

Limiting Gender

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Abstract Grammatical gender features, which are seen as having both a semantic and arbitrary form, have been argued to embody the interpretable-uninterpretable distinction: semantic gender is interpretable, and arbitrary gender is uninterpretable (Kramer 2014, 2015). Using French as a case study, this paper argues that all gender features—even those which have been seen as arbitrary—are necessarily interpretable at the LF interface. Even if a feature does not contribute compositionally to the meaning of a structure, it must be visible to provide the context for interpretation. This leads to an argument for the abandonment of the interpretable-uninterpretable distinction in the representation of features. Instead, the analysis contends that the *mechanism* of interpretation is responsible for differences in the semantic contribution of features: both heads and sub-structures can be taken as input to the interpretive mechanism. The interpretation of heads leads to compositional meaning, and the interpretation of sub-structures to non-compositional meaning. The system has the consequence of simplifying restrictions on gender specification such that they are solely linked to the availability of a semantic interpretation, rather than to a combination of phonological and semantic licensing conditions.

Key Words interpretability, gender, feature specification, French, licensing conditions, features, Distributed Morphology, compositionality

1 Introduction

Uninterpretable features have led a double life: (i) as a motivator of AGREE, in what has now come to be known as the *derivational time bomb* model (Chomsky 2000, 2001); and (ii) as a way to encode whether a given feature contributes to the interpretation of a structure (i.e. is *interpretable*), or does not (i.e. is *uninterpretable*) (Pesetsky & Torrego 2007; Kramer 2014, 2015). While arguments against the *derivational time bomb* model have gained traction in the wake of Preminger (2011, 2014), these arguments do not necessitate abandoning uninterpretable features as a way of encoding the fact that certain features do not receive their own denotation at LF. In this way, the interpretable-uninterpretable distinction continues to live on in our morphosyntactic representation.

In this paper, using French grammatical gender as a case study, I level an argument against the interpretable-uninterpretable distinction based on a failure to account for the way features can contribute non-compositionally to the denotation of a structure, then link this argument to the puzzle of feature specification: why are nouns selective about which genders they can be specified for? Current accounts in the literature following Kramer (2014, 2015) involve leveraging the difference in the semantic behavior of interpretable versus uninterpretable features to capture the natural versus arbitrary gender distinction described in Corbett (1991). On these accounts, natural gender, which contributes a compositional meaning of, for example, biological sex or animacy, is encoded as an interpretable gender feature. Arbitrary gender, which does not contribute compositionally, is encoded as an uninterpretable gender feature. Limiting the specification of gender is then linked to either semantic or phonological licensing conditions, depending on whether the feature is interpretable or uninterpretable.

In contrast to the above account, I show that even if a feature itself does not receive a denotation over the course of interpretation at LF, it still must provide the context for the interpretation of pieces of structure. Therefore arbitrary gender cannot be uninterpretable (i.e. invisible) at LF. The novel generalization is thus that all features are *interpretable*, in the sense that they are visible to LF, but in any given derivation this does not necessitate that a feature be directly *interpreted*, in the sense that it compositionally contributes to the denotation of a sub-structure. There are two empirical consequences of this claim. First, an account for alternations in gender that correspond to non-compositional changes in meaning. Second, a revised way to limit the specification of gender across nouns: whether a given noun can be specified for masculine, feminine, or both is solely a function of the availability of a semantic interpretation.

The structure of the paper is as follows. In §2, I show that there are pairs of nouns in French that differ only in the specification of the gender feature, yet differ non-compositionally in meaning. These contrast with pairs that alternate only in gender yet differ in meaning compositionally, as well as pairs that differ structurally in more than just gender and alternate in meaning. In §3 I show that current theories of how to account for the difference between compositional (i.e. *natural*) and non-compositional (i.e. *arbitrary*) effects of gender, which use the uninterpretable-interpretable distinction, cannot account for cases in French where gender licenses non-compositional alternations in the interpretation of structure. I argue in favor of a binary gender distinction represented in a feature geometry, where the entire geometry is interpretable and gender is part of the asserted content. In §4 I show

how a particular formulation of interpretive mechanism at LF, combined with the feature representation from the previous section, derives all and only the data described in §2. I show that an account using contextual allosemy over-predicts the effects of gender, where a unified mechanism that can insert denotations for heads or sub-structures captures the generalizations. In §5, I explore the impact of a representation without uninterpretable features, and a mechanism that interprets heads and (sub-)structures alike. I show that the puzzle of gender specification boils down to whether or not an interpretation is available for a given gender-root pairing. §6 concludes with a discussion of the status of uninterpretability in linguistic theory. Having shown that the interpretable-uninterpretable distinction does not derive any of the functions it has been purported to derive, I conclude that the distinction should be abandoned.

2 Gender and nominal morphology in French

French has a semi-productive morphological inventory that serves a wide range of functions. In this section, I show that there are cases of alternations in gender that result in alternations in meaning independent of biological sex, diminution, countability, and other potentially confounding factors. The data and analysis provide evidence against uninterpretability as a primitive property in the representation of morphosyntactic features: contra Kramer (2015), Pesetsky & Torrego (2007) and many others, features do not come in forms with and without a denotation. Instead, there are cases where a feature is directly interpreted, where it contributes its meaning compositionally, and others where it is part of the context for interpretation, where it contributes non-compositionally.

Before continuing, I would like to outline my assumptions regarding nominal structure and briefly discuss a recent competing account. Following Kramer (2009, 2014, 2015), I assume that gender is located on a nominal categorizing head, n , and that a bare noun minimally has the structure $\{ n, \{ n, \checkmark \} \}$ —both assertions are in line with the standard categorizing assumptions of Distributed Morphology. I also assume that the root is a completely featureless index, and contentless until interpretation and exponence at the interfaces (Acquaviva 2009; Harley 2014). As I discuss in §5, the assumption that roots are contentless and featureless does not allow for roots to syntactically select for the content of its categorizing head, unless this information is provided in a stipulated list: therefore I assume Merge is unrestrained, and produces every possible root-gender combination.

These assumptions do however contrast with existing claims in the literature. In a recent paper, Fathi & Lowenstamm (2016; henceforth F&L) adopt a system with significantly more complex assumptions regarding the structure of roots and how they relate to the issue of gender specification (which they refer to as *assignment* — see footnote 7 for a discussion of why the assignment-specification distinction is important to these discussions). In particular, F&L assume that roots are not featureless, and that patterns of specification can be accounted for by a probe-goal relationship between \checkmark and n . While F&L also seek to account for the same alternations central to the present paper, they deny the semantic role of gender. In large part, I believe this is due to their focus on the properties of gender at PF. Therefore their account differs from the present on two basic dimensions: in F&L’s account (i) gender is specified on the root; and (ii) gender has no denotation.

Over the course of the present paper, it will become clear why their second claim is unsustainable: I show that even when gender does not contribute its canonical compositional interpretation it influences the realization of denotations within the nominal spine. To the opposite extreme of F&L, I argue that *all* gender is interpretable at the semantic interface. Importantly, these claims do not preclude the possibility of complexities of gender at PF. Therefore it is in principle possible to unify the phonological alternations that make up the core of F&L’s account with the present analysis. I leave this to future work.

The question of whether or not roots are featureless is more complex. From the vantage point of French, the basic fact underlying the claim that roots do not contain gender features is that roots are only specified for gender when they are nominalized (modulo gender that appears on adjectives, particles, and more by way of AGREE). If roots were inherently specified for gender, we would predict to see these effects when roots combine with other functional categorizers such as *v* and *a*. Accounts that place gender on the root must maintain a conspiracy to allow gender only to surface when categorized by *n*. On the other hand, the present account (following Kramer) states that this is not a conspiracy at all: nominalization and the specification of gender go hand-in-hand as gender is specified on *n*.

With these assumptions, I turn to the core data of alternations of gender in French.

2.1 Alternations with animate nouns

The most common interpretation associated with alternations between masculine and feminine gender in French is biological sex. The alternation occurs with humans and animals alike, often corresponds to a morphophonological change on the noun itself (usually null in the masculine and visible in the feminine), is always evident from the wider agreement context with determiners, adjectives, and verbal particles, and encodes a kind or generic reading with the masculine gender. Two canonical examples are given in (1) and (2).

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|-----|----|--------------------------------------|-----|----|---|
| (1) | a. | <i>lion</i> (MASC)
‘(male) lion’ | (2) | a. | <i>écrivain</i> (MASC)
‘(male) writer’ |
| | b. | <i>lionne</i> (FEM)
‘female lion’ | | b. | <i>écrivaine</i> (FEM)
‘female writer’ |

However, a change in gender does not necessarily entail an alternation in the morphophonology on the noun, as shown in (3). In these cases, as in all cases, the change in gender is still evident morphologically in agreement with articles, quantifiers, adjectives, and verb particles—it is simply unmarked on the noun itself.

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|-----|----|--|
| (3) | a. | <i>journaliste</i> (MASC)
‘(male) journalist’ |
| | b. | <i>journaliste</i> (FEM)
‘female journalist’ |

Moreover, the kind reading encoded by the masculine is not without exception. In (4), we see that the masculine specified counterpart of $\sqrt{\text{TURKEY}}$ only refers to males, where the feminine refers to females and kinds.

- (4) a. *dindon* (MASC)
 ‘male turkey’
 b. *dinde* (FEM)
 ‘(female) turkey’

Additionally, as evidenced in (5) and (6), not every alternation in gender with an animate NP corresponds to an alternation in biological sex:

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|-----|--|-----|---|
| (5) | a. <i>chèvre</i> (MASC)
‘goat cheese’
b. <i>chèvre</i> (FEM)
‘goat’ | (6) | a. <i>camelot</i> (MASC)
‘street peddler’
b. <i>camelotte</i> (FEM)
‘junk’ |
|-----|--|-----|---|

Finally, there are many cases where no alternation is attested. These cases, often referred to in the literature as the *epicene*, are exemplified in (7) and (8). To refer to the male and female counterparts of these animals, speakers must use an adjective (e.g. *la souris mâle* (FEM) ‘the male mouse’ or *la souris femelle* (FEM) ‘the female mouse’), which adds compositionally to the meaning while keeping the gender of the NP constant.

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|-----|---|-----|--|
| (7) | a. <i>singe</i> (MASC)
‘monkey’
b. # <i>singe</i> (FEM) | (8) | a. # <i>souris</i> (MASC)
b. <i>souris</i> (FEM)
‘mouse’ |
|-----|---|-----|--|

These examples and counter-examples show us that, while there is the undeniable presence of semantic compositionality and morphophonological regularity within the domain of grammatical gender, there is also plenty of room for idiosyncrasy and unpredictability. Given the availability of a compositional and potentially productive denotation of biological sex associated with gender, a central question becomes why this specification pattern, and its subsequent interpretation, is not generalized to every corner of the language where it logically could extend, as evidenced in (7) and (8). Providing an account of this fact is one of the aims of the present paper.

2.2 Alternations with inanimate nouns

Nouns referring to inanimate objects are generally considered to take the form in (9) and (10), where the noun is only specified for a single gender.

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|-----|--|------|---|
| (9) | a. # <i>table</i> (MASC)
b. <i>table</i> (FEM)
‘table’ | (10) | a. <i>bureau</i> (MASC)
‘desk’
b. # <i>bureau</i> (FEM) |
|-----|--|------|---|

Alternations in gender within nouns that denote inanimate objects are far less discussed in the literature, although there are many examples of this process. A small sample is given below, where, as previously observed, there is often an associated change in morphophonological form (e.g. (11)-(13)), but this is not always the case (e.g. (14)).

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|------|---|------|--|
| (11) | a. <i>bassin</i> (MASC)
‘basin (geographical)’ | (13) | a. <i>rouet</i> (MASC)
‘spinning wheel’ |
| | b. <i>bassine</i> (FEM)
‘washing basin’ | | b. <i>roue</i> (FEM)
‘wheel’ |
| (12) | a. <i>chapelet</i> (MASC)
‘prayer beads’ | (14) | a. <i>cache</i> (MASC)
‘mask’ |
| | b. <i>chapelle</i> (FEM)
‘prayer room’ | | b. <i>cache</i> (FEM)
‘hiding place’ |

Many accounts, including Harris (1991), Zamparelli (2008), Percus (2011), Carstens (2010), and Kramer (2015) acknowledge examples similar to these, but claim that pairs of this type do not share a root, or any structure that ties together their shared meaning and form.¹ I believe this claim is misguided for the following reason.

Let the null hypothesis be that if two pairs of nouns overlap in morphophonological form, then these nouns share a root. Therefore this is assumed to be true, or at least unfalsified, unless faced with convincing evidence to the contrary. The motivation for this null hypothesis over one in which all nouns are assumed to have distinct roots unless faced with evidence that they are the same is grounded in falsifiability and simplicity. I assume a general preference for a simple system—one with fewer roots, which reduces stress on storage—over one that is more complex—one with more roots that take up greater amounts of storage.

This also capitalizes on our well-known ability to recognize and generalize across forms to the greatest extent consistent with the input, a process clearly necessary for learning language and learning in general (e.g. the *Wug Test* in Berko Gleason 1958). In terms of acquisition, the child initially assumes that two words that share phonology share structure. In this case, that structure is the root. This assumption may be challenged if these pairs turn out to be homophones: therefore falsification requires the child to create a representation of meaning, contrast them, and evaluate the extent to which they are similar.

Indeed, this is the same null hypothesis that underlies the widely accepted claim that pairs such as those in (1) and (2) share a root, now applied without exception across the lexicon as a whole. The task at hand is then to determine what constitutes convincing evidence that two nouns *do not* in fact share a root despite overlap in form.

Conservatively, let us say if a pair overlaps in form but does not overlap in meaning, then it does not share a root. While this is quite coarse and should be refined, it is sufficient to allow us to accept in good faith that the pairs in (11)–(14) share a root, and reject obvious cases of homophony (e.g. examples (15) and (16)).

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|------|-----------------------------------|------|----------------------------------|
| (15) | a. <i>sel</i> (MASC)
‘salt’ | (16) | a. <i>foie</i> (MASC)
‘liver’ |
| | b. <i>selle</i> (FEM)
‘saddle’ | | b. <i>fois</i> (FEM)
‘faith’ |

¹To my knowledge, only Ferrari (2005) attempts to directly account for the behavior of these nouns. I do not discuss the details of this account here, but the major claim of the paper is all of these alternations constitute compositionally between $\sqrt{\quad}$ and n : what differs is the denotation that n contributes.

In the literature, the basis of rejecting the claim that the pairs in (11)–(14) share a root is that these pairs are not compositionally related to one another, as is the case with pairs like those in (1) and (2). This criterion is significantly more restrictive than the present claim that it is enough for pairs to share *some* meaning, even if the overlap is abstract and difficult to express under our current understanding of how meaning is derived, which relies fundamentally on function application. However, it is not evident why a more restrictive criterion should be adopted, beyond that (i) it allows us to exclude the pairs in (11)–(14) from our consideration, as they do not map easily onto current theories of grammatical gender; and (ii) our current theory of meaning deals with compositionality more intuitively than non-compositionality. Neither of these reasons are empirically sufficient to conclude that pairs such as those in (11)–(14) do not share a root: both make arguments based in the deficiency of the theories at hand. Therefore I stick to the most general criterion possible, which recognizes that not all changes in meaning are necessarily compositional. The goal then is to provide a way to advance the theory of feature interpretation.

In large part, the remainder of the paper is devoted to showing how gender can contribute either compositionally or non-compositionally to the interpretation of structure. I derive this solely from the architecture of interpretation itself, rather than through differences in the representation of features as input to the interpretive mechanism. The result is a system that naturally limits the specification of gender based on the availability of an interpretation for a given gender-root combination.

Before continuing with this account, I first consider a number of possible confounds for the claim that gender uniquely alters meaning in certain pairs that overlap in form. This includes diminutive/augmentative meanings, mass/count alternations, and adjective NPs. At first blush, examples in each of these categories seem to fall in line with those in (11)–(14), however I ultimately conclude that more than gender is alternating in these structures. The examples show that there is not always a simple mapping between alternations in gender and meaning, essentially refining the criteria for identifying pairs such as those in (11)–(14).

2.2.1 Diminutive/augmentative

In French, there are certain alternations in nouns that tend to be associated with diminution. There is not one particular gender associated with the diminutive—it can occur with either the masculine or feminine—however there are particular morphemes that are implicated. For the purposes of this paper, I focus on *-on* (masculine) and *-ette* (feminine), exemplified in (17) and (18), however these morphemes are not always associated with diminutive meanings, nor are they the only morphemes used to form diminutives.

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|------|----|---|------|----|--|
| (17) | a. | <i>carafon</i> (MASC)
'small carafe' | (18) | a. | <i>pendule</i> (MASC)
'clock' |
| | b. | <i>carafe</i> (FEM)
'carafe' | | b. | <i>pendulette</i> (FEM)
'small clock' |

In these cases, the alternation in meaning is compositional. Following Kramer (2015), who uses converging evidence from gender alternations associated with diminution in Amharic, German, and Serbian-Croatian (among many others), I assume this is the result of an additional [DIMIN] feature rather than gender itself. For the purposes of this paper, the precise

location and denotation of this feature in French is not important. What is important is the fact that its presence is a confound for the claim that an alternation in gender uniquely conditions the alternations in denotation of these pairs.

The examples above are relatively straightforward cases—it is easy to observe the effect of diminution. However it is also possible for the influence of [DIMIN] to be more subtle, as in (19) and (20).

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|------|-------------------------------------|------|---------------------------------------|
| (19) | a. <i>cordon</i> (MASC)
‘string’ | (20) | a. <i>brochet</i> (MASC)
‘pike’ |
| | b. <i>corde</i> (FEM)
‘rope’ | | b. <i>brochette</i> (FEM)
‘skewer’ |

Furthermore, there is not necessarily a change in gender to signal diminution. This is evidenced in (21) and (22).

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|------|-------------------------------------|------|--|
| (21) | a. <i>chat</i> (MASC)
‘cat’ | (22) | a. <i>affiche</i> (FEM)
‘poster’ |
| | b. <i>chaton</i> (MASC)
‘kitten’ | | b. <i>affichette</i> (FEM)
‘small poster’ |

Regardless of whether it can be concluded with certainty that these forms contain a diminutive feature, in the interest of isolating the influence of gender itself, I set aside pairs that plausibly contain this confound. If further research instead suggests that these do in fact alternate only in gender, they may still be integrated under the present account without adaptation.

2.2.2 Singulative

A second confound for gender uniquely influencing changes interpretation in French are cases where an alternation in gender is coupled with a shift from a mass noun to a noun denoting a unit of measure: the singulative. Mathieu (2012) uses evidence from a number of languages, including Breton, Syrian Arabic, and Ojibwe, to show that this process is associated with a shift in gender and encoded on the division head (Div^o) proposed by Borer (2005). A similar situation is found in French, where the feminine has a mass reading (23b, 24b) and the masculine has a measure reading (23a, 24a).²

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|------|--|------|--|
| (23) | a. <i>croûton</i> (MASC)
‘piece of bread’ | (24) | a. <i>glacçon</i> (MASC)
‘ice cube’ |
| | b. <i>croûte</i> (FEM)
‘bread’ | | b. <i>glace</i> (FEM)
‘ice’ |

²However these examples differ in at least one important way from those of Mathieu (2012): the shift from mass to singulative goes from feminine to masculine rather than masculine to feminine, as is observed in all of the languages in his sample (except in Ojibwe, which shifts from inanimate to animate). This may be a function of cross-linguistic variation, or it may be indicative of a deeper difference. I do not explore the issue further here.

Again, I do not provide a detailed analysis of this process in French, as it is beyond the scope of the paper. What is important is that these instances do not indicate that gender on the nominalizing head is licensing the singulative. Rather other parts of the structure, likely Div° , are responsible for this alternation. I therefore set aside examples of this type in the exploration for cases where arbitrary gender alone influences the interpretation of nouns.

2.2.3 Adjective NPs

A final confounding construction that must be taken into consideration is an adjective NP, where the NP is null or elided. At first blush, the data in (25) appear to be an alternation of the type in (11)–(14): the difference between the interpretation of the two nouns, which completely overlap in form, appears to be due to gender, as this is the only visible alternation.

- (25) a. *diesel* (MASC)
 ‘diesel fuel’
 b. *diesel* (FEM)
 ‘diesel car’

However a broader look at the landscape in French shows that this is a more productive process. Both the nouns in (26) are derived from adjectives meaning ‘familial’ and ‘sporty’, respectively, but mean ‘family car’ and ‘sports car’.

- (26) a. *familiale* (FEM)
 ‘family car’
 b. *sportive* (FEM)
 ‘sports car’

An analysis that unifies all of these forms is given in (27), where the noun meaning ‘car’, *voiture*, is systematically elided:

- (27) a. une (voiture) diesel
 ‘diesel car’
 b. une (voiture) familiale
 ‘family car’
 c. une (voiture) sportive
 ‘sports car’

Again, for the present analysis, I set aside pairs that may fit this description, as the difference in interpretation cannot be attributed to the apparent alternation in the gender of the noun.

2.3 Summary

In this section, I showed that alternations in gender can either be associated with a compositional (e.g. (1)–(4)) or non-compositional (e.g. (11)–(14)) change in meaning. The main empirical gain is on the non-compositional side, where I argued there are cases where gender alone conditions differences in interpretation. I distinguished these from cases where the alternation is confounded by the diminutive, singulative, or and adjective NPs. In the next

section I begin building an account of all the data discussed, starting with the adoption of a feature structure for gender in French.

3 The structure and representation of gender features

3.1 Existing accounts

Recent analyses of gender (e.g. Kramer 2014, 2015, also Panagiotidis 2017 in this volume) have used the interpretable-uninterpretable distinction to code the difference between gender that directly contributes a denotation (e.g. (1)–(4)), and gender that is not associated with a denotation (e.g. (9)–(10)). Following the work and terminology of Corbett (1991), this distinction is classified as NATURAL versus ARBITRARY gender. The resulting feature structure is the following is given in (28).

- (28) *Kramer (2009, 2014, 2015) feature structure*
- a. Arbitrary masculine: [$u : -\text{FEM}$]
 - b. Arbitrary feminine: [$u : +\text{FEM}$]
 - c. Natural masculine: [$i : -\text{FEM}$]
 - d. Natural feminine: [$i : +\text{FEM}$]

Central to this feature structure is the definition of interpretability. Within this literature, and indeed more generally in generative linguistics, a commonly adopted definition is in terms of a feature’s behavior at LF. This definition is given in (29).³

- (29) *Definition of Interpretability (from Kramer 2015)*
‘A feature is interpretable iff its presence/absence changes the interpretation of a linguistic structure, i.e., if it is legible at LF.’

Not often noted is an inherent ambiguity in the definition in (29). For any given [iF], where [iF] is an interpretable feature, [iF] may either be (i) directly interpreted—that is, given a denotation that may compose with other elements of the structure; or (ii) [iF] may create an environment by providing the context for the interpretation of another element, or as part of the wholesale interpretation of a (sub-)structure (more on this distinction in §4.3). Both of these pathways meet the requirement that a feature affect the interpretation of a structure, albeit in different ways, and therefore require the feature to be visible at LF.

The role of uninterpretable features is more straightforward. For any given [uF], [uF] has no influence on the interpretation of structure.

In general, the focus of research on the interpretability of ϕ -features has been on contrasting cases of direct interpretation of the type in (1)–(4) with apparent cases of uninterpretable, where uninterpretable is assumed to be indicated by a lack of compositional changes in meaning and alternations in gender. Despite the fact that current definitions of interpretability predict that interpretable features should also create environments for interpretation that lead to non-compositional changes in meaning, this possibility has not been

³For the time being, I set aside the issue of whether uninterpretable features are considered *toxic*, in the sense of Chomsky (2000, *et seq*; cf. Preminger 2014). I return to it in the conclusion. The key issue here can be asked independently: are features that do not directly contribute a denotation visible or invisible to LF?

explored. In large part, this is due to the previously discussed rejection of the idea that pairs like those in (11)–(14) share an identical syntactic description save an alternation in gender. Contra existing theories in the literature (described below), and on the basis of the data already seen (e.g. (11)–(14)), I argue that the behavior of features can be accounted for only if all features are interpretable, given the two different behaviors interpretable features are predicted to display at LF. In short, in the sections to follow I argue that there is no such thing as a feature that is entirely uninterpretable: all features are interpreted. Whether they are interpreted directly, or in combination with other heads, is a matter of how the interpretive mechanism interacts with the structure.

As noted above, Kramer (2015) argues on the basis of data from Amharic (and a number of other unrelated languages) that uninterpretable features are solely responsible for making the split between arbitrary and natural gender. Her account provides a foil to the present analysis. Given the data she sets out to account for (i.e. not data of the type in (11)–(14), which as previously discussed are assumed to have different roots despite shared meaning and form), her analysis essentially succeeds: Arbitrary gender is uninterpretable and therefore invisible to LF, hence it does not contribute a denotation or license alternations. The account predicts that all nouns with arbitrary gender will only be specified for one gender, as in (9) and (10). Natural gender, on the other hand, is interpretable, contributes a denotation that composes with that of the root, and licenses alternations in gender specification that correspond to alternations in meaning. Applying this system to French, interpretable gender features are recognized as having, at a first pass, the denotations below:

- (30) *Denotations of (natural) gender in French (first pass)*
- a. $\llbracket [i:-FEM] \rrbracket = \lambda x. x$ is male or underspecified
 - b. $\llbracket [i:+FEM] \rrbracket = \lambda x. x$ is female

However, given the view of gender alternations argued for in the current paper, Kramer’s system makes the incorrect prediction that only natural gender can influence interpretation, as only natural gender is interpretable, and therefore visible, to LF. In the case of French, the prediction is that all alternations in gender must correspond to the denotations in (30). That is, an alternation in gender should always correspond to an alternation in the biological sex of the referent. However, if this were true, then data of the type in (11)–(14) should be unattested: the alternation in arbitrary gender is predicted to be invisible to LF, as arbitrary gender is encoded as an uninterpretable feature. A theory that encodes the distinction between natural and arbitrary gender using interpretability is therefore insufficient to cover the empirical range of interpretations associated with gender observed in French.

French gender does however show both of the predicted behaviors of an interpretable feature, given the definition in (29): natural gender is directly interpreted with approximately the denotations in (30), again as evidenced in the examples in (1)–(4), and arbitrary gender provides a context for interpretation without being directly interpreted, again as evidenced in the examples in (11)–(14). A crucial point that I explore in §4.3 is that there is complementarity between these situations: there is no attested case in which gender contextually influences interpretation *and* is directly interpreted, although this is a logical possibility predicted by certain theories of the interpretive mechanism (i.e. one in which *contextual allosemy* is available). For example, *lion* (MASC) could not mean ‘male lion’ where *lionne*

(FEM) means something like ‘female African lion’ given only a change in gender between the two structures. The interpretative mechanism I propose accounts for this complementarity.

In the next section I introduce a representation of gender that encodes a two-way distinction between masculine and feminine, where both are visible to LF. I argue against presuppositional accounts of gender on lexical nouns, which are standard in the literature on pronominal interpretation. I then continue in §4 by showing that the natural/arbitrary distinction, now framed in terms of whether gender directly contributes a denotation or provides the context for interpretation, cannot be encoded representationally, but must be derived via its interaction with the interpretive mechanism.

3.2 A feature geometry for gender

Structured representations of morphosyntactic features in the shape of a geometry have been widely adopted following the work of Harley & Ritter (2002). The structure consists of privative features, where implicational relations, and inter- and intra-language markedness, are encoded via structural dependencies and node counting metrics.

At present there are two desiderata for the an account of French gender. First, to maintain a distinction between masculine and feminine to be available at both the semantic and phonological interfaces: this allows the proper morphophonological forms and denotations to be expounded. Second, to maintain a distinction between features that are directly interpreted and compositional, and those that non-compositionally create the context for interpretation. I argue that the first objective must be accomplished via the representation of features, whereas the second must be accomplished via the interaction of the feature structure with the interpretative mechanism.

Part of the motivation for this split is that the masculine/feminine distinction must be visible to every component of the grammar: in syntax for agreement, at PF for morphophonological exponence, and at LF for interpretation. Given that the distinction is available and relevant across the entire grammatical system, it is reasonable to posit that it is part of the representation rather than independently emergent from the mechanisms within each component. On the other hand, the arbitrary/natural distinction is only relevant to LF. We might therefore suspect that the distinction is derived from mechanisms specific to the interpretive module of the grammar, rather than say it is present across the entire system, but only used by one component. The geometry in (31) proves sufficient to accomplish these goals.

(31) *Feature geometry for gender (French)*



This is instantiated in the following way to represent each of the genders:

(32) *Masculine*
GENDER

(33) *Feminine*
GENDER
|
[FEM]

Masculine is the underspecified gender node, capturing the fact that masculine is the default and unmarked gender, and feminine is encoded by a gender node with a single dependent feature, [FEM], making it more marked. Both of these structures are fully visible at LF (and PF): they do not alternate between interpretable and uninterpretable forms. For ease, I refer to the masculine gender as shown in (32) as [MASC] and the feminine gender as shown in (33) as [FEM] for the remainder of the paper rather than writing the full structures, while keeping in mind there is no masculine feature.

At this point, the reader may wonder if this account is extendable to languages with multipartite gender systems. This is particularly poignant given that it is likely that gender is syntactically encoded in a variety of different ways: the classification of nouns is not always tied directly to nominalization as it is in Romance and related languages. While we may therefore question the universality of the claim that gender is on n , and whether a feature geometry is constructible for systems such as Bantu, the principles behind the account should be applicable. Recent work on Shona (Bantu) support this intuition: it is possible to map intricate sub-regularities in how alternations in gender relate to changes in meaning (Déchaine et al 2014; Déchaine 2018 in this volume). Furthermore, work in the present volume by Fassi Fehri (2018) on Arabic and Quinn (2018) on Algonquian shows the broader range of semantic systematicity present in what might otherwise be considered arbitrary gender paradigms. Spelling out how the present account relates to this work is an important path for future research.

4 Pathways to interpretation

Given that gender must be interpretable, or visible, at LF, the question of how it is interpreted becomes central. In this section, I show that the natural/arbitrary distinction, and the complementarity between gender receiving a compositional interpretation and providing the context for the idiosyncratic interpretation of a structure can be derived by the mechanism of interpretation operating at LF. I argue in favor of the semantic content of gender on lexical nouns as part of the asserted content, and against a presuppositional account. The analysis provides a way to account for the fact that masculine generally encodes both a denotation of maleness and the kind reading in cases of alternations associated with biological sex, and provides a natural way to encode restrictions on gender specification, as required by the existence of roots that are only specified for a single gender (e.g. (7) and (8)).

4.1 The denotation of gender

Recall that, when gender is directly interpreted as in (1)–(2), masculine denotes kinds, males of a kind, or an entity with indeterminate sex, whereas feminine denotes only females of a kind. Put another way, feminine denotes females of a kind when that information is known or relevant, and masculine is used elsewhere. Following a similar though distinct claim from

Percus (2011; reviewed in detail in §4.2), I argue that masculine gender has no denotation (34a), whereas feminine denotes females (34b). In any given utterance where a root such as $\sqrt{\text{lion}}$ is paired with masculine gender, whether the speaker means to convey that the referent is ‘male’ is dependent on the relevant context: if the referent is male, then it would be infelicitous to use the feminine, as this would cause a conflict between world knowledge and the denotation. However the masculine gender does not conflict with this knowledge, and thus is employed in this situation.

(34) *Denotations of gender in French (final)*

- a. $\llbracket [\text{MASC}] \rrbracket = \emptyset$
- b. $\llbracket [\text{FEM}] \rrbracket = \lambda x. x \text{ is female}$

The claim that masculine gender has no denotation and feminine does is consistent with the representation given in the previous section, where there is only a feminine gender feature and masculine represented by an underspecified node. On the assumption that there is no masculine gender feature in the first place, it follows that masculine gender does not have a denotation (and vice versa): there cannot be a denotation for something that does not exist.

The present account therefore maintains that the content of gender is part of the assertion. This contrasts with the vast literature on pronominal interpretation (e.g. Cooper 1983, Heim 2008, Sauerland 2008, Sudo 2012), and with the account given for lexical nouns by Percus (2011) and Sudo & Spathas (2015). I turn now to a general argument against importing presuppositional accounts of gender into the lexical domain.

4.2 Presuppositional accounts of gender

Without going into the precise details of any one account, the major intuition behind all presuppositional accounts of gender in the pronominal domain is that it is dependent on the presupposed content, and that it is cancellable. Take, for example, the context and utterance in (35), where either a masculine or feminine pronoun can be used to refer back to the antecedent.

(35) *Pronominal gender in French*

- a. Context: Jean is at the zoo and is looking at a monkey. He reads the small placard describing the animal, and sees that it is a female monkey. Noticing how healthy the monkey looks, he says:
 - (i) Le singe est grand. Il est fort aussi.
‘the monkey (MASC) is tall. It (MASC) is strong too.
 - (ii) Le singe est grand. Elle est forte aussi.
‘the monkey (MASC) is tall. It (FEM) is strong too.

Gender on the pronoun can either match the grammatical gender, in this case masculine, or the presupposed gender, in this case feminine. This can occur even if the two do not align, as in the example above.

As already alluded to in §2.1, this is not the case with lexical nouns that can only be specified for a single gender. Given the same context above, only the grammatical gender may

be used: it is not possible to change lexical gender given the would-be relevant presupposition. This is given in (36).

- (36) *Lexical gender in French epicene nouns*
- a. Le singe est grand, et fort aussi.
 - b. #La singe est grande, et forte aussi

To bring into focus why this is inconsistent with a presuppositional account, imagine the following counterfactual situation. In a world, let's call it W_2 , there are certain referent sets that are entirely female⁴: \llbracket secretaries \rrbracket , \llbracket stewardesses \rrbracket , and \llbracket nurses \rrbracket . There are no members of these sets such that, in this counterfactual world W_2 , those members are male. Now imagine that people in W_2 speak a slightly modified version of English, English₂. In English₂, when referring to a member of \llbracket secretaries \rrbracket or \llbracket stewardesses \rrbracket , the pronoun she_2 is used. This pronoun, as in English, carries the presupposition that the referent is female. This is unsurprising given that these sets only denote females in W_2 . However, imagine that in English₂ when referring to a member of \llbracket nurses \rrbracket , the grammar requires us to use he_2 , which, as is the case with *he* in many dialects of English, he_2 carries a presupposition that the referent is male. Therefore, in this very particular case, we must suppress the presupposition of the pronoun, or argue that there are two otherwise identical versions of he_2 : one which has a presupposition of biological sex, and one which does not.

I believe this counterfactual situation never holds with gender on pronouns: if there is a presupposition of gender, it is always at least *possible*, if not obligatory via Maximize Presupposition, to use the gender consistent with the presuppositional content. This was shown in (35) to be the case in French. However, this is exactly what occurs with lexical gender: even in cases where the referent is certainly female or certainly male, the grammar can be restricted to using a gender whose meaning is inconsistent with this presupposition. Therefore, barring an account which accepts that presuppositions can be suspended on a case-by-case-basis, an alternate account must be sought to explain how gender is interpreted in the lexical domain: I propose such an alternative in the next section.

A final question that remains is whether it is generally desirable to claim that gender on pronouns follows a different set of principles than those on lexical nouns. A first thought might suggest unification should be preferred. However, I think the evidence straightforwardly suggests that pronominal and lexical gender are different on a number of levels, given the existence of languages like English, which show that the presence of gender on pronouns does not entail the presence of lexical gender. Therefore independent of the interpretive facts given above, pronominal and lexical gender have independent distributions, and constitute at least partially distinct facets of the grammar.

4.3 The interpretive mechanism

In this section, under the assumption that gender features in French are located on the nominalizing head n (Kihm 2005; Kramer 2009, 2014, 2015), I outline two possible mechanisms for the interpretation for the minimal structure of a nominalized root: $\{ n \{ n \checkmark \} \}$. The first, contextual alloosemy (i.e. an analogous LF process to PF's contextual allomorphy; see Wood

⁴Note the argument works the same with entirely male referent sets.

& Marantz (2015)), requires a more complex interpretative mechanism and proves to over-predict the possible typology of interpretations: a head is predicted to license allosemy *and* contribute compositionally to the denotation, a violation of the complementarity observed in French. The second mechanism—one in which either heads or phrases may be given a denotation—provides a way around these issues.

Consider the structure below, where α and β are heads, and γ is the projection of α :

$$(37) \quad \begin{array}{c} \gamma \\ \swarrow \searrow \\ \alpha \quad \beta \end{array}$$

Each head may be directly interpreted, denote a function, and compose with its sister via Predicate Modification (henceforth PM; Heim & Kratzer 1998). This is shown in (38).

$$(38) \quad \begin{array}{l} \textit{Non-conditioned interpretation of heads composed with PM} \\ \llbracket \beta \rrbracket = \lambda x. G(x) \\ \llbracket \alpha \rrbracket = \lambda x. F(x) \\ \llbracket \gamma \rrbracket = \lambda x. F(x) \wedge G(x) \end{array}$$

The head can also be imagined to provide an environment in which other elements are interpreted, as is the case with contextual allosemy (shown in (39)). However, in order to capture the complementarity between compositional interpretations and special interpretations, α would have to be interpreted as denoting $F_{\text{identity}}(\)$ in these cases, rather than interpreted on its own as it was in (38):

$$(39) \quad \begin{array}{l} \textit{Contextual allosemy and identity composed with PM} \\ \llbracket \beta \rrbracket / \alpha = \lambda x. H(x) \\ \llbracket \alpha \rrbracket = \lambda x. F_{\text{identity}}(x) \\ \llbracket \gamma \rrbracket = \lambda x. F_{\text{identity}}(x) \wedge H(x) \end{array}$$

In such a system, there is no way beyond stipulation to rule-out the interpretation of α as $F(\)$, a non-identity function, in cases where α is conditioning a special interpretation of β . That is, there is no way to prevent the co-occurrence of the licensing of a special interpretation with that of a compositional interpretation—a situation that is unattested. This is shown in (40).

$$(40) \quad \begin{array}{l} \textit{Contextual allosemy and non-identity composed with PM (unattested)} \\ \llbracket \beta \rrbracket / \alpha = \lambda x. H(x) \\ \llbracket \alpha \rrbracket = \lambda x. F(x) \\ \llbracket \gamma \rrbracket = \lambda x. F(x) \wedge H(x) \end{array}$$

There are two major concerns that stem from an account that uses contextual allosemy to condition special interpretations. First, there is no clear way to restrict the system such that a head that provides the context for a special interpretation is not itself interpreted in a way that it compositionally composes. That is, it must be stipulated that those elements that provide a context end up being denoted by the identity function to block the interpretation of γ that resulted in (40). Second, even given this stipulation, we must allow for a head (in

this case, α), to optionally denote either $F(\)$, as in (38), or $F_{\text{identity}}(\)$, as in (39). This conditioning could not be as simple as saying that β is interpreted as denoting the identity function in the context of α . It must be that β denotes the identity function in the context of an α that it conditioned a special interpretation of. It is not clear that this sort of complexity is warranted.

Alternatively, it may be that special interpretations arise via the comprehensive interpretation of sub-structures, as schematized in (41). This occurs under the same assumptions as the interpretation of a head. The main assertion here being that the domain of the interpretation function is over both heads and projections of heads, while the range continues to be a denotation of the familiar type.

(41) *Comprehensive interpretation of a structure*

$$\left[\left[\begin{array}{c} \gamma \\ \wedge \\ \alpha \quad \beta \end{array} \right] \right] = \lambda x. H(x)$$

In this case, no head within the treelet is itself contributing to the denotation—both α and β are subsumed within the phrase being interpreted, and therefore do not compose with each other in the way described in (38). Crucial for the present comparison is that (39) and (41) result in essentially the same denotation for the entire structure γ . However while the contextual allosemy path falls prey to the issues outlined above, the comprehensive path does not. In the comprehensive path, the denotations of α and β themselves are constant—no situation arises where there is optionality in the insertion of a denotation. The optionality lies in whether a structure is interpreted at the level of the heads or a phrase, a process which I show is restricted by the content of lexical knowledge. The comprehensive path therefore does not over-generate meanings as was the case with contextual allosemy. In the next section I return to French, showing the addition of comprehensive interpretation allows for the production of all and only the data described in §2.

Before turning to the implementation of these pathways in French, it is pertinent to mention that the present finding suggests that LF is operating under different principles than PF, particularly with respect to the contextual influence of one primitive (i.e. feature/head at LF, phoneme/morpheme at PF) on another. At least in the present case, it seems interpretation cannot operate under ‘contextual allosemy’, i.e. an analogous operation at LF to what underlies contextual allomorphy at PF. Rather, it must be encoded as the comprehensive interpretation of sub-structures, as schematized in (41). This line of reasoning is not without precedence (see, e.g. Carlson 1983), and fits the description given to the interpretation of other elements, for example idioms, which can be analyzed as otherwise compositionally interpretable sub-structures that receive a non-compositional meaning in derivations where the structure as a whole is interpreted. I set aside further development of how idiomatic interpretations arise, simply noting that it is a possible extension of the theory. Furthermore, I leave it open as to whether other domains within LF still require contextual allosemy (e.g. as has been argued for the interpretation of verbal arguments; see Wood & Marantz (2015)), though the present claim is taken as evidence against the allosemy of *roots*. As in the analysis proposed by Wood & Marantz, the system of comprehensive interpretation continues to preserve the autonomy of syntax (i.e. syntax need not worry about

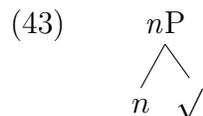
the denotation that α and β receive at LF), but has the benefit of leaving our understanding of the machinery of interpretation largely unchanged.

4.4 Implementation in French

Recall the proposed denotation of gender in French:

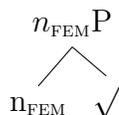
- (42) *Denotations of gender in French*
- a. $\llbracket [\text{MASC}] \rrbracket = \emptyset$
 - b. $\llbracket [\text{FEM}] \rrbracket = \lambda x. x \text{ is female}$

As mentioned in §2, I adopt the following structure of a nominal expression:⁵

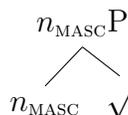


The nominalizing head houses the gender feature. I represent a nominalizing head with feminine gender as n_{FEM} (44), and masculine gender as n_{MASC} (45). In both cases, the full denotation of the nominalizing head must be whatever is required to input a root and output a nominal (perhaps encoded in a feature such as $[\text{NML}]$), plus the content of the gender feature. Therefore neither of the denotations of the nominalizing heads are completely null, even though in the case of masculine gender there is no contribution to the denotation from gender. I do not consider the semantics of nominalization further here, beyond assuming its existence and that it creates something of the correct type to allow composition with the rest of the nominal projection. Therefore I adopt the convention of referring to the denotation of n_{MASC} as \emptyset , without implying that n it has no denotation. The \emptyset refers to the fact that there is no contribution of *gender* to the denotation.

(44) *nP with feminine gender*



(45) *nP with masculine gender*



For the denotation of \checkmark , the critical innovation of the present account is that some roots have a listed denotation, whereas others do not. Whether or not any given root has a denotation is idiosyncratic, unpredictable, and frequently subject to change. Whether a root does or does not have a denotation is not necessarily derivative of some general principle: it is information that must be listed, and is subject to complex synchronic and diachronic factors. In (46), I give the denotations of the roots for the NP pairs examined in §2.

(46) *Examples of denotations for \checkmark in French*

- a. $\llbracket \checkmark\text{lion} \rrbracket = \lambda x. \text{lion}(x)$
- b. $\llbracket \checkmark\text{goat} \rrbracket = \#$

⁵While I assume Bare Phrase Structure (Chomsky 1995), I adopt the convention of representing projections of a head as XP without the implications associated with X-Bar Theory.

- c. $\llbracket \sqrt{\text{monkey}} \rrbracket = \#$
- d. $\llbracket \sqrt{\text{turkey}} \rrbracket = \#$
- e. $\llbracket \sqrt{\text{basin}} \rrbracket = \#$
- f. $\llbracket \sqrt{\text{table}} \rrbracket = \#$

When the root has a denotation, the structures are interpreted as follows:

(47) *lionne* (from (1))

- a.
$$\begin{array}{c} n_{\text{FEM}}\text{P} \\ \swarrow \quad \searrow \\ n_{\text{FEM}} \quad \sqrt{\text{lion}} \end{array}$$
- b. $\llbracket \sqrt{\text{lion}} \rrbracket = \lambda x. \text{lion}(x)$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \text{lion}(x)$

(48) *lion* (from (1))

- a.
$$\begin{array}{c} n_{\text{MASC}}\text{P} \\ \swarrow \quad \searrow \\ n_{\text{MASC}} \quad \sqrt{\text{lion}} \end{array}$$
- b. $\llbracket \sqrt{\text{lion}} \rrbracket = \lambda x. \text{lion}(x)$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \lambda x. \text{lion}(x)$

In these cases, the root composes with the denotation of gender via PM. This results in meaning described in (1): when feminine, the denotation is restricted to female lions only; when masculine, the denotation is either restricted to male lions or can be used for lions in general, depending on the presuppositions at play.

When the root does not have a denotation, PM fails, as shown in (49) and (50). As the denotation of one of the nodes is undefined, it follows from the definition of conjunction that the combination of the two nodes is undefined.

(49) *chèvre* (from (5))

- a.
$$\begin{array}{c} n_{\text{FEM}}\text{P} \\ \swarrow \quad \searrow \\ n_{\text{FEM}} \quad \sqrt{\text{goat}} \end{array}$$
- b. $\llbracket \sqrt{\text{goat}} \rrbracket = \#$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \# = \#$

(50) *chèvre* (from (5))

- a.
$$\begin{array}{c} n_{\text{MASC}}\text{P} \\ \swarrow \quad \searrow \\ n_{\text{MASC}} \quad \sqrt{\text{goat}} \end{array}$$

- b. $\llbracket \sqrt{\text{goat}} \rrbracket = \#$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \emptyset \wedge \# = \#$

However, in each of the cases above the sub-structure as a whole has a denotation. The interpretative mechanism comprehensively interprets the $n\text{P}$ along with its daughters, which includes the gender feature and the root, as shown in (51).

(51) *chèvre (from (5))*

- a. $\llbracket \{ n_{\text{FEM}}\text{P}, \{ n_{\text{FEM}}, \sqrt{\text{goat}} \} \} \rrbracket = \lambda x. \text{goat}(x)$
b. $\llbracket \{ n_{\text{MASC}}\text{P}, \{ n_{\text{MASC}}, \sqrt{\text{goat}} \} \} \rrbracket = \lambda x. \text{goat.cheese}(x)$

Continuing in this way, we can derive all of the data described in §2. First, as shown above, the case where a root that is associated with animate beings alternates in gender, but that alternation does not correspond to an interpretation of biological sex (51).

Second, the special case where the feminine counterpart denotes kinds and females, and the masculine denotes only males is derived in (52). The root $\sqrt{\text{turkey}}$ has no denotation and therefore results in $\#$ when the heads are interpreted and conjoined via PM (52a-b), whereas an $n\text{P}$ that contains that root is interpreted as shown (52c-d).

(52) *dinde/dindon (from (4))*

- a. $\llbracket \sqrt{\text{turkey}} \rrbracket = \#$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \# = \#$
b. $\llbracket \sqrt{\text{turkey}} \rrbracket = \#$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \emptyset \wedge \# = \#$
c. $\llbracket \{ n_{\text{FEM}}\text{P}, \{ n_{\text{FEM}}, \sqrt{\text{turkey}} \} \} \rrbracket = \lambda x. \text{turkey}(x)$
d. $\llbracket \{ n_{\text{MASC}}\text{P}, \{ n_{\text{MASC}}, \sqrt{\text{turkey}} \} \} \rrbracket = \lambda x. \text{male.turkey}(x)$

Third, the case where a root associated with an animate being shows no alternation in gender and one of the two genders is used to denote all members of the kind is captured in (53). Again, as $\sqrt{\text{monkey}}$ has no denotation, the conjunction of the denotations of the heads is undefined (53a-b). At the $n\text{P}$ level, $n_{\text{FEM}}\text{P}$ has no denotation (53c), and $n_{\text{MASC}}\text{P}$ has the denotation given in (53d).

(53) *singe (from (7))*

- a. $\llbracket \sqrt{\text{monkey}} \rrbracket = \#$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \# = \#$
b. $\llbracket \sqrt{\text{monkey}} \rrbracket = \#$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \emptyset \wedge \# = \#$
c. $\llbracket \{ n_{\text{FEM}}\text{P}, \{ n_{\text{FEM}}, \sqrt{\text{monkey}} \} \} \rrbracket = \#$
d. $\llbracket \{ n_{\text{MASC}}\text{P}, \{ n_{\text{MASC}}, \sqrt{\text{monkey}} \} \} \rrbracket = \lambda x. \text{monkey}(x)$

Fourth, the case of fully inanimate roots that alternate in gender and correspond to a change in denotation is given in (54). As before the root has no denotation, thus interpretation and PM at the head level fails (54a-b). On the other hand, interpretation at the phrase level succeeds for both genders (54c-d).

- (54) *bassine/bassin (from (11))*
- a. $\llbracket \sqrt{\text{basin}} \rrbracket = \#$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \# = \#$
 - b. $\llbracket \sqrt{\text{basin}} \rrbracket = \#$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \emptyset \wedge \# = \#$
 - c. $\llbracket \{ n_{\text{FEM}}\text{P}, \{ n_{\text{FEM}}, \sqrt{\text{basin}} \} \} \rrbracket = \lambda x. \text{washing.basin}(x)$
 - d. $\llbracket \{ n_{\text{MASC}}\text{P}, \{ n_{\text{MASC}}, \sqrt{\text{basin}} \} \} \rrbracket = \lambda x. \text{basin}(x)$

Finally inanimate roots that do not alternate in gender are derived in (55). As in (54) the root has no denotation and interpretation at the head level fails (55a-b), however only one of the genders at the phrase level licenses a denotation (55c-d).

- (55) *table (from (9))*
- a. $\llbracket \sqrt{\text{table}} \rrbracket = \#$
 $\llbracket n_{\text{FEM}} \rrbracket = \lambda x. \text{female}(x)$
 $\llbracket n_{\text{FEM}}\text{P} \rrbracket = \lambda x. \text{female}(x) \wedge \# = \#$
 - b. $\llbracket \sqrt{\text{table}} \rrbracket = \#$
 $\llbracket n_{\text{MASC}} \rrbracket = \emptyset$
 $\llbracket n_{\text{MASC}}\text{P} \rrbracket = \emptyset \wedge \# = \#$
 - c. $\llbracket \{ n_{\text{FEM}}\text{P}, \{ n_{\text{FEM}}, \sqrt{\text{table}} \} \} \rrbracket = \lambda x. \text{table}(x)$
 - d. $\llbracket \{ n_{\text{MASC}}\text{P}, \{ n_{\text{MASC}}, \sqrt{\text{table}} \} \} \rrbracket = \#$

On this account there are two places in the description of the grammar where denotations are idiosyncratic and, at least in terms of linguistic theory, unpredictable: with roots and with sub-structures. Neither any given root nor any given sub-structure necessarily has a denotation. On the other hand, if the specific features that comprise a particular head are held constant, a functional head, such as n , will have the same denotation across all possible derivations. This means that for any given feature, the feature is always interpretable and always attempts to contribute a denotation. However, in some cases, the denotation of the head does not surface as it fails to compose with the denotation of its sister. In this case the structure is not entirely illicit: it can be interpreted at the phrase-level, and if a denotation is available, then there is still a possible semantic derivation. The consequence is an account that captures both the stability and systematicity observed in the interpretation of grammatical gender, while still allowing for the idiosyncrasy also characteristic of grammatical gender systems.

Before continuing to the puzzle of specification, I consider one remaining piece left out of the analysis so far: what is the relation between the denotations of sub-structures that

have been argued to share a root, given that it is not the exponence of the root itself that ties the denotations together?

4.5 Associating meanings of sub-structures

The main claim that fuels the given analysis is that pairs of nouns that are morphophonologically related, alternate in gender, and alternate non-compositionally in meaning share a root. In these cases, it was argued that the root itself contributes nothing that can be distilled or composed. In fact, the root has no denotation at all—it is only the root and its immediately dominating phrase that can receive an interpretation as a unit. Crucially, however, these masculine and feminine counterparts interpreted at the nP level are still related in meaning abstractly. In particular, pairs like that in (11)-(14) were argued to be distinct from homophones, as in (15) and (16), in that homophones do not share a root and therefore lack any relatedness in meaning, but do share a phonological signature.

What then is the relation between the meanings of these pairs if it is not directly descendent of the root but still dependent on it? This question is closely related to the long-standing discomfort with identifying the nature of roots more generally. This has led many (including the present account) to define roots by purely formal means as indices individuated syntactically, but free of conceptual and phonological content until the interfaces (Acquaviva 2009; Harley 2014). Putting everything together—in particular the principle of compositionality that governs the semantic functions, and the option for a root to either possess or lack a denotation—an explanation to how these meanings are related arises: pairs of nouns that share a root where the root itself does not contribute a decomposable denotation (i.e., in this case, has no denotation) are related via the structure of the encyclopedic knowledge of denotations rather than via the principles of formal semantics.

Essentially, the claim is that these meanings can be tied together by our faculty for storing and retrieving conceptual knowledge, and is therefore out of the bounds of linguistic theory, insofar as semantics deals with the principles of *compositionality* between meanings rather than *conceptual relatedness* between meanings. While I leave the full structure of this knowledge to be explored in future work, at a first pass, the meanings are plausibly bound together by the fact that the two structures that license each of denotations involve the same root and essentially the same structural description (i.e. $\{ n_{\text{GENDER}}P, \{ n_{\text{GENDER}}, \checkmark \} \}$). In fact, the counterparts differ in the most minimal way possible: one is specified for [FEM], and the other is underspecified for gender. Given a standard model of feature-based activation commonly adopted for memory systems like the storage of conceptual knowledge (e.g. Lewis & Vasishth 2005), both of the pairs are strongly co-activated when the other is selected. This co-activation may provide a path for explaining their conceptual relatedness: the pair is as tightly linked as possible in the web of meanings that constitute our encyclopedic knowledge, which translates to a non-compositional relatedness in meaning.

Given this model for the interpretative component and its corollary system of conceptual knowledge, I turn to the major consequence of the analysis: a solution to the puzzle of specification.

5 Limiting gender

As already alluded to, the analysis provides a pathway for restricting the specification of gender at no extra cost to the derivational technology responsible for interpretation. In this section, I review Kramer’s (2015) proposal for restricting the specification of gender, showing that phonological licensing conditions are not suitable for limiting gender. I then expand the analysis of interpretation from the previous section to show that it naturally derives the fact that not all roots are specified for every gender, as observed in data of the form in (7)–(10).

Under the assumption that syntax, operating autonomously without semantic and phonological input, creates all possible pairings of gender and root, it falls to the interfaces to restrict specification. In this way, no gender-root pairing is ungrammatical in the narrow sense—the syntax is neutral as to which gender is specified, as long as some gender is specified. Both restrictions at PF and LF have been proposed in the literature (e.g. Kramer 2015). On Kramer’s analysis, in cases where natural gender obtains, either interpretable gender can be merged with the root allowing the denotations to compose. In cases where arbitrary gender obtains, a single uninterpretable gender must be consistently merged with a given root. This creates a system that requires selection or licensing between a root and a sub-set of four possible genders to ensure licit forms are produced.

In this system, semantic licensing conditions, which restrict gender-root pairings via conditions on exponence of the root given a particular context, can only be used to restrict interpretable gender, as uninterpretable gender is not visible in the semantic component. Therefore phonological licensing conditions are used to restrict the exponence of forms associated with and n specified for uninterpretable gender and the root. The system thus requires gender specification to be limited by two different means: on the basis of limits on the semantics or failure to expone phonological forms. In contrast, the system I propose derives this apparent licensing solely through the mechanism of interpretation, eliminating the redundancy and theoretical baggage of licensing at both or either of the interfaces. This is only possible in a system where all gender is interpretable.

Under the system argued for here, the restriction of specification occurs in the following way. If there is a denotation for the root as in (45) and (46), then a compositional interpretation can arise, and any specification provided by the syntax is licit. This accounts for the compositional alternations in biological sex. When there is no denotation for the root, despite the lack of compositional interpretation, there is still a possible derivation in which the interpretive mechanism assigns a denotation to the smallest available sub-structure. If there is no denotation for the sub-structure, as in (51c), this results in that particular derivation being interpreted as $\#$ —the specification of gender in this case is illicit. If there is an available denotation, as in (51d), then that denotation is retrieved and the gender specification is considered licit. For most nouns, only one of these sub-structures has a denotation, leading only masculine or feminine gender to license the retrieval of the proper interpretation. Though in other cases, for example (52c-d), both genders are related to a denotation, and specification alternates. The system, which is entirely dependent on the availability of an interpretation for a given root or sub-structure, eliminates the need for syntactic selection between gender and the root, and eliminates phonological licensing conditions, or independent semantic licensing conditions, each of which have been argued in the past to selectively apply to a subset of the lexicon depending on the interpretability of the gender feature.

The move away from phonological licensing conditions of the type proposed by Kramer (2015) is further supported by the incorrect prediction that there should be cases where the phonological component fails to Spell-Out novel patterns of specification. In fact, phonological exponence does not seem to fail. In other words, a new gender-root pairing can be uttered and understood even if a meaning is not immediately assigned by the speaker or hearer. For example, speakers of French tend to accept novel specification patterns of the type in (56), when offered an interpretation.

- (56) *la singe* (FEM)
Offered interpretation: ‘female monkey’

This flexibility is conducive with coining new expressions from existing elements of the morphophonology. The acceptability of novel pairings is most strongly dependent on adding new interpretations—morphophonological forms are largely static and freely combined. This can be seen most acutely in the diachronic changes that have occurred in French. As innovation proceeds, new gender-root pairings receive interpretations with relative ease and freedom. For example, *journaliste* ‘journalist,’ which was only specified for masculine 50 years ago regardless of the sex of the referent, now includes a feminine form used for female journalists.⁶ This change occurred due to social pressures to add female-inclusive terms to occupations in French.

In an important sense, the explanation of how the specification of gender is restricted in the current system is rather shallow: it is directly a function of the idiosyncratic part of the system where roots and structures either do or do not have a listed denotation. Despite this, the account is not simply stipulative: it captures the intuition that there is a randomness associated with the fact that in French the word for table is feminine, the word for desk masculine, and so on. Though attempts have been made in the past to tie masculine and feminine gender to more abstract concepts of male and female biological sex (e.g. Ember & Ember 1979), the gender of inanimate objects and the epicene nouns, at least in French, is not an indication of something deep about the syntax or semantics of the language, and therefore does not require a deep explanation.⁷ The main innovation of the account is to simplify the restriction of specification by focusing on how semantic interpretation proceeds.

6 Conclusion

To conclude, I would like to consider the question framed in the opening paragraph: is the interpretable-uninterpretable distinction necessary for the representation of linguistic knowledge? This question moves beyond the puzzle of how to limit the specification of features, and into the domain of how these features are represented.

As mentioned in the introduction, uninterpretable features have had two roles since their inception following Chomsky (2000, 2001): (i) as enforcers of AGREE in the derivational time

⁶Based on a search of Google Ngram’s French corpus (<https://books.google.com/ngrams>)

⁷Note this argument does not preclude important phonological correlates, which have long been known to be used in the acquisition process when gender is assigned (Tucker et al. 1977). Here, the important split to keep in mind is that of *assignment*, the process by which gender is correlated with a novel noun/root, and *specification*, the process by which the correct gender is retrieved by a speaker who has already acquired an adult lexicon.

bomb model of syntactic operations, and (ii) as a way to encode which features contribute to the denotation of a structure, and which features do not. Recent work by Preminger (2014) provides evidence against the first function of uninterpretable features. In essence, he argues that when an uninterpretable feature fails to be checked by AGREE, the derivation does not crash—instead that feature receives a default valuation. The representationally driven derivational time bombs model is therefore supplanted by the operationally driven *obligatory operations model*, in which the syntactic component is satisfied with an attempt to value features given a particular configuration, even if this attempt is unsuccessful. This renders the first function of the distinction between interpretable and uninterpretable features obsolete.

The present paper provides evidence against the second proposed function of uninterpretable features: the main claim being that there is not a contrast between features that are visible versus invisible to LF. Even if a feature does not leave a compositional mark on the interpretation of structure, it must maintain the ability to influence the way sub-structures are interpreted. I argued that whether or not a feature contributes compositionally or non-compositionally to an interpretation is not a function of the representation of that feature, but rather how that feature interacts with the interpretative mechanism. The representation of a given feature is stable across all derivations, but can be expressed in different ways depending on how it interacts with the structure that surrounds it. If it can be composed directly with its sister, then a compositional interpretation arises. If this fails, it may be subsumed within the interpretation of a piece of structure, in which its expression is non-compositional, yet related to other similar configurations by the structure of encyclopedic knowledge.

Given that neither of the stated functions of uninterpretability are derived by distinguishing between interpretable and uninterpretable features, it follows that the interpretable-uninterpretable distinction should be expunged from the theoretical arsenal of generative grammar. While it may still be possible that there are features that do not have any associated meaning (e.g. as is likely true of Case features), the point is that a given feature does not consist of an interpretable and an uninterpretable counterpart. In general, this move is one in which functions previously attributed to the representation of our linguistic knowledge are instead construed a consequence in how operations are defined. In Preminger’s account, the weight was put on AGREE to be obligatorily executed. Here, the operation considered was the interpretive mechanism, which inserts denotations into the syntactic representation. The core of the operation as has been inherited was not changed: the major innovation was explicitly allowing either heads or sub-structures to receive a denotation. While it remains to be seen whether or not this argument extends to all features across all languages, the present paper serves as evidence that it is a hypothesis worth pursuing.

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