis for of-PPs. The noun we will use to illustrate our analysis is murder, which as a nominalization would standardly be considered to be inherently ‘relational’. In an example such as a brutal murder of a taxi driver,12 the semantic relation between the dependent PP and the head is most likely to be that of undergoer (i.e. d is undergoer of h), but as shown by the examples in 29, other semantic relations are possible. Also, as argued in the previous section, the dependent PP is not obligatory. We can simply have an NP such as a brutal murder.

An analysis tree for the simple NP a brutal murder is given in 28:
For simplicity, we use a standard Montagovian semantics in which NPs are taken to be
generalized quantifiers of type \( \langle e, t \rangle \times t \rangle \), and in which the indefinite article has a simple
predicate calculus representation. Note two points, however. First, the meaning of the noun
\textit{murder} is of type \( \langle e, t \rangle \): it denotes a function from entities to truth values, not some kind of
relation between NP meanings. Second, in order to emphasize the fact that our analysis relies
solely on the logical reconstruction of antecedents for \textit{one} \( e \), we do not assign any syntactic
category labels to units above the word level. Our analysis tree reflects solely the semantic
combinatory potential of the words in the analysed string, and makes no claims as to whether there
is any necessity for corresponding syntactic constituents (as might be shown by constituency tests).
In particular, our analysis has no need of a syntactic category Nom to serve as a structural
indicator of the complement/modifier distinction. We do however allow analysis trees to contain a
modicum of syntactic information in addition to the specification of word-level categories: they
should be construed as indicating word order. We then postulate that units can combine in any
order consistent with their typing and the rule of functional application, applied to adjacent units.\( ^{13} \)

In order to construct the logical translation of the NP, this latter principle forces the first
step to be the application of the translation of \textit{brutal} to that of \textit{murder}, as in 29a. Then the
translation of the indefinite article can apply to the resulting expression, giving 29b. The variables
\( p \) and \( q \) are here of type \( \langle e, t \rangle \), and the variables \( x \) and \( y \) are of type \( e \).

\begin{align}
(29) \quad \lambda p[\lambda y[p(y) \& \textit{brutal}'(y)]](\textit{murder}') \\
= \lambda y[\textit{murder}'(y) \& \textit{brutal}'(y)]
\end{align}

\begin{align}
(29) \quad \lambda q[\lambda p[\lambda x[q(x) \& p(x)]]](\lambda y[\textit{murder}'(y) \& \textit{brutal}'(y)]) \\
= \lambda p[\lambda x[\textit{murder}'(x) \& \textit{brutal}'(x) \& p(x)]]
\end{align}

We emphasize that the expression in 29a corresponding to the string \textit{brutal murder} is construed as
a logical unit, not a syntactic one.

The analysis of the NP \textit{a brutal murder of a taxi driver} is more complicated. In essence, it
represents a generalization of the type-shifting operators employed by Vikner & Jensen (2002) to shift ‘non-relational’ nouns like mansion into the relational type required for a compositional interpretation of expressions like Mary’s former mansion, the interpretation in which the adjective former refers to the timing of the controller relation rather than the mansion itself. But in our analysis, all nouns, including those traditionally construed as relational, have both a non-relational and a shifted relational type. In fact, any logical unit of the non-relational type <e,t> can be shifted to the relational type <e,<e,t>> by a type-shifting operator of the form (30a), with the indicated variable types. As applied to murder’ (the logical translation of the noun murder in its non-relational form), this yields a set of possible relational interpretations for the noun murder, namely the set named in 30b:

\[
(30) \quad a. \lambda p[\lambda d[\lambda h[p(h) & R(h)(d)]]] \quad \quad d,h: e \\
p: <e,t> \\
R: <e, <e,t>>
\]

The symbol R here is a metasymbol standing for a semantic relation between the head (corresponding to the variable h) and the dependent (corresponding to the variable d). In fleshed-out meaning representations it will be instantiated as some particular relation. Semanticists will recognize the analogy with the relation R which Barker (1995) proposed as holding between an ’s-genitive and a head noun in the analysis of expressions like John’s car.

How is the instantiation of R to be determined on any particular occasion? The formal semantic tradition has been to divide instantiations into two types: default interpretations which arise from the argument structure of the noun (thus from nouns considered to be ‘inherently relational’), and pragmatic interpretations, which are determined using world knowledge and contextual information. In our conception, however, where no grammatical distinction can be drawn between ‘relational’ and ‘non-relational’ nouns, it is correspondingly impossible to draw a coherent dividing line between these two types of interpretation. Rather, we propose that all interpretations are based on a mix of world-knowledge and context. All relational expressions of the form R(h)(d) are assigned a probability based on world-knowledge about the likely relations between entities of type h and type d. The context will then determine which relation is most appropriate, and possibly refine its content.

The relational operator is itself likely to be invoked with far greater frequency with some nouns than with others, for example in the case of kin terms such as brother. But in our conception this too is a matter of world knowledge and context, not a matter of underlying argument structure. Note that if, relying on their perhaps more typical uses, we were instead to try to identify a subset of inherently ‘relational’ nouns (a task which we have shown to be fraught with difficulty), and we were to encapsulate the typically relational nature of these nouns GRAMMATICALY through the enforced presence of a relational argument in their underlying argument structure, we would expect at least some of these nouns to take obligatory complements. There is a stark contrast here with transitive verbs, which do genuinely possess underlying two-place argument structures and which correspondingly require the presence of an obligatory complement.

So what constitutes our world-knowledge about murders? First of all, if a murder takes place,
we have an undergoer, and somebody dies. Given that taxi drivers are (unfortunately) more likely to be murdered than to be murderers, this appears to be by far the most likely interpretation of examples like *a brutal murder of a taxi driver*. But many different instantiations of \( R \) are available for the noun *murder*:\(^{14}\)

(31)  
a. David Peace's Red Riding Quartet, which spins a fictional plot alongside the murders of the Yorkshire Ripper, is all the more potent for its true crime background.  
b. One of two sisters who bombed the Old Bailey in the 1970s is in custody today being questioned about the murders of two soldiers in Northern Ireland in March.  
c. Paul Temple is part of the era between the upper class murders of Agatha Christie and the gritty murders of today.  
d. The driving rhythms of London's fiercely competitive cat-walks may seem a thousand miles away from the cosy cottage murders of Miss Marple, but they provide a perfect environment for the more chilling edge of Agatha Christie's short stories.

In 31a, given the world-knowledge that the Yorkshire Ripper was a notorious murderer, the most probable instantiation of \( R \) is performer, not undergoer. In 31b, performer and undergoer might in isolation be assigned more equal probabilities, but the wider context suggests that the undergoer relation is intended. In 31c, there are two occurrences. The item of world-knowledge that Agatha Christie is a crime fiction author yields a high probability of the creator relation for the first, but in the second, anything other than a temporal relation is highly improbable. Finally, in 31d, world-knowledge tells us that Miss Marple is a fictional amateur detective, so the performer relation is refined to that of solver rather than committer of the crime.

In order to construct a logical translation for the NP *a brutal murder of a taxi driver*, we propose that the string *brutal murder* of type \( <e, t> \) is shifted by the relational operator 30a to the relational type \( <e, <e, t>> \). It can then combine with the of-PP, which has type \( <<e, <e, t>>, <e, t>> \) (a function taking as argument a function from entities to properties and returning as value a new property). The of-PP saturates the relational argument and forms a new unit of type \( <e, t> \) corresponding to the string *brutal murder of a taxi driver*. This composes straightforwardly with the translation of the matrix determiner. This sequence of operations is reflected in the analysis tree in 32:
Of note here is that the translation of the preposition of contains a variable O, mnemonic for of, which we take to range over the wide set of semantic relations which this preposition permits, and which we attempt to characterize in section 5.2. The preposition of is therefore not simply meaningless. By employing a different variable, the analysis can in principle be extended straightforwardly to any other preposition, for example prepositions such as for or with. While the range of semantic relations permitted by the preposition of is wider than that of any other preposition, it does not include every conceivable relation. For some relations, more specialized prepositions have to be employed, and the preposition of cannot in general substitute for these.

What the variable O does is to place a constraint on the instantiation of the metasymbol R introduced by the application of the relational type-shift operator to the string brutal murder. This constraint is reflected by the presence of the subscripted metasymbol \( R_\text{O} \) in the final logical translation of the NP. The actual semantic relation instantiated between brutal murder and a taxi driver must then be one which is permitted by the preposition of. Readers who wish to see more detail may consult the appendix.

This (to our knowledge novel) treatment of the way nouns combine with of-PPs disposes of many of the difficulties involved in the necessity of pre-assigning nouns categorially to one of two basic syntactic/semantic types: relational and non-relational. As Partee and Borschev (2012: 447) put it: “The distinction is sharp, but the classification of nouns is not”.

In particular, we do not need to assume that noun \( A \) is grammatically non-relational (and requires type-shifting to a
relational type when it combines with an of-PP), while noun B is grammatically relational (and is type-shifted to a non-relational type when it does not). All nouns can potentially occur in relational constructions in our scenario, and some may more readily do so than others.

4.3. Syntactic and semantic analysis of one. The analysis of one now follows straightforwardly. Like all count nouns, one belongs to the basic type <e, t>. We will write its translation as Ana<e, t> to suggest its status as a type <e, t> anaphor whose antecedent must be some appropriate logical form of type <e, t>. This antecedent can correspond either to a single noun, or to a multi-word string with a noun as head — what in the earlier sections of this paper was referred to as a nominal. However, what is reconstructed is a logical unit of the requisite type, not a syntactic constituent.

Thus the bracketed NP in an example such as 6b, repeated here as 33a, will have the translation in 33b:

(33)  a. An honest local government official is harder to find than [a corrupt one].
    b. λp[∃x[Ana<e, t>(x) & corrupt′(x) & p(x)]]
    c. λy[official′(y) & local-government′(y)]
    d. λp[∃y[official′(y) & local-government′(y)][x] & corrupt′(x) & p(x)]
    = λp[∃x[official′(x) & local-government′(x) & corrupt′(x) & p(x)]]

The derivation of the logical form in 33b will follow the same lines as that of a brutal murder in 28–29. The resolution of Ana<e, t> can be the translation of any contextually available string of type <e, t>; in this case most plausibly the translation of local government official, given in 33c. This can simply be substituted for Ana<e, t> as in 33d.

Nothing prevents one from being followed by an of-PP. Like any noun, it belongs to the type <e, t> and can be type-shifted to the relational type <e, <e, t>> by the relational operator in 30a, as can any larger unit of type <e, t> which contains it. Thus, the bracketed NP in example 34a will have the translation in 34b:

(34)  a. An unprovoked murder in a Bolton back-street last week was followed this week by [a brutal one of a taxi driver].
    b. λp[∃y[Ana<e, t>(x) & R_O(x)(y)] & p(x)]
    c. murder′
    d. λp[∃y[Ana<e, t>(x) & murder′(x) & brutal′(x) & undergoer(x)(y)] & p(x)]

The derivation of the logical form in 34b will follow the same pattern as that in 32. In 34b, there are now two unknowns which need to be resolved. The resolution of Ana<e, t> can be the translation of any of the strings murder, unprovoked murder, murder in a Bolton back-street or unprovoked murder in a Bolton back-street, all of which will be of the appropriate type <e, t>. In 34d we illustrate this resolution by assuming that this is simply the translation of murder as given in 34c. Once this is established, world-knowledge and context will select an appropriate instantiation of R_O, in this case most probably undergoer (which we symbolize by the bold relation undergoer).
Since Ana_e, t> can be resolved by any expression of type <e, t>, including single nouns, and \( R_o \) is any semantic relation permitted by the preposition of, nothing remains of Baker’s claim that that one\(_e\) cannot substitute a lone noun. His second claim, that one\(_e\) can have both single-word and multi-word antecedents, is essentially correct, but not one based on the syntactic postulates of X-bar theory.

5. Frequency and Grammaticality. What is it which has enabled the received wisdom concerning one\(_e\) to persist for so long? Why do some examples with one\(_e\) continue to be introspectively judged in isolation as ungrammatical by some linguists? One reason for the persistence of the claim that one\(_e\) cannot be followed by an of-PP might simply be its frequent repetition, both in syntactic textbooks as a prime exemplar of the supposed rationale for distinguishing complements from adjuncts, and in the psycholinguistic literature as a prime exemplar of the poverty of stimulus argument (see section 1). Linguists with experience of this topic have in effect been trained to believe that 3a is ungrammatical over more than thirty years.

However it is not just to examples like the one of physics that ungrammaticality judgments have been applied, but also to other cases such as the supposed incompatibility of one\(_e\) with numeral determiners in examples like three ones (Lakoff 1970; Postal 1972).

The answer, we suggest, lies in frequency effects connected with the distribution of one\(_e\). In a number of environments, one\(_e\) is in competition with at least one alternative anaphoric strategy which has long been established in the language and is arguably simpler. In such environments, we propose that one\(_e\) is not excluded by any grammatical principles concerning its distribution. As argued above, it is just a count noun with the same distribution as any other count noun. But as an anaphor it can lose out to other anaphors and occur with lower frequency than its competitors—sometimes overwhelmingly lower. Nevertheless, in some cases it will occur, and in the presence of other favorable factors it may even become the preferred option. We begin in section 5.1 with some general observations concerning the distribution of one\(_e\) and its anaphoric competitors. In section 5.2 we turn to a detailed account of the frequency effects associated with the occurrence of one\(_e\) preceding of-PPs, and in section 5.3 we discuss particular meaning relations involving human head nouns, including student.

5.1. The Anaphor ONE\(_e\) and Its Competitors. The main competitor for one\(_e\) is zero. Almost all determiners (exceptions are the, a(n) and every) can function on their own as anaphors, and where this shorter and arguably therefore simpler strategy is available it is typically the most frequent option. One\(_e\) therefore tends to occur in NPs in which it is not immediately preceded by a determiner. It also does not occur without dependents. In a sentence like I want one, one must be the determiner, i.e. one\(_e\) rather than one\(_e\). And I want ones, in which ones has to be one\(_e\), genuinely never seems to occur, presumably because it is invariably preempted by I want some.

The determiners which do not function on their own as anaphors are of course exceptional. The definite article readily co-occurs with one\(_e\) when there is post-modification, as in the one over there, and without post-modification as a predicative NP in examples like That’s the one, where the pronoun it is certainly a competitor but perhaps yields ground to one\(_e\) because of the predicative environment. In non-predicative environments the one clearly loses out to simple pronouns, but this is no reason for treating the combination the one as ungrammatical. With the
indefinite article, there is a simple and straightforward competitor for a one: it is just the determiner oneₐ as in I bought one yesterday. Nevertheless a one is not ungrammatical as such: it occurs predicatively in examples like the BrE colloquial Ooh, you are a one! – and notice that every, which cannot function in isolation as an anaphor, readily co-occurs with oneₑ, as in I counted every one.

A search of 98 random examples of oneₑ in the BNC reveals the prevailing patterns.

<table>
<thead>
<tr>
<th>Immediately preceded by</th>
<th>Total examples</th>
<th>With post-modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjective</td>
<td>69</td>
<td>10</td>
</tr>
<tr>
<td>Participle</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Noun</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>the</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>these/those</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>which</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1: frequency of the dependents of oneₑ (sample of 98 examples from the BNC)

In the majority of examples, oneₑ is immediately preceded by a modifier belonging to a major category (adjective, noun or participle), as in the big ones. The remainder are preceded either by nothing, or by a non-quantificational determiner, and of these almost all contain some form of postmodification (a PP or clause), as in the ones not in the catalogue. The examples where we find a determiner preceding a bare oneₑ with no post-modification are the ones in the predicative function discussed above (they’re the ones), and these ones and which ones. In the latter two cases, the determiners could easily function as anaphors without the assistance of oneₑ. We can conjecture however that the occurrence of examples like these ones may be facilitated by parallelism with the singular this one, which focuses on the countability of the identified referent and is thus typically differentiated from this on its own. And in the case of which ones, oneₑ provides an indication of number which would otherwise be lacking. In other words, oneₑ has properties which enable it to compete on a reasonable footing with the bare determiner in these cases.

It is difficult to apply this functional account of the distribution of oneₑ to the determiners another, each and either, which are not frequent enough to occur in the small sample above, but occur both with and without oneₑ with little functional difference. I want another one says no more than I want another, and is about half as frequent. This behaviour seems idiosyncratic.

The functional account does, however, clearly account for the infrequency with which oneₑ co-occurs with possessive determiners like my, you, his etc., or with quantificational determiners such as numerals. In this case, the bare determiner overwhelmingly predominates: we find mine and five rather than my ones and five ones. But again this does not entail that the latter strings should be deemed ungrammatical. When a large enough corpus is investigated they do
occur, and there are sometimes obvious motivating factors. Taking the co-occurrence of numerals and \textit{one} as an example, even the BNC as a whole is not large enough to provide more than the odd example (and they are from the spoken section of the corpus). But a web search readily turns up perfectly natural-sounding examples:\footnote{17}

\begin{enumerate}
\item This atoll is on the west of Maldives and has 75 islands—13 of them are inhabited, 57 are uninhabited including the five ones which are currently being developed into resorts.
\item There were and still are nine bells in a row in the kitchen, about a foot apart, ten feet from the floor, and on enquiry Major Moor learned from the cook that the ones affected were the five ones on the right; these were the ones situated in the dining room, the drawing room over the dining room, an adjacent bedroom, and two attics over the drawing room.
\end{enumerate}

These examples typically involve NPs with post-modification, and the presence of a post-modifier is clearly conducive to the use of \textit{one} as an overt head to which postmodification can be applied. In examples (35a) and (35b), the analysis could start with either the numeral or the post-modifier being construed as applying to the head first, before the numeral.

In the small sample of 98 examples discussed above, 5 occur with a prepositional phrase, and of these, just a single one is an of-PP. If we extrapolate from this sample, we can deduce that of-PPs occur in only a very small proportion of occurrences of \textit{one}. Nevertheless, as we have shown above, they occur quite frequently in a corpus the size of the whole BNC. In the following section, we continue to an investigation of the anaphoric competitors for \textit{one} in this dataset.

\textbf{5.2. Frequency effects involving of-PPs.} It is not the case that all of the possible semantic relations permitted to of-PP dependents of \textit{one} occur with equal frequency in the corpus data. The full set of 35 relations we identified in the corpus is presented in Tables 2 and 3.

Table 2 contains those relations, many involving animate dependents, which we judge to be expressible in principle not just by the construction with of, but also by the ’s genitive construction, as in the team manager’s eyes. On the other hand, Table 3 contains those relations which are expressible solely by the of construction. The relevance of this division will soon become apparent.
<table>
<thead>
<tr>
<th>R</th>
<th>Read as</th>
<th>Type</th>
<th>Example</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>time (h)(d)</td>
<td>d is time of h</td>
<td>TIME AND SPACE</td>
<td>{acts} of yesterday</td>
<td>20</td>
</tr>
<tr>
<td>member (h)(d)</td>
<td>d has member h</td>
<td>PART-WHOLE</td>
<td>{runner} of Britain’s three-strong team</td>
<td>18</td>
</tr>
<tr>
<td>depiction (h)(d)</td>
<td>d has depiction h</td>
<td>OBJECTLIKE</td>
<td>{photographs} of Lillie Langtree and other noted belles</td>
<td>9</td>
</tr>
<tr>
<td>representative (h)(d)</td>
<td>d has representative h</td>
<td>REPRESENTATIVE</td>
<td>{powerful people} of this city</td>
<td>8</td>
</tr>
<tr>
<td>creator (h)(d)</td>
<td>d is creator of h</td>
<td>AGENTIVE</td>
<td>{tablatures} of Christoph Loeffelholtz and August Noermiger</td>
<td>6</td>
</tr>
<tr>
<td>performer (h)(d)</td>
<td>d is performer of h</td>
<td>AGENTIVE</td>
<td>{cries} of the menfolk</td>
<td>5</td>
</tr>
<tr>
<td>location (h)(d)</td>
<td>d is location of h</td>
<td>TIME AND SPACE</td>
<td>{inner road} of Spithead</td>
<td>4</td>
</tr>
<tr>
<td>body-part (h)(d)</td>
<td>d has body-part h</td>
<td>PART-WHOLE</td>
<td>{eyes} of the team manager</td>
<td>3</td>
</tr>
<tr>
<td>associated-part (h)(d)</td>
<td>d has associated part h</td>
<td>PART-WHOLE</td>
<td>{crews} of Rosie’s Riveters</td>
<td>2</td>
</tr>
<tr>
<td>controller (h)(d)</td>
<td>d is controller of h</td>
<td>CONTROL</td>
<td>{budgets} of the individual</td>
<td>2</td>
</tr>
<tr>
<td>inherent-part (h)(d)</td>
<td>d is inherent part of h</td>
<td>PART-WHOLE</td>
<td>{action force} of demons and evil spirits</td>
<td>1</td>
</tr>
<tr>
<td>undergoer (h)(d)</td>
<td>d is undergoer of h</td>
<td>OBJECTLIKE</td>
<td>{interpretation} of wrestling as a sport</td>
<td>1</td>
</tr>
<tr>
<td>context (h)(d)</td>
<td>d has context h</td>
<td>CONTEXT</td>
<td>{frame of reference} of the next chapter</td>
<td>1</td>
</tr>
<tr>
<td>history (h)(d)</td>
<td>d has history h</td>
<td>CONTEXT</td>
<td>{fossil record} of the phylum</td>
<td>1</td>
</tr>
<tr>
<td>human-property (h)(d)</td>
<td>d has human property h</td>
<td>HUMAN PROPERTY</td>
<td>{powers} of the GP</td>
<td>1</td>
</tr>
<tr>
<td>mental-response (h)(d)</td>
<td>d has mental response h</td>
<td>HUMAN PROPERTY</td>
<td>{attitude} of the young aristocrat</td>
<td>1</td>
</tr>
<tr>
<td>subperiod (h)(d)</td>
<td>d has subperiod h</td>
<td>PART-WHOLE</td>
<td>{years} of the 19th century</td>
<td>1</td>
</tr>
<tr>
<td>source (h)(d)</td>
<td>d is source of h</td>
<td>CAUSATION</td>
<td>{voice} of the oral culture</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2: frequency of of-PP dependents of one<sub>ct</sub>
(semantic relations permitted to the ‘s genitive construction)

In Table 2 we give first a suggested name for the relation, e.g. **undergoer** as in example 51d. This is followed by an informal indication of how this relation is to read, identifying the separate roles played by head and dependent, as in 20 and the illustrative examples in that section. The third column indicates the semantic field to which each relation was assigned for illustrative purposes, and in the final column there is an attested example. In each case, we judge the relation to be expressible in principle not only by the of-PP construction, but also by the ‘s genitive construction), e.g. **powers of the GP**, we also have the **GP’s powers**.

Table 3 has an identical structure. However, in this case we judge the semantic relation concerned not to be expressible by the ‘s-genitive construction. Thus the very frequent partitive construction has no ‘s-genitive counterpart, and for examples like **questions of law or fact** we do not have a corresponding *law or fact’s questions.

<table>
<thead>
<tr>
<th>Semantic relation R</th>
<th>Read as</th>
<th>Type</th>
<th>Example</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>subset (h)(d)</td>
<td>h is subset of d</td>
<td>PARTITIVE</td>
<td>a new one of these {waste-paper basket}</td>
<td>218</td>
</tr>
</tbody>
</table>
It is immediately apparent that the total number of examples in Table 2 (85) is much less than that in Table 3 (433). Thus, in a global perspective, one<sub>ct</sub> occurs most frequently before of-PPs precisely in those semantic relations where there is no alternation with the ’s genitive construction. When there is such an alternation, the ’s-genitive construction is overwhelmingly preferred when the dependent is short (one word), definite/accessible, and animate. The examples with one<sub>ct</sub> following an of-PP tend therefore to occur when dependents are either longer, indefinite/inaccessible or inanimate, or embody some combination of these factors.

As an illustration, consider again example 12b, which we repeat here as 36:

(36) The German keyboard tablatures – Elias Ammerbach’s (Leipzig, 1571 and 1575), those of Bernhard Schmid the elder (Strasbourg, 1577) and Jacob Paix (Lauingen, 1583), and the manuscript ones of Christoph Loeffelholtz (Tuebingen, Univ. Bibl., Mus. ms. 40034) and August Noermiger (1598, idem, 40098) – consist almost exclusively of vocal transcriptions and dances of various nationalities.

The first underlined phrase Elias Ammerbach’s illustrates the ’s-genitive alternative: it is relatively short (in this case 2 words), definite and animate. As a possessive determiner, it can function on its own as an anaphor, and is not followed by one<sub>ct</sub>. The second underlined phrase illustrates the forced use of the of-PP alternative when the determiner position is blocked by another determiner (those): in this case length of the dependent is not a factor. The third underlined phrase illustrates the combination of one<sub>ct</sub> and an of-PP. In this case the dependent is long (5 words not counting the supplementary information in parentheses), and the presence of the

<table>
<thead>
<tr>
<th>content (h)(d)</th>
<th>h has content d</th>
<th>CONTENT</th>
<th>{questions} of law or fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>kind (h)(d)</td>
<td>h has kind d</td>
<td>CATEGORIZATION</td>
<td>{brewery} of its kind</td>
</tr>
<tr>
<td>image (h)(d)</td>
<td>h is image of d</td>
<td>OBJECT-LIKE</td>
<td>{pictures} of a storm on Saturn</td>
</tr>
<tr>
<td>size (h)(d)</td>
<td>h has size d</td>
<td>CATEGORIZATION</td>
<td>{farms} of 100,000 acres</td>
</tr>
<tr>
<td>value (h)(d)</td>
<td>h has value d</td>
<td>CATEGORIZATION</td>
<td>{species} of greater commercial value</td>
</tr>
<tr>
<td>theme (h)(d)</td>
<td>h has theme d</td>
<td>OBJECT-LIKE</td>
<td>{analysis} of previous authorities</td>
</tr>
<tr>
<td>cause (h)(d)</td>
<td>h has cause d</td>
<td>CAUSATION</td>
<td>{tears} of laughter</td>
</tr>
<tr>
<td>composition (h)(d)</td>
<td>h has composition d</td>
<td>PHYSICAL CONTENT</td>
<td>{panels} of sturdy plywood</td>
</tr>
<tr>
<td>age (h)(d)</td>
<td>h has age d</td>
<td>CATEGORIZATION</td>
<td>{children} of an age to be working</td>
</tr>
<tr>
<td>timespan (h)(d)</td>
<td>h is timespan of d</td>
<td>TIME AND SPACE</td>
<td>{period} of mass unemployment</td>
</tr>
<tr>
<td>container (h)(d)</td>
<td>h is container of d</td>
<td>PHYSICAL CONTENT</td>
<td>{bottles} of ale or whisky</td>
</tr>
<tr>
<td>duration (h)(d)</td>
<td>h has duration d</td>
<td>TIME AND SPACE</td>
<td>{pregnancy} of 105 days</td>
</tr>
<tr>
<td>rank (h)(d)</td>
<td>h has rank d</td>
<td>CATEGORIZATION</td>
<td>{officers} of much more senior rank</td>
</tr>
<tr>
<td>amount (h)(d)</td>
<td>h is amount of d</td>
<td>FUNCTION NOUN</td>
<td>{proportion} of lime</td>
</tr>
<tr>
<td>collection (h)(d)</td>
<td>h is collection of d</td>
<td>PART-WHOLE</td>
<td>{group} of two figures</td>
</tr>
<tr>
<td>type (h)(d)</td>
<td>h is type of d</td>
<td>FUNCTION NOUN</td>
<td>{version} of Deus venerunt</td>
</tr>
</tbody>
</table>

Table 3: frequency of of-PP dependents of one<sub>ct</sub> (semantic relations not permitted to the ’s genitive construction)
prenominal modifier *manuscript* blocks the use of the zero anaphor strategy.

A combination of factors may thus favour the occurrence of *one* with a following *of*-PP. Some of these are specific to the selection of *one* as opposed to zero, in particular the presence of particular determiners or modifiers, as discussed in section 5.1. There are then factors related to the genitive alternation. The selection of an *of*-PP construction may be forced, either because the semantic relation is one of those in Table 3 which does not permit the 's-genitive in principle, or because the use of the 's-genitive is blocked by a pre-existing determiner. Only those *of*-PP examples in which the determiner is the definite article allow substitution by the 's-genitive: *the loud cries of the menfolk ~ the menfolk’s loud cries*. Where however the genitive alternation applies, factors such as the length, definiteness and animacy of the dependent come into play.

In order to quantify these factors, we analysed the 85 examples of Table 2 using the methodology of O’Connor et al. (2013), a large-scale study of the genitive alternation based on the BROWN corpus of American English. The 85 examples of Table 2 represent the initial dataset in which the semantic relation expressed by the *of*-PP in principle allows the genitive alternation. It is necessary to exclude any examples where the genitive alternation is blocked by the presence of a determiner other than the definite article: there were 10 of these. The remaining 75 examples were then coded for three factors: (a) length of dependent (1 word, 2-3 words, 4 words or more); (b) accessibility of dependent (pronoun, proper noun, common noun); (c) animacy (animate, organization, inanimate). The results are given in Table 4:

<table>
<thead>
<tr>
<th>ANIMACY</th>
<th>ACCESSIBILITY</th>
<th>LENGTH (words)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC <em>of</em>-PP</td>
<td>BROWN <em>of</em>-PP</td>
<td>freq</td>
</tr>
<tr>
<td>animate</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>organization</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>inanimate</td>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

Table 4: categorization of *of*-PPs as dependents of *one* (compared to odds ratios for the genitive alternation in the BROWN corpus)

In each case, the frequencies and corresponding percentages are compared to the percentages which O’Connor et al. found for the same factors, considered individually, in the BROWN corpus, based on approximately 2800 examples of *of*-PP. It is striking that the distributions in the larger and smaller datasets are broadly consistent with each other, at least in the ranking of the corresponding factors, and frequently in the closeness of the actual proportions.

The main point of this comparison is that O’Connor et al. also give figures for the occurrence of the alternating 's-genitive construction, based the same factors. We used their figures to calculate the odds ratios for each factor in favor of the occurrence of an *of*-PP as opposed to an 's-genitive. The important dividing line is the bold line, which separates those factors where the odds are strongly against *of*-PP and in favour of the 's-genitive, from those factors where the odds are at least closer to evens, and in some cases strongly in favour of *of*-PPs. It will be noted that the distribution of *of*-PPs in our dataset is consistent with these odds ratios: the majority consist of noun phrases which are either not animate, or are not pronouns, or have a
word length of 2 or greater. The conclusion we draw is that the properties of of-PPs as dependents of one of are not distinct from those of of-PPs in the genitive alternation generally, and that one itself has no special import in this regard.

There are in fact only 3 examples in the dataset where the of-PP contains a pronoun of length one word which is categorized as animate (rather than organization or inanimate). This is the kind of example which we would strongly predict to be an ’s-genitive rather than an of-PP. These 3 examples all represent the DEPICTION relationship: for example the ones of me, where ones stands for “photos” and me represents the person depicted, rather than the controller or creator. This, we believe, is not fortuitous. It is not just the animacy and form of the dependent which is important: the precise semantic relation may also have an effect on the relative frequency of the one of + of-PP and ’s genitive + zero anaphor constructions. Payne & Berlage (2011) investigated the relative weight of a number of semantic relations with respect to the general alternation between the of-PP and ’s-genitive constructions, with other important factors such as length, animacy and definiteness of the dependent controlled for. They show that, amongst the relations in principle available to both constructions, CONTROLLER most favours the ’s genitive while DEPICTION most favours of-PP. Thus examples such as the photos of me, with pronouns as dependents and depiction as the intended relation, are not improbable.

Payne & Berlage (2011) also found that the BODY-PART relation lies somewhere in between CONTROLLER and DEPICTION. This mirrors the numbers observed in Table 2 for these relations, with DEPICTION showing 9 occurrences for one of + of-PP and CONTROLLER only 2. The frequencies of these relations in Table 2 are however far too small to support statistical tests of significance, so we leave the correlation between the individual semantic relations and the frequency of one of + of-PP as a plausible prediction.

If we now turn to the examples shown in Table 3, where the genitive alternation plays no role, the potential for an alternative to the of-PP construction is considerably more limited. In the relatively frequent partitive (SUBSET) cases, the presence of one of is largely determined by the presence of a premodifier. A typical example is the one in the Table: a new one of these. As a consequence of the search methodology (see section 3.3), all the singular examples of one of are all of this type. As we would predict, the majority of the plural examples also have premodification, but there are a couple of examples which contain one of immediately after a determiner (where it could well have been omitted): which ones of the eager faces…?, and certain ones of these. The distribution of one of in the partitive is thus motivated by factors other than the partitive construction per se, and no different to the distribution of one of generally.

In the non-partitive cases there can be an alternation between of-PP and a prehead dependent, either nominal or adjectival. Thus, although we do not have *law or fact’s questions as an alternative to questions of law or fact, we do have legal or factual questions. And correspondingly we might have legal or factual ones as an alternative to the attested ones of law or fact. To our knowledge, there is no previous large-scale investigation of this kind of alternation, but we can make the following observations based on our dataset.

Firstly, the range of semantic relations which is permitted by the prehead dependent construction is very broad and appears in principle to be a superset of the semantic relations permitted by the of-PP construction. That is, for each non-partitive semantic relation in Table 3, with the exception of the KIND relation where structural factors (see below) prevent it, we can find
at least one example where the prenominal alternant appears to be grammatical. We illustrate this in Table 5:

<table>
<thead>
<tr>
<th>Semantic relation</th>
<th>Ellipted nominal</th>
<th>Attested of-PP</th>
<th>Prehead alternant</th>
</tr>
</thead>
<tbody>
<tr>
<td>content (h)(d)</td>
<td>questions</td>
<td>ones of law or fact</td>
<td>legal or factual ones</td>
</tr>
<tr>
<td>image (h)(d)</td>
<td>postcard</td>
<td>the other one of New Zealand</td>
<td>the other New Zealand one</td>
</tr>
<tr>
<td>size (h)(d)</td>
<td>farms</td>
<td>ones of 100,000 acres</td>
<td>100,000 acre ones</td>
</tr>
<tr>
<td>value (h)(d)</td>
<td>condition</td>
<td>the only one of relevance</td>
<td>the only relevant one</td>
</tr>
<tr>
<td>theme (h)(d)</td>
<td>impression</td>
<td>a great one of Christopher Watkins</td>
<td>a great Christopher Watkins one</td>
</tr>
<tr>
<td>cause (h)(d)</td>
<td>cries</td>
<td>ones of anguish</td>
<td>anguished ones</td>
</tr>
<tr>
<td>composition (h)(d)</td>
<td>panels</td>
<td>more serviceable ones of sturdy plywood</td>
<td>more serviceable sturdy plywood ones</td>
</tr>
<tr>
<td>age (h)(d)</td>
<td>ball</td>
<td>the only one of similar age</td>
<td>the only similar age one</td>
</tr>
<tr>
<td>timespan (h)(d)</td>
<td>period</td>
<td>the early one of railway building</td>
<td>the early railway building one</td>
</tr>
<tr>
<td>container (h)(d)</td>
<td>bottles</td>
<td>smaller stone ones of ale or whisky</td>
<td>smaller stone ale or whisky ones</td>
</tr>
<tr>
<td>duration (h)(d)</td>
<td>pregnancy</td>
<td>a short one of 90-105 days</td>
<td>a short 90-105 day one</td>
</tr>
<tr>
<td>rank (h)(d)</td>
<td>officers</td>
<td>ones of much more senior rank from the military wing</td>
<td>much more senior rank ones from the military wing</td>
</tr>
<tr>
<td>amount (h)(d)</td>
<td>proportion</td>
<td>a considerable one of lime</td>
<td>a considerable lime one</td>
</tr>
<tr>
<td>collection (h)(d)</td>
<td>group</td>
<td>a short one of two figures</td>
<td>a short two figure one</td>
</tr>
<tr>
<td>type (h)(d)</td>
<td>version</td>
<td>not a single one of Deus venerunt gentes</td>
<td>not a single Deus venerunt gentes one</td>
</tr>
</tbody>
</table>

Table 5: prehead alternants (nominal or adjectival) to the of-PP construction

In practice, the prehead alternative is in the majority of the attested cases categorically blocked by structural factors. A prehead alternative does not exist when the of-PP is clausal, as in an example such as *the fundamental process of turning customer needs into customer wants*. The prehead constituent also cannot be a determined nominal, nor can it contain any post-head dependent. Thus, as an alternative to *detailed pictures of a storm on Saturn*, we do not have *detailed a storm on Saturn pictures*. Correspondingly, there is no prehead alternant to the attested *detailed ones of a storm on Saturn*. It is for this reason that the KIND examples are systematically excluded: the dependent, headed by a noun such as kind, invariably contains a determiner. A typical example is *the only brewery of its kind in Worcestershire*.

The length of the dependent is also evidently an important factor. Whilst, we suspect, the vast majority of prehead modifiers are single-word units rather than internally complex ones, the of-PPs are typically at least two words long. Of the 179 examples which represent the semantic relations in Table 5 (i.e. the relations in Table 3 excluding SUBSET and KIND), only 35 are one-word long, that is 20%, a figure similar to the proportion of one-word of-PPs in the genitive alternation.

In conclusion, we have found in a detailed examination of the of-PP dependents of one it absolutely no evidence that one itself has any special bearing on the frequency of occurrence of the of-PP, let alone its grammaticality. The frequencies which are observed are essentially those
we would expect given the properties of of-PPs as dependents of nouns in general.

5.3. Human head nouns.

We have not yet cited any examples of one<sub>ct</sub> + of-PP where the antecedent belongs to certain types of human head noun which are usually considered inherently relational. These are nouns denoting interpersonal or kin relations (e.g. friend, brother), role nouns (e.g. king), and indeed agent nominalizations of the student type. Such examples do not occur, to our knowledge, in the BNC. But this, we believe, is simply a consequence of the limited size of the BNC rather than grammaticality as such, since natural-sounding examples of the relevant kind are certainly attested in larger corpora. We cite some web examples, identified as almost certainly produced by native speakers, in 37–39. The examples in 37 illustrating interpersonal and kin relations form a new fifteenth semantic field. However, role nouns can be subsumed under the function noun field, and agent nominalizations under the object-like dependent field.

(37)  
a. WAGs (wives and girlfriends, usually the badly behaving [ones of English sports stars])
   \{wives and girlfriends;  d is interpersonal relation of h\}

b. Both the parents of children with difficulties and [the ones of children with a normal evolution] must be contacted to settle educational programs that involve the family.
   \{parents;  d is kin relation of h\}

(38)  
Dudley himself was no more eager for the match. Yes, he wanted to marry with a queen, but not [the one of Scotland].
   \{queen;  d has role with respect to h\}

(39)  
a. Despite the rivalry between the two sides, supporters, specially [the ones of Real Madrid] are known to show respect to the individual talents in the opposition team.
   \{supporters;  d is undergoer / h is agent\}

b. A single company, ArkivMusic, has struck deals with all four major publishers (and numerous minor ones) of classical music recordings to make their deleted records available via a burn-on-demand service.
   \{publishers;  h is theme, d is agent\}

The two examples of agent nominalizations in 39 differ in that 39a has an ‘s-genitive counterpart. It would be possible to say Real Madrid’s with a zero anaphor, just as well as the ones of Real Madrid.

Is it possible to find an example in all relevant respects like Baker’s original example 5, with the particular agent nominalization student? Users of corpora will know that finding specific strings is virtually impossible even for quite short string lengths (the probability of a possible k-word string at any arbitrary point in a text being identical with some specific string is approximately 1 in 10<sup>2k</sup>). The difficulty of finding an occurrence is further reduced if a specific antecedent (student) is called for, given that it may be arbitrarily distant from the occurrence of one<sub>ct</sub> + of-PP. However, consider example 40:

(40)  
In the case of medicine, I think there’s no other alternative than the Universidad de la Republica. I would think their classes are equally crowded, but haven’t ever heard
any of the medicine students complain as much as the [ones of computer science].
{students; h is theme, d is agent}

This example — offering advice to a North American about Uruguayan university entrance requirements — may be from a non-native speaker, but the writer’s English betrays no obvious non-native traces and the example sounds entirely natural to us.

As we have shown in section 5.2, the of-PP construction has more than just the ’s genitive as a competitor: there is also the possibility in many cases of employing an NP with a simple nominal or adjectival pre-head modifier. As well as the queen of Scotland (or Scotland’s queen) in 38, we could have the Scottish queen. And as well as the supporters of Real Madrid (or Real Madrid’s supporters) in 39a, we could also have the Real Madrid supporters. With agent nominalizations like student, it is the only competitor: as well as the students of medicine, we could have either the medicine students (which the author in 40 actually chooses for the antecedent), or the medical students.

A BNC investigation into the relative frequencies of of-PPs and pre-head modifiers with the head noun student reveals that, at least with single word dependents, the pre-head modifier construction very strongly predominates (see Table 4).

<table>
<thead>
<tr>
<th>of-PP</th>
<th>EXAMPLES</th>
<th>PRE-HEAD MODIFIER</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>student of physics</td>
<td>1</td>
<td>physics student</td>
<td>7</td>
</tr>
<tr>
<td>student of science</td>
<td>2</td>
<td>science student</td>
<td>6</td>
</tr>
<tr>
<td>student of chemistry</td>
<td>0</td>
<td>chemistry student</td>
<td>6</td>
</tr>
<tr>
<td>student of medicine</td>
<td>0</td>
<td>medical student</td>
<td>64</td>
</tr>
</tbody>
</table>

Table 4: frequencies in the BNC of of-PP and pre-head modifier with the head noun student

Length of the dependent is a relevant variable: the longer the dependent is, the more likely the of-PP construction becomes. A survey of of-PP constructions with the head noun student reveals that the mean length of the dependent is 2.1 words (number of examples = 423; standard deviation = 1.6). It is in conformity with this length principle, therefore, that in example (40) the author chooses the ones of computer science over the computer science ones.

In conclusion, there are no grounds for considering examples like the one of physics (with student as antecedent) to be ungrammatical. No syntactic principle excludes such phrases. They are simply a non-preferred option given a short dependent.

6. THE IMPLICATIONS FOR ACQUISITION. The footprint of Baker’s arguments in the literature is huge. Textbook authors often rely on them to motivate X-bar theory (e.g. Radford 1981:92–100, 1988:174ff; Carnie 2002:122; Burton-Roberts 2011:165–170). At least five different works by David Lightfoot and coauthors repeat Baker’s arguments in connection with arguing for universal grammar (Hornstein & Lightfoot 1981:18ff; Lightfoot 1982, chapter 4; Lightfoot 1989:322f; Lightfoot 1991:4–8; Anderson & Lightfoot 2002:196–198). Baker’s thesis is treated as uncontroversially established not only within psycholinguistics (e.g. Hamburger & Crain 1984; Crain 1991:609ff) but also occasionally by philosophers of cognitive science (see e.g. Ramsey & Stich 1991:295). There has been renewed recent theoretical discussion of the facts (Oga 2001; Panagiotidis 2003; Gualmini 2007), and prolonged debate has been stimulated since 2003 by a

Unfortunately all of this work has been based on descriptive error. The facts about anaphoric one are not as Baker assumed, and once they are properly understood not a trace of Baker’s supportive argumentation for innateness survives.

Baker actually supplies two distinct arguments, each associated with a specific fact to be acquired—what Pullum & Scholz (2002) call an ACQUIRENDUM. The two acquirenda are:

(41) a. A single word of the lexical category N cannot be the antecedent for one_{ct}.
b. A multi-word phrase of the category Nom can be the antecedent for one_{ct}.

Confirming 41a would call for negative information: that one_{ct} can never be antecedent by a noun that has a complement (as opposed to being antecedent by the whole Nom constituent containing the noun and the complement together). But nobody is ever supplied with this information, so 41a gives rise to what Pullum & Scholz call a STIMULUS-ABSENCE argument for linguistic nativism: nothing in the environment could directly supply the information necessary for learning. But given the evidence we have provided to show that 41a is not true, this collapses. Nothing entailing 41a is acquired by those who become speakers of English — and for anything entailing 41a to be innate would prevent attainment of the adult state of knowledge of language.

To confirm 41b, by contrast, positive information could in principle suffice: if some utterance act could convince you (by occurring in a context where nothing else makes sense) that one_{ct} must have a multi-word Nom as its antecedent, you would have learned that multi-word Nom antecedents are possible. So 41b gives rise to what Pullum & Scholz call a STIMULUS-POVERTY argument.

Baker gave an example of the kind of rare but in-principle-accessible evidence that would permit 41b to be learned. He pointed out that in a context where Alice has a red glass in her hand, encountering 42 would provide relevant evidence.

(42) John has a blue glass, but Alice doesn’t have one.

One cannot mean glass here, on pain of contradicting the visible evidence; yet if it is taken to stand for blue glass, everything makes sense. Hence multi-word antecedents must be permissible.

Baker made a mistake here. The one in 42 is not the noun; it is the determinative. That is why the plural form would be impermissible (*John has some toys but Alice doesn’t have ones). And the antecedent in 42 is not a Nom, but the whole indefinite NP a blue glass. This can be remedied: we could replace 42 with something like John has a blue glass, but we couldn’t find another one for Alice, which does have one_{ct}. It is rather remarkable, though, that through all the repetitions of his point no one ever noticed that Baker’s examples did not illustrate his point.

Events like hearing 42 in a context where Alice has a non-blue glass are referred to by Akhtar et al. 2004 as BAKER EVENTS. What Baker says about them is that they ‘must certainly be extremely uncommon in a child’s early experience.’ He offers no support at all for this assertion. And in fact the frequency of Baker events remains unknown. Their frequency might well be
adequate to ensure that random linguistic experience would soon refute the one-word-antecedent hypothesis, but there has been no large-scale study of this; nearly everyone has been content to repeat what Baker said.

Lidz et al. (2003) is an exception. Lidz et al., to their credit, attempted to assess the frequency of Baker events by looking for them in corpora of speech addressed to young children, and they claimed to have found one in the Adam corpus of the CHILDES database and one in the Nina corpus. Unfortunately, both of their examples (which Jeff Lidz kindly showed us) are mistaken diagnoses: they contain one₄. Our own explorations turned up a few apparent Baker events in the Lara corpus (see e.g. lines 441, 770, 912, 1179, and 1218), but we confess it can be very hard to tell from transcripts of interactions with young children, and more work is needed.

It is not difficult to make a preliminary assessment of what the frequency might be in arbitrary text, however. We examined every occurrence of one or ones in three texts to get a rough sense of how many of them represented Baker events. What we looked for were instances of one₄ for which the only reasonable assumption given the context was to understand them as having multi-word antecedents. The results are in Table 5. What they show is that in each million words of arbitrary text we can expect about 35 utterances that in effect indicate the analog of Baker events. If conversations with children are like other kinds of text in this regard, then since children hear 10 to 30 million words before they are three (Hart and Risley 1995), one might expect 3-year-olds to have encountered between 350 and 1000 Baker events. That is by no means vanishingly small. Understanding some of the utterances involved might be enough to support purely experience-based learning of the fact that multi-word antecedents are possible.

<table>
<thead>
<tr>
<th>Text</th>
<th>Word Count</th>
<th>One(s)</th>
<th>One₄</th>
<th>Baker Events</th>
<th>Per Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Street Journal corpus, w7_001</td>
<td>160,000</td>
<td>262</td>
<td>25</td>
<td>6</td>
<td>37.5</td>
</tr>
<tr>
<td>Alice's Adventures in Wonderland</td>
<td>26,000</td>
<td>78</td>
<td>4</td>
<td>1</td>
<td>38.5</td>
</tr>
<tr>
<td>Anne of Avonlea</td>
<td>90,000</td>
<td>173</td>
<td>22</td>
<td>3</td>
<td>33.3</td>
</tr>
</tbody>
</table>

Table 5: Numbers of apparent Baker events in three texts

We note in addition that there is reason to doubt that a sound stimulus-poverty argument for linguistic nativism can be based on an acquirendum like 41b, and it is important. Whether Baker events are common enough to be relevant or not, if what gets learned is simply that one₄ is an anaphor of type <e,t>, then it is not clear why 41b would ever be doubted by an unprejudiced learner: nouns and Nom constituents can both have that type, so the learner who makes the broadest assumption, namely that anything of type <e,t> will do, will be correct.

A further remark to be made about the developmental-linguistic and psycholinguistic literature is that it is vitiated by frequent shifts in the presumed acquirendum, none of them being accurate. Lidz, Waxman, and Freedman (2003) started out by taking the child’s task to be to learn something like Baker’s original syntactic claim: that ‘one is anaphoric to the phrasal category [Nom]’ — a claim we have shown to be false. Lidz et al. attempted to test whether young children assume that claim. They familiarized 18-month-old infants with a screen display of a yellow bottle accompanied by the utterance ‘Look! A yellow bottle!’ , and then showed both a
yellow bottle and a blue bottle accompanied by either ‘Now look: what do you see now?’ (the control condition) or ‘Now look: do you see another one?’ (the test condition). The idea was that if the children knew that $\textit{one}_ct$ was an anaphor seeking a Nom as antecedent (and not a noun), another one would be interpreted with one taking the Nom $\textit{yellow bottle}$ as its antecedent, so the infants would take a longer look at the yellow bottle. (See Akhtar et al. and Tomasello 2004 for detailed criticism.)

The assumption Lidz at al. appear to make is that infants will pick the longest possible antecedent (for notice, $\textit{bottle}$ on its own would also be a Nom). Regier & Gahl (2004) make this explicit in their response, exhibiting a Bayesian strategy that could learn from positive data that $\textit{one}$ must take as antecedent a larger rather than a smaller Nom. But that is not the generalization that competent adult speakers acquire.

Lidz & Waxman (2004) reply to Regier & Gahl, but restate the acquirendum in a slightly different and non-equivalent form: ‘$\textit{one}$ is anaphoric only to syntactic constituents larger than $\textit{N}_0$’, which neither entails nor is entailed by the former one. Assuming that ‘larger’ means ‘longer’, it entails that $\textit{one}_ct$ can only have multi-word antecedents, and that is certainly not true: $\textit{one}_ct$ frequently has one-word antecedents.

Pearl & Lidz (2009) present a fuller response to Regier & Gahl, but change the acquirendum yet again, proposing (p. 239): ‘Anaphoric $\textit{one}$ can take any Nom as an antecedent, but a multi-word antecedent is preferred when it is available.’ They claim that ‘when there is more than one [Nom] to choose from . . . adults prefer the [Nom] corresponding to the longer string,’ and children ‘have the adult pragmatic preference to choose the referent corresponding to the larger [Nom] string when there is more than one [Nom] antecedent.’ This too is false (as well as slightly different from all the earlier work). For instance, it is flatly contradicted by example 23 in Baker (1978:419), $\textit{The student with short hair is taller than the one with long hair.}$ If $\textit{student with short hair}$ were preferred over $\textit{student}$ as antecedent, the predicted interpretation would be that the $\textit{one with long hair}$ means ‘the student with short hair who has long hair.’

Such shifts and inaccuracies wreck the chances of getting a result that bears on the acquisition of $\textit{one}_ct$ or the issue of linguistic nativism. Unless the participants can agree on what acquirendum they are talking about, they can never succeed in determining whether its acquisition calls for innate linguistic prerequisites. And in this case not only have the parties all picked different acquirenda, but in addition the acquirenda they have picked do not hold in the language to be acquired.

In sum, psycholinguists working on anaphoric $\textit{one}$ have (i) failed to validate the claim that bare noun antecedents are illicit (which they are not); (ii) confused the crucial item with one of its homonyms; (iii) failed to establish that Baker events are rare; and (iv) shifted their assumptions about the acquirendum from study to study. In consequence, the results obtained have agreed neither with each other, nor with linguists’ assumptions about what was to be shown, nor with what (under our analysis) actually has to be acquired.

7. Concluding. Nothing remains of the factual basis for an argument from either stimulus absence or stimulus poverty running along the lines Baker suggested. One rests on refuted data and the other is entirely inconclusive.

It is worth reflecting on why anyone could think it likely that a learner would ever assume a
one-word limit on antecedents for an anaphor. What the learner is looking for (if we are anywhere near right) is a meaning to assign. Glass and blue glass and pretty blue glass that John is holding are all expressions of type <e,t>. An unbiased hunt for a type <e,t> antecedent should be content with finding any <e,t> that fits the context. There is no reason to think the word count should matter.

The preferential-looking experiments of LWF and the Bayesian-learning simulations that emerged in the subsequent discussion all involved several shifts in the acquirendum, and all of the investigation was undertaken without any reinvestigation of the relevant English data. In consequence, neither the nativist nor the non-nativist strands of the work arrive at any results that carry conviction. The new puzzle that arises is how one can be promiscuous enough to allow either a complement-taking noun or a whole nominal to be its antecedent and supply its sense. We have provided a formal semantic analysis that answers that question. It leaves us with no specific reason to think that learning Baker’s positive acquirendum from the evidence is problematic: given only that one is identified as an anaphor of semantic type <e, t> (and even linguistic nativists have to assume that much can be learned from exposure to speech, since one is not universal), it automatically follows that the meanings of nominals (combinations of nouns with their dependents) will be suitable meaning donors.

It is unfortunate that the work on anaphoric uses of one began in such a resolutely syntactic mode. No one seems to have thought much about its meaning, or the implications thereof. The fact is that for a child capable of identifying nouns and conjecturing meanings for them, learning one looks rather easy. It is a count noun with hardly any semantic content. A phrase like a big one has a meaning something like ‘a big thing (of the indicated sort)’. It is scarcely a mystery how a child capable of learning noun meanings could learn a particularly bland and general one such as this.

Learning to use one in particular constructions does not seem to call for anything but positive evidence. No subtle constraint on the category of its antecedent has to be learned: either nouns or multi-word Nom will do. An of-PP, or any other PP, can compose with one when a plausible meaning results. On the basis of exposure to the range of alternative constructions like NPs with a genitive determiner or with premodifying nouns and adjectives, the learner will be encouraged to use them in ways that match linguistic experience: use mine or my one rather than the one of me in cases of control or possession; use the one of me sometimes with depictive nouns; and so on. The probability matching seen in young language learners’ adaptation to the speech of their caregivers is well known. There is no reason to expect this natural process to be switched off when it comes to learning alternations between syntactic constructions. And there is also no reason to consider low-probability examples like the car of John or the ones of physics as being grammatically ‘blocked’ by their more probable alternants. No syntactic principle forbids these low-probability constructions; if they sound a bit odd in isolation it is merely because they are less preferred.

Neither theoretical arguments in support of linguistic nativism nor experimental work in developmental psycholinguistics can amount to much if they are based on flawed descriptive linguistics. It is somewhat shocking to reflect on the fact that the syntactic conditions on one have been touted for thirty years as a prime example of a linguistic discovery supporting the plausibility of linguistic nativism when the whole factual basis of the case, presupposed in all the psycholinguistic work, was mistaken.
If language acquisition is ever to be scientifically understood, observation of children’s language and child-directed speech will have to proceed in parallel with controlled psychological experiments, and computational modeling, and above all, careful description of the linguistic system that is acquired. But notice, we are not suggesting at all that experimentation and modeling can take over and eliminate the need for theoretical and descriptive linguistics. Having a sound theoretically-based description of the linguistic system to be acquired is surely crucial if progress is to be made on explaining acquisition. Efforts at explaining the acquisition of a linguistic system are doomed to failure if the presupposed description of the acquired system is grossly inaccurate, as has proved to be the situation here.

APPENDIX. Derivation of a brutal murder of a taxi-driver. To derive the meaning of the (attested) phrase a brutal murder of a taxi-driver, we proceed by first constructing the translation of the of-PP:

(A1)

\[ \lambda O[\lambda z[\exists y[\text{taxi-driver}(y) \& O(y)(z)]]] \]

We straightforwardly apply the translation of the determiner a to the translation of the noun taxi-driver to derive the translation of the NP a taxi driver as in A2a. We then apply the translation of the preposition of to the translation of the NP as in A2b. Here, the new variables \( u \) and \( z \) are of type \( e \), the variable \( n \) is of type \( <<e, t>, t> \), and the variable \( O \) is of the relational type \( <e, <e, t>> \).

(A2)

a. \( \lambda q[\lambda p[\exists y[q(y) \& p(y)]]](\text{taxi-driver}') \)
   \[ = \lambda p[\exists y[\text{taxi-driver}(y) \& p(y)]] \]

b. \( \lambda n[\lambda O[\lambda z[n(\lambda u[O(u)(z)])])(\lambda p[\exists y[\text{taxi-driver}(y) \& p(y)]]])] \)
   \[ = \lambda O[\lambda z[\lambda p[\exists y[\text{taxi-driver}(y) \& p(y)]]](\lambda u[O(u)(z)]))] \]
   \[ = \lambda O[\lambda z[\exists y[\text{taxi-driver}(y) \& \lambda u[O(u)(z)](y)]]] \]
   \[ = \lambda O[\lambda z[\exists y[\text{taxi-driver}(y) \& O(y)(z)]]] \]
The translation of the preposition *of* contains a variable $O$ which we take to range over the wide set of semantic relations which this preposition permits. By altering the range of this variable, the analysis can therefore in principle be extended to any other preposition.

We can then represent the structure of the full NP with the analysis tree in 32. The typing here forces first the composition of the translation of *brutal* with that of *murder*, as in A3a. This translation is of type $<e, t>$, and before it can combine with the translation of the *of*-PP must be shifted to the relational type $<e, e, t>$ by the relational operator 30a. This type-shifting is shown in A3b.

(A3)  
\[
\begin{align*}
\lambda p[\lambda y[p(y) & \text{ & brutal}'(y)]](\text{murder'}) \\
= \lambda y[\text{murder}'(y) & \text{ & brutal}'(y)]
\end{align*}
\]

b.  
\[
\begin{align*}
\lambda p[\lambda d[\lambda h[p(h) & \text{ & } R(h)(d)]](\lambda y[\text{murder}'(y) & \text{ & brutal}'(y)])] \\
= \lambda d[\lambda h[\lambda y[\text{murder}'(y) & \text{ & brutal}'(y)](h) & \text{ & } R(h)(d)]] \\
= \lambda d[\lambda h[\text{murder}'(h) & \text{ & brutal}'(h) & \text{ & } R(h)(d)]]
\end{align*}
\]

The logical translation in A3b therefore represents a relational interpretation of *brutal murder*.

The translation of the *of*-PP can then apply to the translation of *brutal murder* as in A4:

(A4)  
\[
\begin{align*}
\lambda O[\lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } O(y)(z)]](\lambda d[\lambda h[\text{murder}'(h) & \text{ & brutal}'(h) & \text{ & } R_o(h)(d)]])] \\
= \lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \lambda d[\lambda h[\text{murder}'(h) & \text{ & brutal}'(h) & \text{ & } R_o(h)(d)]]](y)(z)] \\
= \lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \lambda h[\text{murder}'(h) & \text{ & brutal}'(h) & \text{ & } R_o(h)(y)](z)]]] \\
= \lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \text{murder}'(z) & \text{ & } \text{brutal}'(z) & \text{ & } R_o(z)(y)]]]
\end{align*}
\]

The relational variable $O$, which represents the range of semantic relations permitted by the preposition *of*, imposes a constraint on the instantiation of $R$: whatever semantic relation is chosen to instantiate $R$ must lie within this range. In A4 we represent this constraint by subscripting $R$ accordingly, i.e. $R$ is restricted to $R_o$.

It is then straightforward to derive the translation of the full NP by applying the translation of the indefinite article to the translation of *brutal murder of a taxi driver*, as in A5:

(A5)  
\[
\begin{align*}
\lambda q[\lambda p[\exists x[q(x) & \text{ & } p(x)]](\lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \text{murder}'(z) & \text{ & } \text{brutal}'(z) & \text{ & } R_o(z)(y)]]]) & (\lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \text{murder}'(z) & \text{ & } \text{brutal}'(z) & \text{ & } R_o(z)(y)](z) & \text{ & } p(x)))] \\
= \lambda p[\lambda z[\lambda z[\exists y[\text{taxi-driver}'(y) & \text{ & } \text{murder}'(z) & \text{ & } \text{brutal}'(z) & \text{ & } R_o(z)(y)]](z) & \text{ & } p(x))] \\
= \lambda p[\lambda x[\exists y[\text{taxi-driver}'(y) & \text{ & } \text{murder}'(x) & \text{ & } \text{brutal}'(x) & \text{ & } R_o(x)(y)] & \text{ & } p(x)]]
\end{align*}
\]

The final line of A5 thus corresponds to the translation of the full NP given in 32.
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**Payne, John, and Eva Berlage.** 2009. Pro-nominal *one* and relational nouns. Paper presented at ICAME 30, University of Lancaster.


This paper originates in a confluence of two independent lines of research, one by Pullum and Scholz on stimulus-poverty arguments and the other by Payne and Berlage on one-anaphora. We thank the audiences at Brown University, Yale University, Newcastle University, the University of Manchester, the University of North Carolina, the Lancaster ICAME conference (Payne & Berlage 2009), and the Boston ISLE conference (Payne & Berlage 2011) for their questions and comments. Pauline Jacobson and Laura Kertz were particularly helpful to us. Barbara Scholz, who was the first to notice the mutual relevance of the two research programs, died in May 2011 before this paper was completed; the other three authors bear all responsibility for remaining errors in the text (and we thank Zoltan Galsi, whose careful reading enabled us to avoid some of them).

Notes

1. For those who endorse the ‘DP hypothesis’ the relevant constituent is, confusingly, labeled NP; but nothing substantive will hang on the fact that we do not assume that hypothesis here.

2. Notice that we distinguish the category D, to which words like the and every belong, from the function ‘determiner of’, which can be filled by either a D (as in the house) or a genitive NP (as in John’s house).

3. The two items are called oneₐ and one₀ by Jackendoff (1977:60).

4. There are derivative non-anaphoric uses, as in the great ones of mathematics, or military personnel and their loved ones.

5. Jackendoff (1977:60–61) notes the distinction between oneₐ (which he calls oneₐ), and oneₐ (which he calls one₀), but makes a double mistake in discussing the facts: he claims that the quarts of wine and the ones of water is ungrammatical (we give evidence below that such phrases are well formed) and that it contains oneₐ (it does not; it contains oneₐ — hence the presence of the determinative the — so it does not support his claim about why such a phrase would be ungrammatical.

6. The CQP edition of the BNC (http://www.natcorp.ox.ac.uk) was developed by Sebastian Hoffmann and Stefan Evert.

7. Rosie’s Riveters is wrongly transcribed in the BNC as ‘[gap:name] Rivetus’. We have replaced this with a corrected transcription.

8. Panagiotidis (2003) cites an unpublished 1989 manuscript by Andrew Radford as the source for the idea that the behaviour of oneₐ can be explained by assuming that there are two different prepositions of. Also, again apparently following Radford, Panagiotidis uses this idea for yet another change to the Baker acquirendum by arguing (correctly) that oneₐ belongs to the lexical category N, not the phrasal category Nom. The reason that oneₐ supposedly does not occur with a following complement would then be that, as a pronominal, it could not itself inherently be relational.

9. This group is not intended to be coextensive with the set of nouns that Löbner (1985) dubbed “functional nouns”, a type of relational noun whose relational argument represents a unique entity.

10. Following Vikner & Jensen (2002), we use the more general concept ‘controller’ rather than simply ‘owner’. Consider the two examples in the following paragraph of the noun car followed by an of-PP (both attested examples from the BNC). In the first example, the car of a passing motorist [CBC 8327], we might not know whether the driver is actually the legally
registered owner of the car, but he/she must certainly be in control of it. And in the second example, the car of the Spanish consul-general in Rotterdam [HKX 2612], the consul might not own or even drive the car in question. But he/she controls its use.

11 The noun sake occurs only in the fixed phrases for the sake of X and for X’s sake, and the noun dint is entirely restricted to the fixed phrase by dint of X, but these are fossilized idiom parts, not ordinary nouns taking syntactically obligatory complements. Huddleston & Pullum et al. (2002: 440) states that denizen is a unique exception, but this is now known not to be true: we have found attested uses of it with no complement.

12 This example is based on an example from the BNC (locator [A8F 286]). In order to simplify the translation into predicate logic, we have changed the definite article in the original example (the brutal murder of a taxi driver) to an indefinite one.

13 The view of semantic composition expressed here has strong affinities to glue semantics, e.g. Dalrymple (1999), or combinatorial categorial grammar (CCG), e.g. Steedman (2011). It could straightforwardly be reformulated in either of these frameworks. However, for the purposes of this paper we do not need to adopt either the Glue semantics assumption that non-adjacent elements can be combined, or CCG assumptions concerning a more extended set of combinatorial operations and a categorial syntax which is tied directly to semantic operations.

14 These examples were sourced using Webcorp. URLs, accessed in May 2011, are:

(31a) http://www.guardian.co.uk/books/booksblog/2008/jul/16/gruesomemurdersmakegreatbooks
(31b) http://www.guardian.co.uk/uk/2009/nov/17/arrests-murders-soldiers-northern-ireland
(31c) http://www.thevervoid.com/columns/inlibtd/paultemple.htm
(31d) http://www.btscene.eu/verified-search/torrent/the-dressmaker/

15 Partee and Borschev (2012: 448) hold as a “working hypothesis” the notion that relational and non-relational nouns are of different syntactic categories and different semantic types. The exemplificatory syntactic diagnostics are however not particularly decisive. For example, both supposed contexts for non-relational nouns (This is (a(n)) N; This/That N is ... (e.g. good)) readily accept supposedly relational ones: This is a portrait; This portrait is good. Pauline Jacobson (p.c.) has pointed out to us a semantic diagnostic which appears superficially stronger and which she attributes originally to a UMass dissertation (Mitchell 1986, see also Partee 1989, Asudeh 2005), namely that the supposed inherently relational nouns have a hidden argument which is obligatorily bound by quantifiers. Thus in On Christmas Eve, every boy brought plum pudding to a neighbor, the interpretation would have to be: “for each boy, x, x brought plum pudding to x’s neighbor”. Even though this interpretation is the most plausible one, we doubt that the bound interpretation it is genuinely obligatory, given the right context. For example, if some particular deserving person is always given plum pudding on Christmas Eve by every boy in the town, then on this particular Christmas Eve because of an address error the pudding was delivered to a neighbor of the deserving person instead. In our account, the bound reading is easily obtained by allowing the type-shifting operator to apply to all nouns in isolation of any dependent.

16 For simplicity, the search was restricted to plural examples with ones. The original search was for 100 examples, of which 2 were discarded because they represented the plural of the number “1” in multiplication tables.

17 The web examples in this section were sourced using Webcorp. URLs, accessed October 2012:

(35a) http://famouswonders.com/aba-atoll/
(35b) http://www.spookyisles.com/2012/07/the-bells-of-bealings-house/
(35c) http://www.fmvmagazine.com/?p=7162
There may of course be idiolectal variation in some of these judgements, but the overall picture is unlikely to be affected by such variation.

We should note that one_{ct} appears to be distinctly less frequent in American English (AmE) than in BrE. The frequency of the plural ones in the BNC (almost all one_{ct} tokens, sporadic expressions like two ones are two being rare) is roughly 117 per million words. The corresponding figure for the Wall Street Journal corpus (LDC 1993) is only 37 per million words, and for the Corpus of Contemporary American English (Davies 2008) it seems to be only 7.2 per million. Nevertheless, within these overall lower frequencies, the syntactic behaviour does not deviate markedly from BrE. Sentences with one_{ct} followed by an of-PP represent about 0.6% of COCA, and the range of semantic relations exhibited is much the same. For example, these three sentences from COCA have head nouns frequently considered to be relational (and many more such examples could be cited):

(i) There are those who contend that a trophy property costs at least $20 million. And that price tends to be the benchmark used when sales, like the recent [one of a town house on West 10th Street] for $20 million, are reported in the media and talked over by those who like to talk about these things (New York Times, 30 Jan, 2011).

(ii) “Many thanks for sending me the photographs,” he wrote to Sears from Biltmore in Asheville, North Carolina, on August 7, 1895. “The new [one of Helen] has a wonderfully fine expression and makes me feel like returning to Boston and putting my umbrella through my portrait.” (Antiques, Sep 2001)

(iii) I have observed individuals of the Negro race in whom the brain was as large as the average [one of Caucasians]; (Natural History 104, 1995)

Rather than using the binary distinction between definiteness and indefiniteness as a formal proxy for the discourse status of the dependent, O’Connor et al. use a hierarchy of nominal types (pronoun > proper noun > kinship term > common noun definite > common noun indefinite), linking these distinctions to notions of accessibility as in Ariel (2001). In their results, they omit counts for kinship terms, which occur relatively infrequently (we have done likewise, and this is the reason why there are 73, not 75 BNC examples in the accessibility column). They also amalgamate definite and indefinite noun phrases headed by common nouns into a single factor. The basic distinction between definite and indefinite dependents is however shown to be significant in Börjars et al. (2013), another recent large-scale investigation of the genitive alternation, based on the spoken sections of the BNC.

Under “organization”, we have included all animate collective nouns, e.g. nouns like family. The web examples in this final section were again sourced using Webcorp. URLs, accessed variously in May 2009 and May 2011:


(37b) http://www.betterparentingarticles.com

(38) http://ladyhedgehog.hedgie.com/mary.html

(39a) http://www.wikipedia.org (old entry for El Clásico)

(39b) http://en.wikipedia.org/wiki/Deletion_(music_industry)

(40) http://board.totaluruguay.com/Education/University_entrance_requirements

Non-intersective adjectives such as former will belong to type <<e, <e, t>>, <e, <e, t>>, and
can thus refer to the relation \( R \). We ignore this complication here.

The derivation given here in which the translation of the matrix determiner applies last obviously corresponds to interpretations in which this determiner, if scope-bearing, scopes over any determiner in the PP. Thus it is compatible with an interpretation of (say) the NP *every picture of a student* in which a different student is depicted in each picture. Harder to obtain are inverse scope readings, as in the interpretation of the NP *a picture of every student* in which there are different pictures of each student (see the discussion of the analogous scope problem with respect to *'s genitive constructions in Vikner & Jensen 2002: 200-204). Our solution, which has affinities with the treatment of inverse scope out of NP modifiers in Steedman (2009: 58-60), has the advantage of generalizing to both the *'s genitive and of-PP constructions. What is needed is for the PP of *every student* to take the translation of *a picture* as argument, rather than just *picture*. This primarily requires the translation of *of* to be type-shifted from type \( <<e, t>, t>, <<e, e, t>, t>, <<e, e, t>, t>> \) to type \( <<e, t>, t>, <<e, e, t>, t>, <<e, e, t>, t>> \). The translation of *of* will then be \( \lambda n[\lambda \hat{O}[\lambda q[n(\lambda u[\hat{O}(u)(q))])]]) \), where the variable \( \hat{O} \) has the shifted type \( <<e, <<e, t>, t>> \). When applied to \( \lambda p[\forall y[\text{student}' (y) \to p(y)]] \), the translation of *every student*, this yields, after simplification, the translation of the PP of *every student*, viz. \( \lambda \hat{O}[\lambda q[\forall y[\text{student}' (y) \to \hat{O}(y)(q)]]] \). The relational translation of *picture* will be \( \lambda u[\lambda p[\exists z[\text{picture}' (z) \& R(z)(u) \& p(z)]]] \), yielding an inverse-scope translation for the whole NP, viz. \( \lambda q[\forall y[\text{student}' (y) \to \exists z[\text{picture}' (z) \& R_\hat{O}(z)(y) \& q(z)]]] \) (where \( R_\hat{O} = R_\hat{O} \)). In order to derive the relational translation of *a picture*, a type-shift is required for the determiner from type \( <<e, t>, <<e, e, t>, t>> \) to type \( <<e, e, t>, t>, <<e, e, t>, t>> \). Its translation will be \( \lambda r[\lambda u[\lambda p[\exists z[r(u)(z) \& p(z)]]]] \), the variable \( r \) being of type \( <e, <e, t>> \). This is applied to the relational translation of *picture*, i.e. \( \lambda d[\lambda h[\text{picture}' (h) \& R(h)(d)]] \).