A set-based semantics for person, obviation, and animacy

Christopher Hammerly

Department of Linguistics

University of British Columbia

2613 West Mall

Vancouver BC, V6T 1Z4 Canada

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ABSTRACT

This paper provides a general analysis of the semantics of person, broadly construed, through a case study of Ojibwe (Central Algonquian). Ojibwe shows person-like distinctions based on whether an entity is living or non-living (i.e. animacy), and, within living things, whether a being is prominent or backgrounded in the discourse (i.e. obviation). The central principle of the account is contrast: The activation and interpretation of a feature is driven by the requirement that it makes a cut to derive the proper categories within a given inventory. With this principle, I show that a small set of bivalent features denoting first-oder predicates can capture Ojibwe as well as a wider typology of person, animacy, obviation, and noun classification distinctions.[*]

Keywords: obviation, animacy, person, Algonquian, Ojibwe, ɸ-features

1. INTRODUCTION. Human languages share the function of allowing us to make reference to basic concepts that form the foundation of our social, environmental, and linguistic knowledge. This includes the AUTHOR of an utterance (i.e. the FIRST PERSON), the ADDRESSEE receiving an utterance (i.e. the SECOND PERSON), and various OTHER things and beings that are not taking direct part in the conversation or discourse (i.e. the THIRD PERSON). While these conceptual building blocks are shared across languages, we also see variation on a number of dimensions. First, languages differ in what further concepts within the so-called 'others' are formally distinguishable. To name a small sample, many languages encode a cut between ANIMATE beings and INANIMATE things, others between HUMAN and ANIMAL beings, and still others between socially or discourse PROMINENT humans versus those in the BACKGROUND. Second, languages with access to the same building blocks can differ in how they can be lumped together when making reference to groups. For example, many languages (e.g. Ojibwe) show a contrast between two different types of FIRST PERSON PLURAL pronouns: the EXCLUSIVE, which must include reference to the author but necessarily excludes the addressee, and the INCLUSIVE, which necessarily includes reference to both the author and addressee. However, other languages (e.g. English) have only a single GENERIC FIRST that is ambiguous as to whether the addressee is included or excluded.

The goal of this paper is to advance a unified framework to understand the rich variation in our ability to reference to various persons and things by defining (i) our possible representational building blocks, (ii) the grammars that combine those basic elements into structures, and (iii) the principles of semantic composition that interpret the structured representation. To build and refine this theory, the main line of inquiry is to understand how PERSON, ANIMACY, and OBVIATION distinctions are made within Ojibwe, a Central Algonquian language spoken in the land area extending mostly north from the Great Lakes of North America. Put succinctly, PERSON contrasts the two types of CONVERSATIONAL PARTICIPANTS (the 'author' and 'addressee') as well as the NON-PARTICIPANTS (the 'others'), ANIMACY contrasts living beings ('animate') versus non-living things ('inanimate'), and OBVIATION contrasts the single most discourse prominent animate third person (the 'proximate' person) from all other animate third persons (the 'obviative' persons).

How do these contrasts appear in Ojibwe? That is, how are the conceptual PRIMITIVES such as the author, addressee, and various others lumped into CATEGORIES, and how are they expressed morphophonologically? At first blush, as schematized in 1 with strong plural pronouns, Ojibwe makes distinctions between EXCLUSIVE (which references the author + others), INCLUSIVE (which references the author + addressee + others), SECOND (which references the addressee + others), and THIRD (which references the others alone). In the parlance of Harbour (2016), Ojibwe shows a QUADRIPARTITION—a four-way split in person categories.

(1)   *Core person categories in Ojibwe as evidenced by strong pronouns*

niinawind		EXCLUSIVE		author + others
giinawind	=	INCLUSIVE	=	author + addressee + others
giinawaa		SECOND (PL)		addressee + others
wiinawaa		THIRD (PL)		others

However, the strong pronouns alone do not reveal the full set of possible distinctions. The THIRD person category can be further divided through animacy-based noun classification and obviation. As noted above, animacy divides the others into categories containing living beings (ANIMATE) versus non-living things (INANIMATE), while obviation distinguishes the single most discourse prominent animate third person (PROXIMATE) from all others (OBVIATIVE) (Bloomfield 1962). With animate nouns, encoding an obviation status is obligatory—animate nouns cannot lack obviation. The default status is proximate, which appears, for example, when there is just one animate noun in the discourse (intuitively, being the only animate noun necessarily makes it the most prominent).

Evidence for these cuts abounds in the patterns of agreement and marking on regular nominals. Consider the patterns of plural marking in 2, where obviation is contrasted between the animate noun *ikwe* in 2a and 2b, with the inanimate noun *ziibi* in 2c showing a third type of marker (all in bold).

(2)   a. ikwew-**ag**   b. ikwew-**a'**   c. ziibiw-**an**
          woman-**PROX.PL**   woman-**OBV.PL**   river-**INAN.PL**
          'women (PROX)'   'women (OBV)'   'rivers (INAN)'

Similarly, the patterns of agreement with intransitive verbs show a three-way distinction between proximate, obviative, and inanimate, as shown in 3. While the argument in each case is the null pronoun *pro*, the distinctions are apparent from the PERIPHERAL AGREEMENT slot (in bold).

(3)   a. misko -zi   **-wag**   *pro*
          red   -BE.ANIM **-PROX.PL** PRO.PROX.PL
          'They (PROX) are red'

      b. misko -zi   **-wa'**   *pro*
          red   -BE.ANIM **-OBV.PL** PRO.OBV.PL
          'They (OBV) are red'

      c. miskw -aa   **-wan**   *pro*
          red   -BE.INAN **-INAN.PL** PRO.INAN.PL
          'They (INAN) are red'

Putting all the pieces together, the resulting set of distinctions that emerges is schematized in 4, where the generic THIRD person category is now replaced by PROXIMATE (which can reference

proximate + animate + inanimate others), OBVIATIVE (which can reference animate + inanimate others), and INANIMATE (which references inanimate others alone).[1] Extending the terminology of Harbour (2016), we can refer to this six-way distinction as a HEXAPARTITION.

(4)   *Animacy, obviation and person categories form a hexapartition in Ojibwe*

EXCLUSIVE	author + all others
INCLUSIVE	author + addressee + all others
SECOND	addressee + all others
PROXIMATE	proximate + animate + inanimate others
OBVIATIVE	animate + inanimate others
INANIMATE	inanimate others

What I show over the course of the paper is that the set of categories in 4 provides an exhaustive PARTITION of the PERSON SPACE. In less technical words, the distinctions present in Ojibwe allow for reference to be made to any logically possible combination of the author, addressee, proximate other, animate others, or inanimate others across six different groupings. The question is then how these groupings are achieved. The view taken in this paper is that all of these basic concepts are PRIMITIVES of a mental ONTOLOGY that is manipulated and accessed by morphosyntactic FEATURES. These features compose to give rise to nominal CATEGORIES that allow reference to different combinations of the primitives. Previous accounts in this vein (e.g. Harbour 2016, Ackema & Neeleman 2018, Cowper & Hall 2019) have focused on only the CORE PERSON categories. By expanding the empirical and typological domain to the distinctions made by animacy and obviation in Ojibwe, the current paper uniquely supports a particular view of the representation and composition of morphosyntactic features for person in general. The central principle advocated for is CONTRASTIVE INTERPRETATIONS (e.g. Dresher 2009), which has been applied to a variety of other linguistic domains including the derivation of phonological inventories (Dresher 2009), tense and modality (Cowper & Hall 2017), and the core persons (Cowper & Hall 2019). Features are taken to denote first-order predicates that compose with a basic conjunctive semantics, and are activated and interpreted depending on whether they serve to make a useful cut of the person space to derive the relevant categories.

Besides understanding how these principles can be used to account for contrasts in Ojibwe, the account also provides a way of understanding the parameters of variation across languages—needless to say, not all languages are like Ojibwe in making a six-way cut. For example, languages might distinguish ANIMATE and INANIMATE, but not PROXIMATE and OBVIATIVE, or languages might distinguish INCLUSIVE and EXCLUSIVE, but not ANIMATE and INANIMATE. But, this variation is not entirely free. The general puzzle at hand, which can ultimately be traced back to Zwicky (1977), is known as the PARTITION PROBLEM (Harbour

2016). Zwicky observed that languages with a three-way distinction between person categories (e.g. English) treat 'you and us' (the INCLUSIVE) as a form of 'us' (i.e. a type of FIRST) rather than a form of 'you' (i.e. a type of SECOND). These two partitions are schematized in 5, where the lack of a line between two cross-linguistically possible categories indicates that there is instead a single category that encompasses either meaning.

(5)   *Example of attested (left) and unattested (right) partitions (as first observed by Zwicky)*

| EXCL |
| INCL | ⎫ GENERIC FIRST (PL)
| SECOND |
| THIRD |

| EXCL |
| INCL | ⎫ GENERIC SECOND (PL)
| SECOND |
| THIRD |

In other words, there are languages with a GENERIC FIRST, which always references the author plus others, but is ambiguous as to whether or not the addressee is included. On the other hand, there is no language with a GENERIC SECOND, which would reference the addressee plus others, but would be ambiguous as to whether the author is included.

Such lumping goes beyond mere surface-level morphophonological SYNCRETISM—two categories that are otherwise distinguished in a language sharing a common form in some corner of a paradigm. It is instead a CONFLATION of categories, in which a language erases a distinction that other languages may permit (e.g. McGinnis 2005). Careful studies of possible partitions (e.g. Harley & Ritter 2002, Cysouw 2003, Bobaljik 2008, Harbour 2016) have revealed that there are far fewer patterns of conflation than we might reasonably imagine: only five of the fifteen logical possibilities are attested. These patterns will be explored in due course.

The first part of the paper (§2) introduces the formulation of the partition problem first proposed by Harbour (2016) and extends it to understand obviation and animacy in Ojibwe. In §3 I present the theory of contrastive interpretations (Dresher 2009, Cowper & Hall 2019) to model how morphosyntactic features are interpreted and combined to give rise to different categories, then apply the system in §4 to capture person, animacy, obviation, and number in Ojibwe. Next, in §5 I explore a typological prediction of the account, showing the the language isolate Ktunaxa provides positive evidence. I then turn to evaluating alternative accounts including Harbour's proposal and the feature geometry in §6. In §7 I consider extensions of the proposed system to noun classification in Zapotec, Romance, and Bantu before concluding in §8.

2. THE EXTENDED PARTITION PROBLEM.

2.1. SUPERPOSITION. The initial goal is to motivate the underlying distinctions related to person, obviation, and noun classification. Gaining a meaningfully abstracted perspective on patterns

of conflation, and distinguishing them from mere syncretism, is a challenging empirical task. The basic form of the challenge is that our primary data—paradigms of agreement, pronouns, dietetic elements, and so on—are obscured by accidental homophony, as well as systematic morphophonological processes. The solution to this challenge has long been to compare across paradigms of pronouns and agreement within a language, rather than relying on the categories revealed by a single paradigm. The question being: what is the full set of possible distinctions a language makes? While by no means the first study to undertake such a program (see, e.g. Cysouw 2003), this has recently been productively formalized through the SUPERPOSITION method of Harbour (2016).

THE BASICS OF SUPERPOSITION. By way of introduction, I begin with what superposition reveals about the core person categories related to the author, addressee, and generic others. The basic form of the method is shown in 6, where each of the boxes on the left side of the 'equation' are two of the agreement slots found with transitive matrix verbs in Ojibwe (specifically, forms from the independent order VTA paradigm). For expositional purposes, just the plural variants of each category are shown (EXCL(USIVE), INCL(USIVE), SECOND plural, and (proximate) THIRD plural). The first paradigm from the left is for the person prefix, and the second is for the central agreement marker. The right side of the equals sign shows the result of superposition, which derives the underlying partition. The two paradigms are slightly offset from one another to preserve the visibility of the original cuts, and are shaded to more clearly reveal the correspondences between the left and right sides.

(6)   *Superposition with Ojibwe person prefix (left) and central agreement (right) with plural persons in the independent order verb transitive animate (VTA) paradigm*

Prefix		*Central*		*Underlying Partition*	
ni-		-aanaa			EXCLUSIVE
gi-	+		=		INCLUSIVE
		-waa			SECOND (PL)
o-					THIRD (PL)

Observe that neither of the slots alone realizes distinctions between all four categories. In other words, there are syncretisms. The person prefix shows a syncretism between INCLUSIVE and SECOND; the central agreement slot shows two syncretisms: between INCLUSIVE and EXCLUSIVE, and SECOND and THIRD. If we were to consider the person prefix alone, we might conclude that Ojibwe exemplifies an exception to Zwicky's observation that INCLUSIVE and SECOND are never conflated when a three-way distinction is being made. The method shows this would be misguided: when the two paradigms are superimposed, a four-way split emerges, and we can surmise that the

pattern in the person prefix is a morphophonological artifact, and not directly indicative of the underlying partition of persons.

What is meant by partition? Couched in current terminology, a partition is the pattern of conflation between the possible person categories. In the coming sections, a formal definition will emerge as the lattice-based representation is introduced. Continuing to ignore the distinctions introduced by obviation, number, and noun classification, Ojibwe shows a QUADRIPARTITION: a four-way distinction between EXCL, INCL, SECOND, and THIRD. English, on the other hand, shows a three-way distinction between a generic FIRST (which conflates EXCL and INCL), SECOND, and THIRD, known as the STANDARD TRIPARTITION. This is schematized in 7.

(7)   *Standard triparition in English nominative pronouns*

we	EXCL ⎫
	INCL ⎭ GENERIC FIRST (PL)
y'all	SECOND (PL)
they	THIRD (PL)

An empirical question emerges: What are the possible patterns of conflation that can arise?

THE ORIGINAL FIVE PARTITIONS. We can now begin to formulate the partition problem for the core persons, a generalized form of the question that arises from Zwicky's classic observation: Why are only some of the logically possible patterns of conflation attested in natural language? In an extended exposition with a large sample of languages, Harbour shows that only 5 of the 15 possible partitions are attested (see Chapters 2 and 3 of Harbour 2016). So far, we have discussed only two of the five possibilities—the quadripartition, where all four possible person categories are distinguished, and the standard tripartition, where the INCLUSIVE and EXCLUSIVE are conflated into a GENERIC FIRST PERSON, while both SECOND and THIRD are distinguished. The full set is given in 8, where horizontal lines indicate where partitions of the person space are being made, and a lack of horizontal line indicates those two possible elements are conflated into a single category. From left to right, these are referred to as the monopartition, participant bibartition, author bipartition, and the already familiar tripartition and quadripartition.

(8)   *Abstract representation of attested person partitions (without obviation and animacy). For further details and examples, see Chapters 2 and 3 of Harbour (2016)*

EXCL		EXCL		EXCL		EXCL		EXCL
INCL		INCL		INCL		INCL		INCL
SECOND		SECOND		SECOND		SECOND		SECOND
THIRD		THIRD		THIRD		THIRD		THIRD

There is a maximum of four PARTITION ELEMENTS, corresponding to the categories EXCLUSIVE, INCLUSIVE, SECOND, and THIRD. With the exception of the quadripartition, where all four elements are distinguished, each partition in 8 represents a different pattern of conflation. Considering those not-yet-discussed, in the monopartition (far left), there is a single partition where all four possible elements are conflated in a single GENERIC PERSON category. In the participant bipartition (second from the left), there is a two-way cut between the PARTICIPANT versus THIRD categories, resulting in the conflation of EXCLUSIVE, INCLUSIVE, and SECOND. In the author bipartition (middle), there is a two-way cut between elements containing AUTHOR versus NON-AUTHOR, where, respectively, EXCLUSIVE/INCLUSIVE and SECOND/THIRD are conflated.

The partition problem can thus be framed as a question of why certain partitions are attested, while others are unattested. In the next section, I complicate the picture further by considering partitions produced by obviation and animacy, setting the stage for the main contribution of the present paper.

THE HEXAPARTITION OF OJIBWE. We can use the superposition method to motivate the existence of the hexapartition of Ojibwe introduced in the introduction, which includes distinctions based in both obviation and animacy. This time, I have chosen to use the paradigm of intransitive matrix verbs with plural arguments (referred to as the independent order VAI or VII paradigm in the Algonquianist literature). In the left side of the equation, the leftmost paradigm gives the forms for the person prefix, the center paradigm the forms for the central agreement slot, and the rightmost paradigm the peripheral agreement slot. The figure on the right side of the equation is the superposition of these three cuts, again offset slightly and coded with shading.

(9)   *Superposition with Ojibwe person prefix (left), central agreement (center), and peripheral agreement (right) with plural arguments in the verb animate intransitive (VAI) and inanimate intransitive (VII) paradigms*

Prefix		Central		Peripheral		Underlying Partition	
ni-		*-imin*		*-∅*			EXCL
gi-	+		+		=		INCL
		-im					SECOND (PL)
∅-		*-w*		*-ag*			PROX (PL)
				-a'			OBV (PL)
				-an			INAN (PL)

The primary goal is to capture this additional partition, while not losing the ability to derive the original partitions. This amounts to treating the generic THIRD person partition element as a conflation between the PROXIMATE, OBVIATIVE, and INANIMATE partition elements. The system

thus must be able to generate a maximum of six partition elements given the addition of Ojibwe.

At this point, it is necessary to address a potential complication for the proposed relationship between animacy and obviation. The starting point is to consider the patterns of agreement in embedded clauses in 10. When the embedded subject is obviative, as in 10a where the matrix subject is proximate, an obviative agreement marker *-ni-* is obligatory. When the embedded subject is proximate, as in 10b where the matrix subject is now local, this agreement is ungrammatical.[2]

(10)   a.   o-waabam-aa-n *pro*   inini-wan ozhitoo*(-ni)-d jiimaan
              3-see-DIR-3′   PROX man-OBV build-3′-3   canoe.INAN
              'S/he (PROX) sees the man (OBV) building a canoe'

        b.   ni-waabam-aa *pro*   inini   ozhitoo(*-ni)-d jiimaan
              1-see-DIR   FIRST.SG man.PROX build-3′-3   canoe.INAN
              'I see the man (PROX) building a canoe'   [NJ 08.30.19]

While Ojibwe does not show overt obviative morphology on inanimate nouns, obviative agreement appears with inanimate nouns under similar conditions to what was seen in 10. Obviative agreement is obligatory in the context of another animate third person 11a, while it is ungrammatical when there is no animate third person present 11b.

(11)   a.   o-waabandaan ikwe   jiimaan   gaa-michaa*(-ni)-g
              3-see.VTI   woman.PROX canoe.INAN REL-big-3′-0
              'The woman sees a canoe that is big'

        b.   ni-waabandaan jiimaan   gaa-michaa(*-ni)-g
              1-see.VTI   canoe.INAN REL-big-3′-0
              'I see a canoe that is big'   [NJ 08.30.19]

There is, however, still a fundamental asymmetry between animate and inanimate nouns in how they relate to obviation. An animate noun can clearly alternate between proximate and obviative in the context of another animate noun. This is shown with the Ojibwe example in 12, with the classic direct-inverse alternation characteristic of all Algonquian languages, where either animate noun can be associated with the proximate and obviative categories.

(12)   a.   o-gii-waabam-aa-n ikwe-wan   gwiiwizens
              3-PAST-see-3-OBV woman-OBV boy
              'The boy (PROX) saw the woman (OBV)'

        b.   o-gii-waabam-igoo-n gwiiwizens-an ikwe
              3-PAST-see-INV-OBV boy-OBV   woman
              'The boy (OBV) saw the woman (PROX)'   (Hammerly 2021b)

In contrast, inanimate nouns either show a lack of proximate/obviative status, or show evidence of

being (covertly) obviative. This is perhaps most directly evidenced by the fact that in languages with overt proximate marking such as Blackfoot (Plains Algonquian), proximate-marked inanimate nouns are ungrammatical (Bliss 2005a, 2013, Ritter 2014). The sentence in 13a provides a baseline where the animate noun is marked proximate and the inanimate noun obviative marked. Such a sentence is grammatical. In contrast, 13b shows that the reverse relationship—marking the inanimate noun proximate and the animate noun as obviative—is ungrammatical.

(13)   a.   An-a   imitáá-wa ná-ówatoo-m-a   an-i   í'ksisako-yi
                  DEM-PROX dog-PROX PAST-eat-DIR-PROX DEM-OBV meat-OBV
                  'The dog (PROX) ate the meat (OBV)'

         b.   *An-a   í'ksisako-wa ot-ówatoo-ok-a   an-i   imitáá-yi
                  DEM-PROX meat-PROX   OBV-eat-INV-PROX DEM-OBV dog-OBV
                  Intended: 'The meat (PROX) was eaten by the dog (OBV)'   (Bliss 2005a: 14)

A similar situation arises in Ojibwe, though since inanimate nouns are not themselves marked for obviation the contrast is less stark. In short, when animate and inanimate nouns are co-arguments of a verb, the inanimate noun cannot trigger obviative marking on the animate noun 14b—an unmarked (by all indications, proximate) animate noun is grammatical 14a.

(14)   a.   o-gii-biinitoon onaagan   ikwe
                  3-PAST-clean   plate.INAN woman.PROX
                  'The woman (PROX) cleaned the plate'

         b.   *o-gii-biinitoon onaagan   ikwe-wan
                  3-PAST-clean   plate.INAN woman-OBV
                  Intended: 'The woman (OBV) cleaned the plate'   [NJ 08.18.19]

We can therefore maintain a fundamental asymmetry between ANIMATE and INANIMATE nouns in how they relate to obviation, though the system is active in both cases to some degree. ANIMATE nouns show clear alternations between PROXIMATE and OBVIATIVE, which is triggered (in some sense) by the presence of another THIRD PERSON ANIMATE noun. INANIMATE nouns show alternations between being unmarked for obviation and showing evidence of being OBVIATIVE, but do not ever seem to be PROXIMATE per se. Given this, I continue to treat the core contrast made by obviation as a property of ANIMATE nouns, setting aside inanimate obviation for future work.[3]

Finally, it is important to address what occurs in contexts where there is MIXED REFERENCE to animate and inanimate things—for example, in a sentence like *I saw both the cat and the pie on the table*, where *cat* is animate and *pie* is inanimate. A priori, there are three possibilities: (i) such constructions are grammatically ineffable, (ii) inanimate forms of agreement and pronouns are used in mixed reference, or (iii) animate forms (either proximate or obviative) of agreement

and pronouns are used in mixed reference. The evidence suggests that it is the final of these three options that holds for Ojibwe. Consider first the sentence in 15, where the proximate plural demonstrative *ingiw* (in bold) refers back to all of the preceding nouns, which include both proximate animate nouns (*binesiwag* 'birds', *giigoonyag* 'fish', *mitigoog* 'trees'), and, crucially, an inanimate noun (*zaaga'igan* 'lake'). Similarly, the object agreement marker (also in bold) on the verb *gana-waabam* 'look after', which takes the multiply conjoined DPs as its object, appears in the proximate plural form.

(15)   ...weweni ji-gana-waabam-ang-**waa**   ongow   awesiiny-ag, miinawaa
        carefully in.order.to-care-look-INCL-**3PL** DEM.PROX.PL animal-PL,   and
        ingiw   binesiw-ag, miinawaa giigoony-ag, miinawaa zaaga'igan, mitigoo-g,
        DEM.PROX.PL bird-PL   and   fish-PL,   and   lake,   tree-PL
        akina sa   **ingiw**.
        all   EMPH **DEM.PROX.PL**
        '...so that we can carefully look after these animals (PROX), and these birds (PROX), and
        the fish (PROX), and the lake (INAN), the trees (PROX), all of **these things** (PROX).'(Treuer
        2001: 110–111)

This example shows that, when there is mixed reference to proximate and inanimate things, that the proximate form is used both in pronouns and agreement.

Now, consider the example in 16, where a mixed set of obviative animate nouns (*dewe'igan* 'drum', *asemaa* 'tobacco') and inanimate nouns (*midewiwin* 'medicine') are conjoined. In this case, the transitive verb *aabaji'* 'use' shows agreement inflection, in bold, associated with a (plural) obviative object being acted on by a proximate.

(16)   Anishinaabe gii-miinind igaye onow   dewe'igan-an miinawaa i'iw
        anishinaabe PAST-given also DEM.OBV drum-OBV   and   DEM.INAN.SG
        midewiwin miinawaa asemaa-n   ji-aabaji'-**aad**
        medicine   and   tobacco-OBV in.order.to-use-**3>3′**
        'The Anishinaabe were also given the Drum (OBV) and the medicine dance (INAN) and
        tobacco (OBV) to use.''   (Treuer 2001: 64–65)

In summary, with both mixed groups of proximates + inanimates and obviatives + inanimates, we see agreement inflection and proforms more specifically associated with animate, rather than inanimate, nouns. This finding plays an important role in the formal definitions of the categories related to animacy and obviation presented in §2.4

2.2. ONTOLOGICAL COMMITMENTS. With the categories of person, obviation, and animacy established for Ojibwe, the road to a solution starts with understanding the underlying ontology of person, broadly construed. Following Harbour (2016), we can begin with a model with a

single author, i, a single addressee, u, and multiple others, o, o', o'', etc. While the assumption is not strictly necessary, Harbour provides an extended argument in favor of a minimal, egocentric ontology over alternatives that allow the possibility of multiple speakers and/or hearers (i.e. i', i'', etc; or u', u'', etc). Particularly convincing is that there is no evidence that any language differentiates between a would-be choric *we* denoting a set of authors, and the run-of-the-mill *we* denoting an author plus others. The existence of such a partition would falsify the minimal ontology, but typological surveys have failed to uncover such a case (e.g. Cysouw 2003, Bobaljik 2008).

I propose two extensions to the ontology of the others in the face of animacy-based noun classification and obviation: the addition of the INANIMATE OTHERS and the PROXIMATE OTHER. The inanimate others will be represented by a sequence of r's (i.e. r, r', r'', etc.) and the proximate other by p.[4] In turn, the sequence of o's will be reserved for (non-proximate) animate others.

The existence of an animacy split in the ontology is assumed in Harbour's original account (see pg. 67), but the properties and consequences are not explored. Intuitively, the line that is drawn between animate beings versus inanimate things is far less strict than the one drawn between the author versus addressee and the participants versus non-participants. Some entities such as humans and animals are almost universally treated as animate; others such as plants and supernatural, environmental, and biological forces trend towards animate, but vary from language to language (or culture to culture); yet other languages will include many things with animate-like properties that are biologically non-living, such as cars or dolls, but these are especially in the eye of the beholder. Ojibwe shows these types of anomalies, such as *asin* 'stone', *aagim* 'snowshoe', and *opin* 'potato' being classified as grammatically animate in many dialects. What is relevant here is that a distinction between animate versus inanimate entities is being made, not so much which entities fall on one side of the line or the other.

As with animacy, the current paper will have little to say about what precise properties are endowed upon proximate referents—that is, what exactly it means to be a p versus an o. Previous work has shown that across the Algonquian family obviation may be related to perspective-taking or point-of-view (e.g. Bliss 2005a,b, Hammerly & Göbel 2019), switch-reference (e.g. Muehlbauer 2012), topicality, saliency, or accessibility (e.g. Bloomfield 1962), or the control co-reference relations (e.g. Grafstein 1984). The goal is to define the categories that allow reference to these concepts, but I do not precisely define their meaning.

A further question that can be asked at this point is whether the proximate other p should be minimal like i and u have been argued to be, or form or a sequence like the o's and r's (i.e. p, p', p'', etc.). As is the case for the author and addressee, this choice does not have an impact on the core proposal here, but would change the denotations of the features and ultimately the categories. Because it makes for simpler diagrams, I demonstrate the system with a minimal ontology for p,

noting that the alternative non-minimal ontology should still be taken as a live possibility that is consistent with the core claims made in the current paper.

Consideration of additional noun classification systems in §7 precipitates the adoption of further ontological categories. A key question that comes to the fore, which is already coming into view at this point, is whether a single universal ontology of person should be posited. I believe that the evidence converges against such a view. It seems clear enough that all humans distinguish an author, an addressee, and others, so that these particular primitives may be universal; but beyond this, there is a great deal of variability and innovation. Do we want to attempt to maintain that all possible distinctions that languages could make are ontologically present, but that not all languages activate the features to linguistically encode these contrasts? The existence of esoteric noun class distinctions suggests that the variation stems from differences in the ontology itself, rather than solely with the features that gate access to it.

Finally, it is necessary to acknowledge the possibility that a non-ontological approach could in principle be pursued to account for the featureal specification of obviation and animacy (see, e.g. Adger & Harbour 2007, Rezac 2008). In other words, we could conceptualize the third person ontology as simply a series of o's, with the [Proximate] and [Animate] features simply adding additional properties. The current paper presents a viable ontological solution to the representation of animacy and obviation without directly articulating or ruling out this alternative. Future work should consider whether there are any potential advantages to a non-ontological account, and whether it can be substantially distinguished on an empirical basis from the solution pursued here.

2.3. A LATTICE REPRESENTATION FOR THE CORE PERSONS. We can now come to a more formal definition of partitions by organizing the ontology into lattices. The motivation for the shift is to refer directly to how the ontological space of person is organized, rather than the opaque and imprecise categories of INCLUSIVE, EXCLUSIVE, and so on (though, it is difficult to get away from these labels entirely). We have our ontology of the author i, the addressee u, and all other (animate) persons o, o', o'', and so on (the inanimate r's and the proximate p are momentarily set aside). Partitions are the lumping together of these primitives into different lattices, which are referred to as PARTITION ELEMENTS. These are semantically interpreted and create restrictions on reference familiar to each category.

The EXCLUSIVE is represented with i_o.[5] i_o can be re-written as a set that includes the singleton $\{i\}$, the dyads $\{i, o\}$, $\{i, o'\}$, $\{i, o''\}$, ..., the triads $\{i, o, o'\}$, $\{i, o', o''\}$, $\{i, o, o''\}$, ..., and continuing increases in cardinality from there. Similarly, the SECOND person u_o includes the singleton $\{u\}$, the dyads $\{u, o\}$, $\{u, o'\}$, $\{u, o''\}$, ..., the triads $\{u, o, o'\}$, $\{u, o', o''\}$, $\{u, o, o''\}$, ..., and so on. The INCLUSIVE iu_o differs in that the minimal set is the dyad $\{i, u\}$, but from there it increases in a similar fashion from triads $\{i, u, o\}$, $\{i, u, o'\}$, $\{i, u, o''\}$, ..., on up. The generic
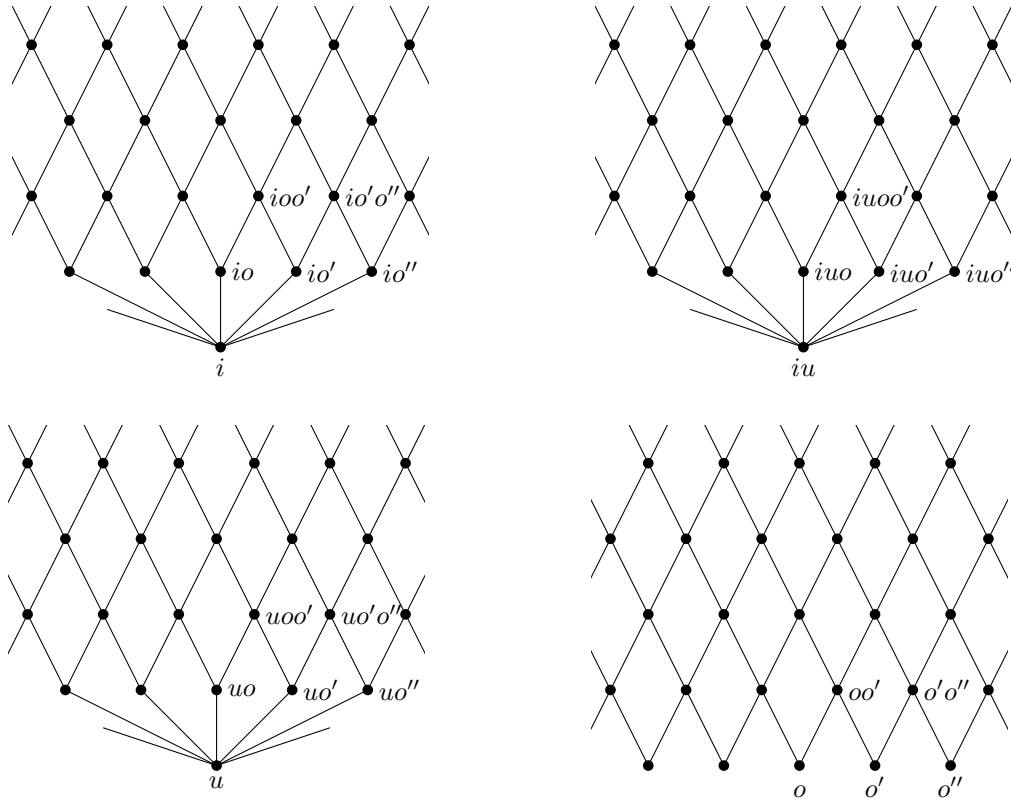
FIGURE 1. Hasse diagrams for EXCLUSIVE (i_o; top left), INCLUSIVE (iu_o; top right), SECOND (u_o; bottom left), and THIRD (o_o; bottom right).

THIRD person o_o does not have a unique minimal element. It starts with the singletons $\{o\}$, $\{o'\}$, $\{o''\}$, ..., then to the dyads $\{o, o'\}$, $\{o, o''\}$, $\{o', o''\}$, ..., again continuing from there.

Harbour (2016) provides a perhaps more intuitive visual representation for the lattices denoted by the four elements discussed above in the form of Hasse diagrams. The diagrams for each of the four persons are re-produced here in Figure 1, and become particularly useful in the discussion of number in §4.4. The rows in the diagram are organized, from bottom to top, in increasing cardinality. The minimal element(s) being on the bottom row, and increasing by one in each ascending row. Each point in the diagram represents an element of the lattice, and the lines that link the points show where subset-superset relationships hold. Because the number of other persons (o, o', o'', etc) is unbounded, full Hasse diagrams are not shown for any of the lattices. Instead, an abbreviated representation is given, where incompleteness is indicated by partially extending lines to the left, right, and upper boundaries. Furthermore, only a sample of nodes are labeled—just enough to allow the pattern of the diagram to emerge.

Note that when put together in a single lattice rather than represented separately, the four partition elements exhaust the possible sets that can be formed from an ontology consisting of i, u, and the o's (in other words, combined, they are the POWER SET of $\{i, u, o, o', o'', \dots, \}$). The
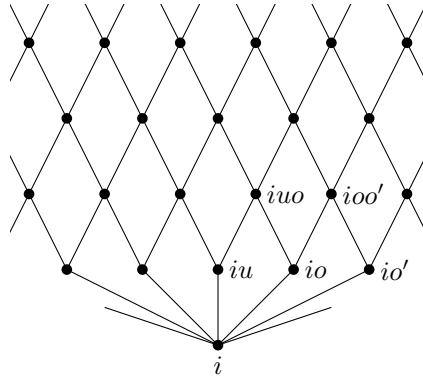
FIGURE 2. Hasse diagram for the generic FIRST ($i_o + iu_o = i_{uo}$).

difference between languages is how this space is carved up. Returning to the figures used in the discussion of superposition, we can replace the category labels with subscript notation, as in 17.

(17)   *Attested person partitions with subscript notation (ignoring obviation/animacy)*

i_o		i_o		i_o		i_o		i_o
iu_o		iu_o		iu_o		iu_o		iu_o
u_o		u_o		u_o		u_o		u_o
o_o		o_o		o_o		o_o		o_o

To take a concrete example of what collapses between the partitions look like, consider the Hasse diagram for the generic FIRST person of the standard tripartition in Figure 2, which combines the EXCLUSIVE and INCLUSIVE lattices from Figure 1.

2.4. LATTICE REPRESENTATIONS FOR OBVIATION AND ANIMACY. The distinctions in obviation and animacy in Ojibwe can be captured within the lattice-based representation with the extended ontology. The core function of animacy and obviation is to divide the numerous other persons (r's, o's, and p). The INANIMATE category allows reference to the r's, the PROXIMATE category necessarily includes reference to the proximate other p but also can include the o's and r's, while OBVIATIVE necessarily excludes reference to p while necessarily referencing the o's and possibly referencing the r's.

In terms of the subscript notation, p_{or} is the desired partition for PROXIMATE, o_{or} is the desired partition for OBVIATIVE, and r_r the desired partition for INANIMATE. The PROXIMATE partition element p_{or} abbreviates the singleton $\{p\}$, the dyads $\{p, o\}$, $\{p, o'\}$, $\{p, o''\}$, ..., $\{p, r\}$, $\{p, r'\}$, $\{p, r''\}$, ..., the triads $\{p, o, o'\}$, $\{p, o, o''\}$, $\{p, o', o''\}$, ..., $\{p, r, r'\}$, $\{p, r, r''\}$, $\{p, r', r''\}$, ..., $\{p, o, r\}$, ..., and so on. The key is that every set includes the proximate p. The OBVIATIVE partition element o_o is similar to the generic THIRD person in the previous section, but can include
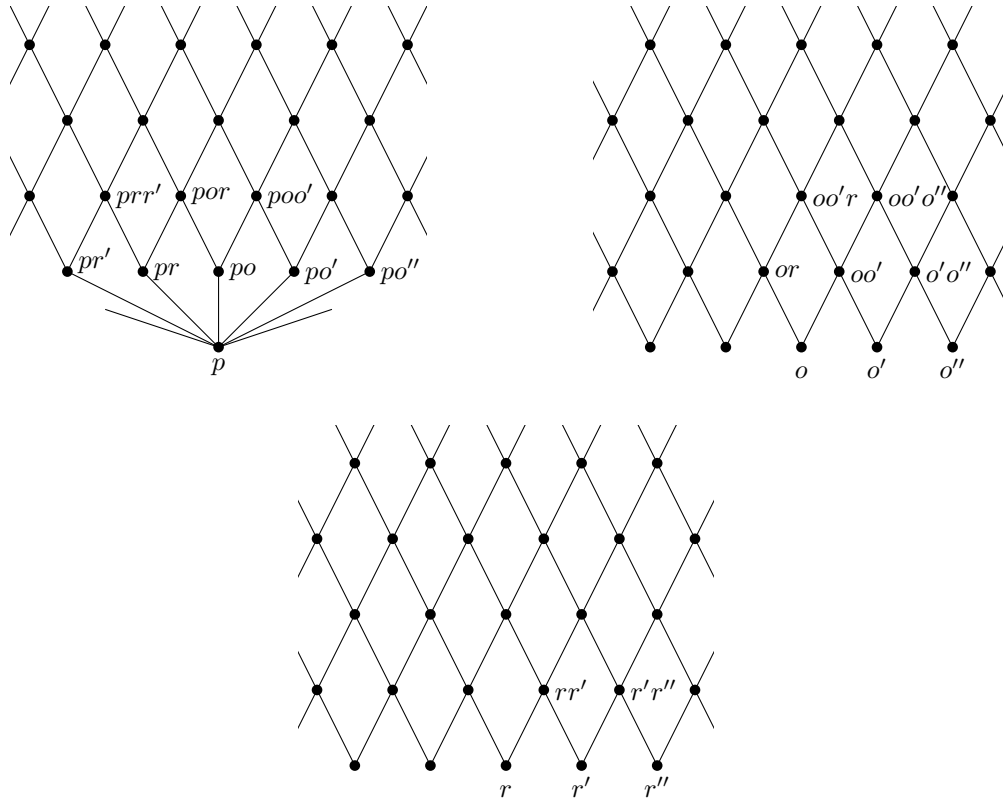
FIGURE 3. Hasse diagrams of the proposed PROXIMATE (p_{or}; upper left) and OBVIATIVE (o_{or}; upper right), and INANIMATE (r_r; bottom) lattices

mixed-reference dyads and triads where there is at least one animate other combining with any number of inanimate other (e.g. $\{o, r\}$, $\{o, r, r'\}$, or $\{o, o', r\}$). Finally, the INANIMATE partition r_r, like the OBVIATIVE and generic THIRD, does not have a unique minimal element. It starts with the singletons $\{r\}$, $\{r'\}$, $\{r''\}$, ..., then the dyads $\{r, r'\}$, $\{r, r''\}$, $\{r', r''\}$, ..., and continues from there.

These sets can be visually represented with the Hasse diagrams in Figure 3. The PROXIMATE lattice includes a unique bottom element, p. As a result, all further sets in the ascending rows also include this element. The OBVIATIVE lattice is analogous to the generic THIRD person lattice in Figure 1, as is the INANIMATE lattice (but with r's rather than o's).

We can now replace the category labels from 4 with the lattices denoted by the subscript notation, as shown in 18. Note that the partitions related to EXCLUSIVE, INCLUSIVE, and SECOND now include the proximate p and the inanimate r's in the subscript. This allows these categories to refer to collections that include p, o's and r's either alone or in combination.

(18)   *Animacy, obviation and person categories in Ojibwe in subscript notation*

i_{por}
iu_{por}
u_{por}
p_{or}
o_{or}
r_r

To summarize, this section provided a formal and ontologically-based characterization of the six categories related to person, animacy, and obviation in Ojibwe. The major extension from previous accounts (e.g. Harbour 2016) was to add ontological primitives related to inanimate things and the proximate person and understand how each category can reference these primitives. Collectively, it was shown that these six categories can reference any element within the power set (the set of all possible sets) of an ontology formed from i, u, p, the o's, and the r's.

3. REPRESENTING AND COMPOSING FEATURES. The goal of this section is to show how reference to the ontology via various categories can be derived through the composition of morphosyntactic features. I begin by proposing denotations for the root node (ϕ) and the features related to person, obviation, and animacy. I then introduce the theory of contrastive interpretations (Dresher 2009, Cowper & Hall 2019) and show how it accounts for the original partition problem, providing a novel formalization. This sets the stage for the extension of the account to capture obviation and animacy in §4.

3.1. ORGANIZING THE ONTOLOGY AND DEFINING FEATURES. The ontology, represented here by ϕ, provides the primitives for reference. The denotation of ϕ is derived from the set in 19.

(19)   *Set containing the full ontology*
         $\{i, u, p, o, o', \ldots, r, r', \ldots\}$ $\dashv \llbracket \phi \rrbracket$

ϕ denotes the power set (the set of all possible sets) of the entire ontology, denoting the ϕ *lattice* ($\mathscr{L}_\varphi$), as shown in 20. The derivation, which is rather involved, can be found in Appendix A. Additionally, ϕ introduces a variable over this lattice.

(20)   *Denotation of the full ontology*

    a. $\mathscr{L}_\varphi = \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}, r_r\}$
    b. $\llbracket \phi \rrbracket = \lambda x.\, x \in \mathscr{L}_\varphi$

Partitions are formed by the composition of various features with ϕ. The core person features are

derived by composition with sets containing the author alone 21a, the [Author] feautre, and/or the author and the addressee 21b, the [Participant] feature (Harbour 2016, Cowper & Hall 2019). The new proposal defended in this paper is the addition of two features: (i) the [Proximate] feature, which includes the author, addressee, and proximate person 21c, and (ii) the [Animate] feature, which includes all of the animate persons 21d.

(21)   *Subsets of the ontology as denotations of features*

    a. $\{i\}$ $= [\![\text{[Author]}]\!] = S_{au}$

    b. $\{i, u\}$ $= [\![\text{[Participant]}]\!] = S_{pt}$

    c. $\{i, u, p\}$ $= [\![\text{[Proximate]}]\!] = S_{px}$

    d. $\{i, u, p, o, o', \ldots\}$ $= [\![\text{[Animate]}]\!] = S_{an}$

On the current account, it is not necessary to form lattices by taking the power set of these sets (cf. Harbour 2016). Therefore the features denote a simple set, rather than sets of sets. These sets will be referred to as S_{au}, S_{pt}, S_{px}, and S_{an}, as shown above. With these denotations established, the task is to define how these features compose to restrict ɸ and give rise to our categories via a partition of the person space. This is accomplished by giving denotations for the binary feature values $+$ and $-$.

3.2. CONTRASTIVE INTERPRETATIONS. In this section, I introduce the theory of CONTRASTIVE INTERPRETATIONS (Dresher 2009), which provides a principled means to restrict the composition of features with ɸ. I first review the work of Cowper & Hall (2019), who show the theory of contrastive interpretations is capable of deriving the original five partitions of the core persons, and provide a novel formalization of their insights. §4 is then devoted to showing how the additional partition of Ojibwe with obviation and animacy is captured with the system.

Given that Cowper & Hall are only concerned with the core persons, the head π represents the entire relevant portion of the ontology. This is shown in 22.

(22)   a. $\mathscr{L}_{\pi} = \{i_o,\ iu_o,\ u_o,\ o_o\}$

      b. $[\![\pi]\!] = \lambda x.\ x \in \mathscr{L}_{\pi}$

Cowper & Hall posit two binary-valued person features, which combine to partition the head π. They treat these features as first-order predicates, as in 23.

(23)   *Person features as first-order predicates (Cowper & Hall 2019)*

    a. $[\![\text{[+Author]}]\!]$ = includes the speaker

    b. $[\![\text{[−Author]}]\!]$ = does not include the speaker

    c. $[\![\text{[+Participant]}]\!]$ = includes at least one participant

    d. $[\![-\text{Participant}]\!]$ = does not include a participant

With the sets S_{au} and S_{pt} defined in the previous section, I advance a formal definition of feature values to generalize the informal statements in 23.

    The formulas in 24 define the composition of the root lattice with person features (this also applies to obviation and animacy, but different definitions will be necessary for number). Positive composition of F with G, shown formally in 24a, results in a lattice consisting of all elements within $\mathscr{L}_G$ that contain at least one member of S_F. The fact that the positive variant need not include all members of the set defined by a given feature will play a critical role in the coming derivation of the various different types of person systems. Negative interaction of F with G, given formally in 24b, results in a lattice consisting of all elements within $\mathscr{L}_G$ that do not contain any members of S_F.

(24)   a. $[\![+F(G)]\!] = \{g : \exists f \in g\ [g \in \mathscr{L}_G \wedge f \in S_F]\}$
          b. $[\![-F(G)]\!] = \{g : \neg\exists f \in g\ [g \in \mathscr{L}_G \wedge f \in S_F]\}$

In the coming derivations of each partition, I use $\oplus$ to denote positive interactions between sets and lattices, and $\ominus$ to denote negative interactions, as shown in 25.

(25)   a. $[\![+F(G)]\!] = \mathscr{L}_G \oplus S_F$
          b. $[\![-F(G)]\!] = \mathscr{L}_G \ominus S_F$

The order of composition of features denoting simple first order predicates is commutative (Harbour 2016: 218), so features can compose in any order and the same result will be obtained. This property is particularly relevant when evaluating Harbour's original account of feature composition/lattice interaction (see §6.1), where the order of composition of features on a given head is a matter of parameterization that must be fixed within a given language.

    The major boon is that this property frees the account of a need to stipulate additional parameters or constraints to organize the composition of features on a head. This allows the feature set to be a truly unordered bundle, providing a more parsimonious representation, and as a consequence simplifying the mapping between syntax the LF interface. Here, heads (and, by extension, the functional sequence) are the sole locus of restrictions in the order of composition — a fact that has been widely noted and well-established in current theories of the syntax-semantics interface, where phrase-structure hierarchies guides semantic composition (e.g. Heim & Kratzer 1998). There is no need for additional mappings to be established to guide the composition of features.

GENERATING CONTRASTS AND THE ORIGINAL PARTITION PROBLEM. We can now take the next

step towards solving the partition problem by consider how features are used to divide up the space of person reference within the theory of contrastive interpretations. Following the work of Dresher (2009, 2018) on the derivation of phonological contrasts, the division of an inventory into distinct partitions can be derived from the SUCCESSIVE DIVISION ALGORITHM in 26, which ultimately is active over the course of acquisition. I eschew the formal details to focus on the principles behind the theory.

(26)   Informal definition of SUCCESSIVE DIVISION ALGORITHM (SDA)
       Assign CONTRASTIVE FEATURES by successively dividing an inventory until every member has been distinguished.

The idea is general enough to apply to any number of domains where an inventory must be divided into some number of categories. In phonology, it is applied to allow for the inventory of phonemes in a given language to be distinguished. For the present purposes, it is applied to allow the inventory of person partitions to be distinguished. For an inventory of person categories, the initial state is one in which there are no divisions between the persons. In other words, the monopartition created by the presence of π. The necessary contrasts (i.e. the patterns of distinction and conflation between partition elements) to be derived are determined by the primary input to the learner, and features are added, further dividing the inventory, until the proper number of partition elements are derived. For example, a learner who is faced with a tripartition language will never see evidence that there are unique forms for the inclusive versus exclusive elements, while a learner faced with a quadripartition language will. In other words, the learner will only have evidence of a CONTRAST in clusivity in the quadripartition language. Based on the principles below, the presence or absence of a contrast will result in differences in how our two person features are activated and interpreted.

There are two major tenets of this theory. The most fundamental, adapted from Clements (2001) and given in 27, is the notion of FEATURE ACTIVITY. This limits the specification of features to only those that play a role in deriving the inventory—these features are thus considered active in a given language.

(27)   FEATURE ACTIVITY
       A feature is ACTIVE if it plays a role in the derivation of the inventory.

This principle can allow us to derive the monopartition and the two types of bipartition. If the learner is faced with no evidence of a partition, then they will not specify any person features on π, leading the monopartition to be derived. If the learner has evidence of an author bipartition type split being made—that is a partition that splits sets that include the speaker (i_o, iu_o) versus those that do not include the speaker (u_o, o_o)—then the feauture [$\pm$Author] will be activated to make

this split. Similarly, if the learner sees evidence of a split between forms that include at least one discourse participant (i_o, iu_o, u_o) versus those that do not (o_o), then the [±Participant] feature will be activated and used to derive the inventory.

The second tenant adapted from Hall (2007) is given in 28, and provides further clarification on feature activity: only features that provide the means to generate a contrast are active.

(28) CONTRASTIVIST HYPOTHESIS

The derivation of an inventory only operates with those features that are necessary to distinguish the members of the inventory.

In the case that the hypothesis in 28 holds, then the principle in 29 also holds.

(29) COROLLARY TO THE CONTRASTIVIST HYPOTHESIS

If a feature is active, then it must be contrastive.

The contrastivist hypothesis and its corollary provide the means to capture the tripartition and quadripartition.

Consider the tripartition first, with the relevant CONTRASTIVE HIERARCHY shown in 30. Contrastive hierarchies graphically represent the notion of CONTRASTIVE SCOPE, which defines the particular piece of the inventory of person that a feature divides based on the two principles and corollary above.[6] The inventory of π is first split by [±Participant], making a division between the first and second persons versus the third persons. The further split introduced by [±Author] then only serves to separate the members on the [+Participant] side of the divide, separating the sets that include i from those that lack it. This allows for a partition that makes a distinction between second and first person, but lacks a clusivity distinction.

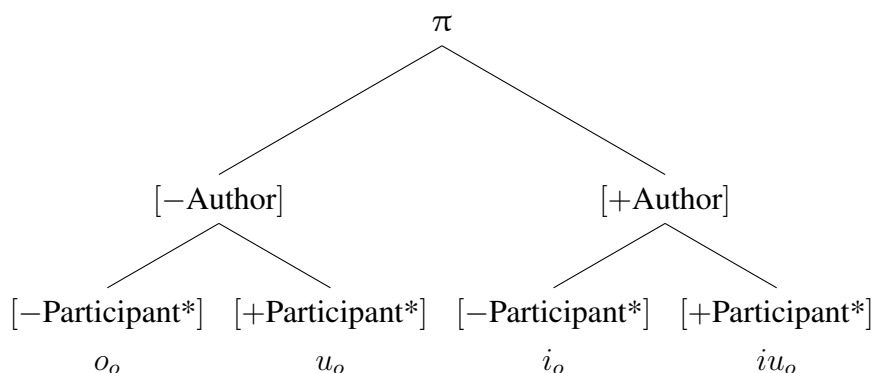(30) *Contrastive hierarchy for the tripartition*

$$\pi$$

[−Participant]   [+Participant]

o_o

[−Author]   [+Author]

u_o i_o iu_o
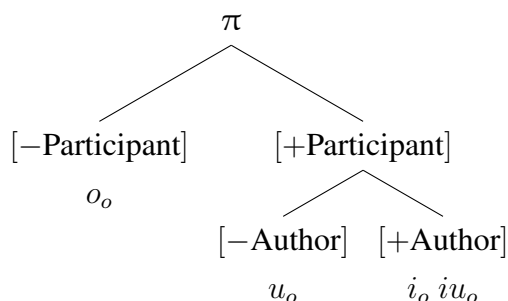
The feature [±Author] only makes further cuts when [+Participant] has applied, but not [−Participant], based on the contrastivist hypothesis, which dictates only those features which are necessary to make a contrast are specified. Since [−Participant] creates a partition that completely excludes any discourse participant, there is no further contrast for the feature [±Author] to make

(i.e. there are no sets that include i). As a result, any application of the author feature would be entirely vacuous—the generic third person partition element is derived regardless. In contrast, on the [+Participant] side, [±Author] can further partition the sets into those that include versus exclude the author, thus providing a relevant contrast to derive the generic first versus second person.

The quadripartition exemplifies a second way in which the notion of being contrastive affects the representation of person, as schematized in the hierarchy in 31.

(31)   *Contrastive hierarchy for the quadripartition*

$$
\begin{array}{c}
\pi \\
\end{array}
$$

[−Author]   [+Author]

[−Participant*] [+Participant*] [−Participant*] [+Participant*]

o_o u_o i_o iu_o

The key difference is that [±Author] now takes contrastive scope above [±Participant]. The first contrast is therefore between those elements of the π lattice that include the author (i_o, iu_o) versus those that exclude the author (u_o, o_o). In the latter case, [±Participant*] (the '*' is explained in the next paragraph) makes further a division between the sets that exclude a participant (the third person o_o) and those that include a participant (the second person u_o).
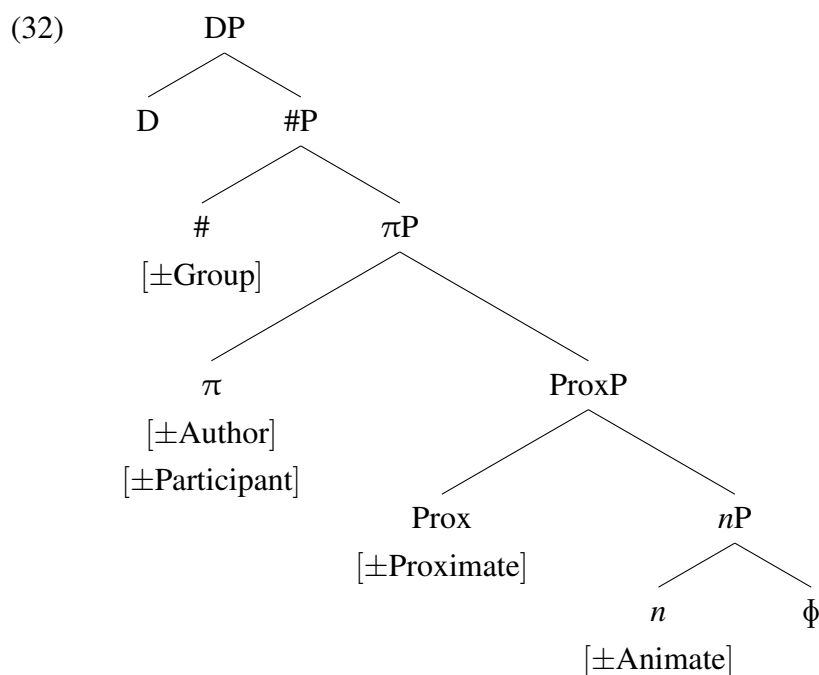
The division made on the [+Author] side is more subtle, and crucially relies on the corollary to the contrastivist hypothesis: features must introduce some relevant contrast. Recall that the [±Participant] feature dictates that some discourse participant must be present. Taken at face value, both the inclusive and exclusive partition elements satisfy the predicate, as both include the author. However, a learner faced with a quadripartition (i.e. evidence that there are separate categories for exclusive and inclusive) will narrow the meaning of this feature to instead mean 'includes/does not include a discourse participant other than the speaker', leading the feature to make a contrast between those sets that include versus exclude the addressee and allowing the learner to derive a clusivity contrast (Cowper & Hall 2019). In other words, the meaning becomes a subset of the feature's wide contrastive scope interpretation seen within the tripartition. For the remainder of the paper, I represent the narrowed version of this feature as [Participant*]. In essence, this allows a restricted version of an [Addressee] feature to be active within the representation. For further discussion, see §6.3. Short of conceiving of the absence of a feature as complete narrowing, a further property of the system is that the author feature will never have an alternative interpretation.

Since this feature only contains a single element i, [Author] is as narrow as a feature can be while still being present at all.

In summary, we have now exhausted all of the possibilities of feature combinations and contrastive meanings under the current two feature system, and have thus derived all and only the five original partitions—that is we have provided a solution to the original partition problem. The key insights are (i) that features denote first order predicates (formalized as a set of ontological primatives) which can combine based on whether they are positively or negatively valued; and (ii) the particular interpretation and potential combination of features is restricted by contrastive principles, which require any and all features to provide some relevant cut of the full ontology related to person.

4. DERIVING THE OJIBWE PARTITION. In this section, I return to consideration of the animate and proximate features and to deriving the hexapartition of Ojibwe in the context of the theory of contrastive interpretations.

4.1. THE FUNCTIONAL SEQUENCE. A keystone of the proposal is the functional sequence in 32. I have included projections up to DP, noting that nominals of different types may vary in how much functional structure they contain (see Déchaine & Wiltschko 2002).

(32)

```
          DP
         /  \
        D    #P
            /  \
           #    πP
        [±Group] / \
               π    ProxP
          [±Author]  /  \
        [±Participant] Prox   nP
                  [±Proximate]  / \
                               n   ɸ
                          [±Animate]
```

The structure is in line with decades of cross-linguistically informed work on the functional sequence of nominal projection (e.g. Ritter 1991, 1993, Picallo 1991, Kramer 2014, 2015), with noun class occupying the lowest position on n, followed by obviation heading its own projection,

then the two person features on π, and finally number in the highest position, labelled #. The present account utilizes the hierarchy of functional heads both to restrict the order of composition (e.g. number features compose after person, obviation, and noun class; but note that only crucial ordering is person/animacy/obviation before number) and the possible contrastive scope relations.

The idea that contrastive scope relations are restricted by the functional hierarchy is novel to the present account, but is closely related to the proposal of Hall (2020) who argues for treating features of different types as constituting separate CONTRASTIVE DOMAINS. The chief consequence of this proposal is that only features that are specified on the same head—in this case the two person features on π—can alternate in the contrastive scope that they take. All other contrastive relations will be fixed according to the functional hierarchy. Therefore, noun classification will always take contrastive scope over everything; obviation takes contrastive scope over person and number; person is next, taking contrastive scope over number alone, which does not scope over anything. In systems where all five features are active, we therefore only predict two possible types of systems: (i) one where [Author] scopes over [Participant], winnowing the latter feature to [Participant*], resulting in a distinction between the INCLUSIVE and EXCLUSIVE, and (ii) one where [Participant] scopes over [Author] resulting in a conflation of INCLUSIVE and EXCLUSIVE into a GENERIC FIRST. The first system is that of Ojibwe. As discussed in §5, the second type is represented by Ktunaxa, a language isolate spoken in what is now British Columbia and Montana.

4.2. A CONTRASTIVE HIERARCHY FOR OJIBWE. The addition of animacy and obviation requires an extension of the contrastive hierarchy. Given the functional sequence in the previous section, the hierarchy in 33 is obtained.

(33) *Contrastive hierarchy for the Ojibwe hexapartition*
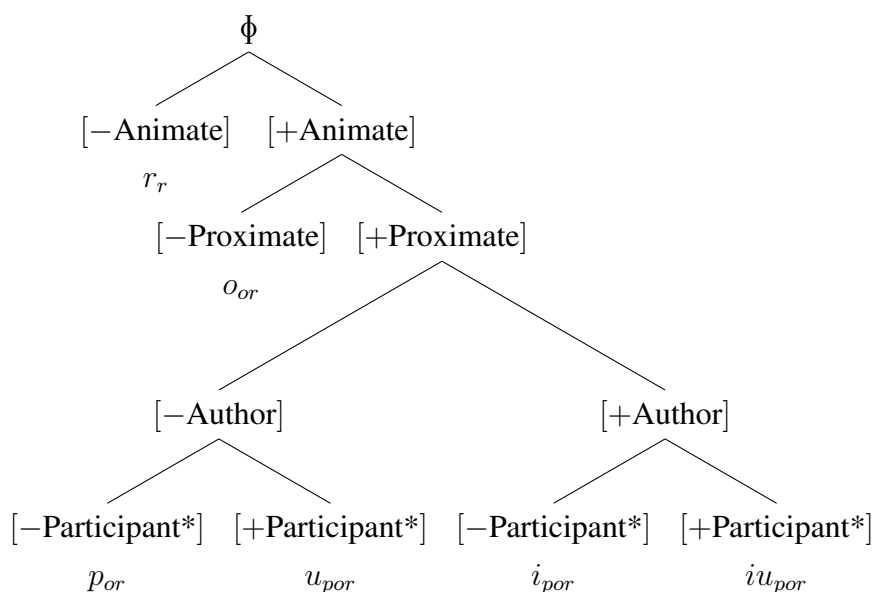
Like the quadripartition, the contrastive scope relation between [Author] and [Participant] lead to the winnowed feature [Participant*]. Furthermore, analogously to the split made by [−Participant] in the tripartition where the [±Author] feature was not composed, there is no further possible partition that can be gained through an interaction with [±Proximate], [±Participant], or [±Author] following [−Animate]. Similarly, no further partitions can be made by [±Participant] nor [±Author] following [−Proximate]. Since the application of these features would be vacuous at best, under the SDA the features are not posited by the learner.

4.3. FEATURE COMPOSITION. The first feature to compose with ϕ is [±Animate]. What partitions should be made by this feature? Put in plain language, the aim is for [+Animate] to pick out a lattice that includes all sets containing i, u, p, or at least one of the o's, but does not exclude the r's. This correctly allows the animate category to make reference to mixed groups of animate beings and inanimate things, as well as groups of animate beings alone (see examples 15 and 16). In turn, the aim of [−Animate] is to pick out a lattice with only those sets including the r's (or excluding i, u, p, and any of the o's). Only the positive variant should include a mixture of r's with i, u, p or the o's. The definition of values for person features, repeated in 34 for ease of reference, can fulfill these desiderata.

(34)   *Denotation of values for animacy, person, and obviation (repeated from 24)*

    a. $[\![+F(G)]\!] = \{g : \exists f \in g \,[g \in \mathscr{L}_G \wedge f \in S_F]\}$

    b. $[\![-F(G)]\!] = \{g : \neg\exists f \in g \,[g \in \mathscr{L}_G \wedge f \in S_F]\}$

The positive variant picks out the members of G that contain some member of the set denoted by F, while the negative variant introduces logical negation compared to the positive variant before the existential operator, picking out the members of G that contain no member of the set denoted by F. The negative variant allows for the derivation of our first category: INANIMATE. This is derived by the composition of the negatively valued [−Animate] feature with ϕ, as shown in 35.

(35)   *Derivation of* INANIMATE

    $[\![-\text{Animate}(\varphi)]\!]$

    $= \mathscr{L}_\varphi \ominus S_{an}$

    $= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}, r_r\} \ominus \{i, u, p, o, o', \ldots\}$

    $= \{r_r\}$

The notation makes the derivation somewhat opaque. While the denotation of [Animate] includes, for example, i_{po}, it does not include i_{pr} or i_{or}. Why should these latter two be excluded by negative action of [Animate] on ϕ? The reason is that, in all three cases, the implied sets necessarily include

i; in turn, negative action of [Animate] excludes all sets that include i (or u, p or an o, the other members of S_{an}). Therefore, despite i_{pr} and i_{or} including the inanimate r's, negative action by [Animate] dictates their removal. The only element that is not 'contaminated' by one of the animate primitives is r_r, the INANIMATE partition element.

The composition of ϕ with [+Animate] is the first step for the derivation of the remaining five categories. The result this composition is shown in 36.

(36)   *Result of [+Animate] acting on ϕ*
$$\llbracket +\text{Animate}(\varphi) \rrbracket$$
$$= \mathscr{L}_\varphi \oplus S_{an}$$
$$= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}, r_r\} \oplus \{i, u, p, o, o', \ldots\}$$
$$= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\}$$

In this case, only the sets in $\mathscr{L}_\varphi$ that contain i, u, p, or one of the o's are preserved. However, it does not exclude sets that contain one of the r's, allowing reference to mixed groups. Notice that we are left with the five partition elements associated with the five remaining categories. The composition of the remaining features [±Proximate], [±Animate], and [±Participant*] will pick out each of these elements.

The next category we can derive is OBVIATIVE, represented by the partition element o_{or}. This is derived by the result of 36 composing with [−Proximate], as shown in 37. Note, the denotations for feature values with [±Proximate] are the same as those for the core person features and animacy.

(37)   *Derivation of* OBVIATIVE
$$\llbracket -\text{Proximate}(+\text{Animate}(\varphi)) \rrbracket$$
$$= ((\mathscr{L}_\varphi \oplus S_{an}) \ominus S_{px})$$
$$= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \ominus S_{px}$$
$$= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \ominus \{i, u, p\}$$
$$= \{o_{or}\}$$

This removes any set that contains an i, u, or p, leaving only those consisting of at least one of the o's and possibly any number of r's—again, allowing reference to mixed groups as seen in example 16.

The derivation of PROXIMATE in 38 is more complex. This involves composition first with [+Animate], already seen in the derivation in 36, followed by [+Proximate], which removes the o_{or} partition element, then [−Author], removing both i_{por} and iu_{por}, and finally [−Participant*] removes u_{or}, leaving only p_{or} remaining. This allows reference to mixed groups, as seen in example 15.

(38)   *Derivation of* PROXIMATE

$$[\![-\text{Participant*}(-\text{Author}(+\text{Proximate}(+\text{Animate}(\varphi))))]\!]$$
$$= ((((\mathscr{L}_\varphi \oplus S_{an}) \oplus S_{px}) \ominus S_{au}) \ominus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus S_{px}) \ominus S_{au}) \ominus S_{pt*})$$
$$= ((((\{i_{por}, u_{po}, iu_{por}, p_{or}, o_{or}\} \oplus \{i, u, p\}) \ominus \{i\}) \ominus \{u\})$$
$$= ((\{i_{por}, u_{por}, iu_{por}, p_{or}\} \ominus \{i\}) \ominus \{u\})$$
$$= \{u_{por}, p_{or}\} \ominus \{u\}$$
$$= \{p_{or}\}$$

As with the derivation of the original partition problem, the composition of these features is commutable. In particular, there is nothing crucial in the order of composition of the two core person features, which are specified on a single head. There is therefore no need to specify an additional parameter on composition order for these cases.

The second person, shown in 39, takes positive values for the proximate and author features as in 38, but differs in that the participant* feature positively composes, leaving only u_{por}.

(39)   *Derivation of* SECOND

$$[\![+\text{Participant*}(-\text{Author}(+\text{Proximate}(+\text{Animate}(\varphi))))]\!]$$
$$= ((((\mathscr{L}_\varphi \oplus S_{an}) \oplus S_{px}) \ominus S_{au}) \oplus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus S_{px}) \ominus S_{au}) \oplus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus \{i, u, p\}) \ominus \{i\}) \oplus \{u\})$$
$$= ((\{i_{por}, u_{por}, iu_{por}, p_{or}\} \ominus \{i\}) \oplus \{u\})$$
$$= \{u_{por}, p_{or}\} \oplus \{u\}$$
$$= \{u_{por}\}$$

The derivation of EXCLUSIVE in 40 again includes positive composition of the proximate feature. Additional positive composition of the author feature selects those sets containing i, and negative interaction by participant* removes those containing u, leaving only the desired exclusive element i_{por}.

(40)   *Derivation of* EXCLUSIVE

$$[\![-\text{Participant*}(+\text{Author}(+\text{Proximate}(+\text{Animate}(\varphi))))]\!]$$
$$= ((((\mathscr{L}_\varphi \oplus S_{an}) \oplus S_{px}) \oplus S_{au}) \ominus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus S_{px}) \oplus S_{au}) \ominus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus \{i, u, p\}) \oplus \{i\}) \ominus \{u\})$$
$$= ((\{i_{por}, u_{por}, iu_{por}, p_{or}\} \oplus \{i\}) \ominus \{u\})$$
$$= \{i_{por}, iu_{por}\} \ominus \{u\}$$

$$= \{i_{por}\}$$

Likewise, INCLUSIVE is derived by positive composition of the proximate and author features, leaving only sets that include i. In contrast to the exclusive, positive composition of participant* selects sets that include u, leaving only the inclusive element iu_{por}.

(41) *Derivation of* INCLUSIVE

$$[\![+\text{Participant*}(+\text{Author}(+\text{Proximate}(+\text{Animate}(\varphi)))))]\!]$$
$$= ((((\mathscr{L}_\varphi \oplus S_{an}) \oplus S_{px}) \oplus S_{au}) \oplus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus S_{px}) \oplus S_{au}) \oplus S_{pt*})$$
$$= ((((\{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}\} \oplus \{i, u, p\}) \oplus \{i\}) \oplus \{u\})$$
$$= ((\{i_{por}, u_{por}, iu_{por}, p_{or}\} \oplus \{i\}) \oplus \{u\})$$
$$= \{i_{por}, iu_{por}\} \oplus \{u\}$$
$$= \{iu_{por}\}$$

The above derivations derive all and only the six categories found in Ojibwe (excluding number). Crucially, this particular feature combination does not predict a distinction between proximate and obviative outside of the animate third person—the local persons do not alternate on this dimension, and instead show the profile of a typical quadripartition.

4.4. INTERACTIONS WITH NUMBER. The final piece is to define the interactions with a number feature. Number in Ojibwe makes a cut between atomic/non-group (singular) and non-atomic/group (plural) sets. In his theory, Harbour makes use of a feature [±Atomic] to make this distinction. Informally, the feature creates a partition between atomic sets (i.e. sets with a cardinality of one) and non-atomic sets (i.e. sets with a cardinality of greater than one). Harbour treats atomicity as a basic concept, simply denoting it as a predicate $atom(x)$. In 42, I provide a formal definition of the predicate in terms of set notation.

(42) $[\![\text{[Atomic]}]\!] = \{g : |g| = 1 \wedge g \in \mathscr{L}_\varphi\}$

More precisely, the feature denotes the subset of the ɸ lattice with a cardinality equal to one. This is shown in 43.

(43) $\{i, u, p, o, o', o'', \ldots, r, r', r'', \ldots, \}$

In many theories of number, such as those based in the feature-geometric approach, the number feature in singular/plural type languages has been thought to make a split based on GROUP rather than ATOMICITY. Arguments for such a [Group] feature are generally based in the fact that plural is morphologically marked, while singular unmarked. Given that these theories use privative

features (i.e. features that lack values), morphological markedness is encoded by representational markedness, with singular being the default interpretation of the number node # (the interpretation of # when it is unmarked for features). While these sorts of arguments strictly based in markedness are less directly relevant for the current system, where features are bivalent and both singular and plural are equally marked in the representation, other factors such as agreement might be considered. Number agreement uniformly targets plural goals over singular goals (e.g. Nevins 2011). In order to define an agreement probe that prefers plural over singular (i.e. groups over atoms), a [Group] feature is necessary (Hammerly 2020).

With all of this in mind, it is perfectly possible to define a group feature in terms of sets, as shown in 44.

(44) $[\![\text{[Group]}]\!] = \{g : |g| > 1 \land g \in \mathscr{L}_\varphi\}$

The difference between the group and atomic features is that group includes all sets with a cardinality of greater than 1, rather than all sets with a cardinality equal to 1. As such, the group feature defines a lattice that is the complement of that defined by [Atomic], with respect to the full ɸ-lattice. In terms of deriving the proper partitions, the two turn out to be equivalent.

To see this, consider the proposed denotations of feature values for number, shown in 45. The positive value in 45a is equivalent to set intersection between the lattice denoted by the number feature F (either borne of the atomic or group feature) and the lattice denoted by G (for our purposes, the lattice produced following composition with noun classification and person). The negative value in 45b is relative complementation or set difference. This produces a partition of the lattice denoted by G with only those elements not found in the lattice denoted by F (i.e. the complement of the lattice denoted by F).

(45)   *Feature values as lattice interactions with number*
    a. $[\![+F(G)]\!] = \{g : g \in \mathscr{L}_G \land g \in \mathscr{L}_F\}$
    b. $[\![-F(G)]\!] = \{g : g \in \mathscr{L}_G \land g \notin \mathscr{L}_F\}$

Returning to the contrast between [Atomic] and [Group], both produce the same two partitions, but with opposite correspondences the feature values. With [Atomic], the positive value picks out the 'singular' sets, and negative value the 'plural' ones. With [Group], the positive value picks out the 'plural' sets, and the negative value the 'singular' ones. I frame the singular-plural number contrast in terms of [Group] rather than [Atomic], though nothing hinges on this choice.

Again, the denotation of values with number differs from person, obviation, and animacy, but both share a core similarity in that the negative value is associated with logical negation. Number is simply intersection (with the positive value) or complementation (with the negative value) between
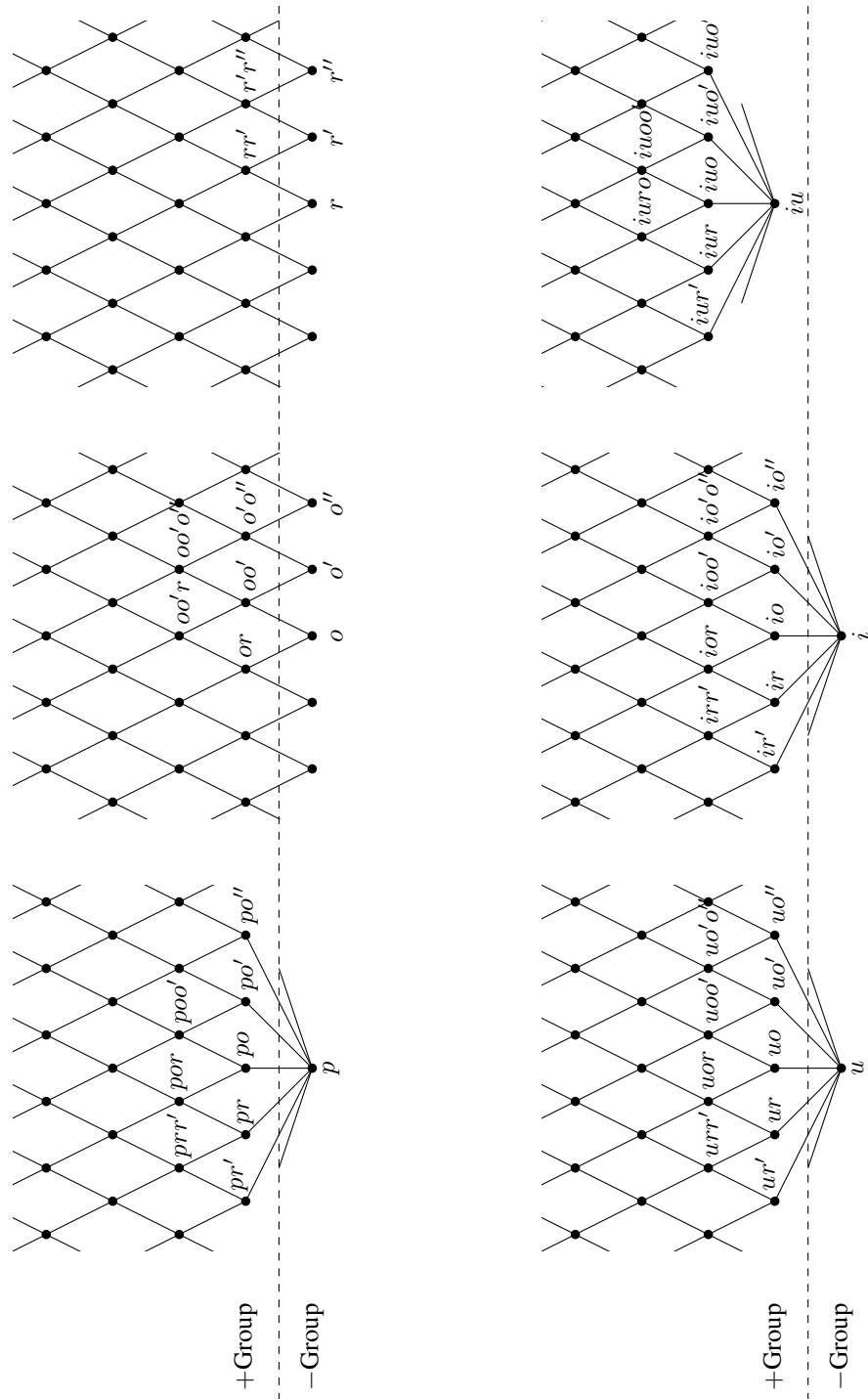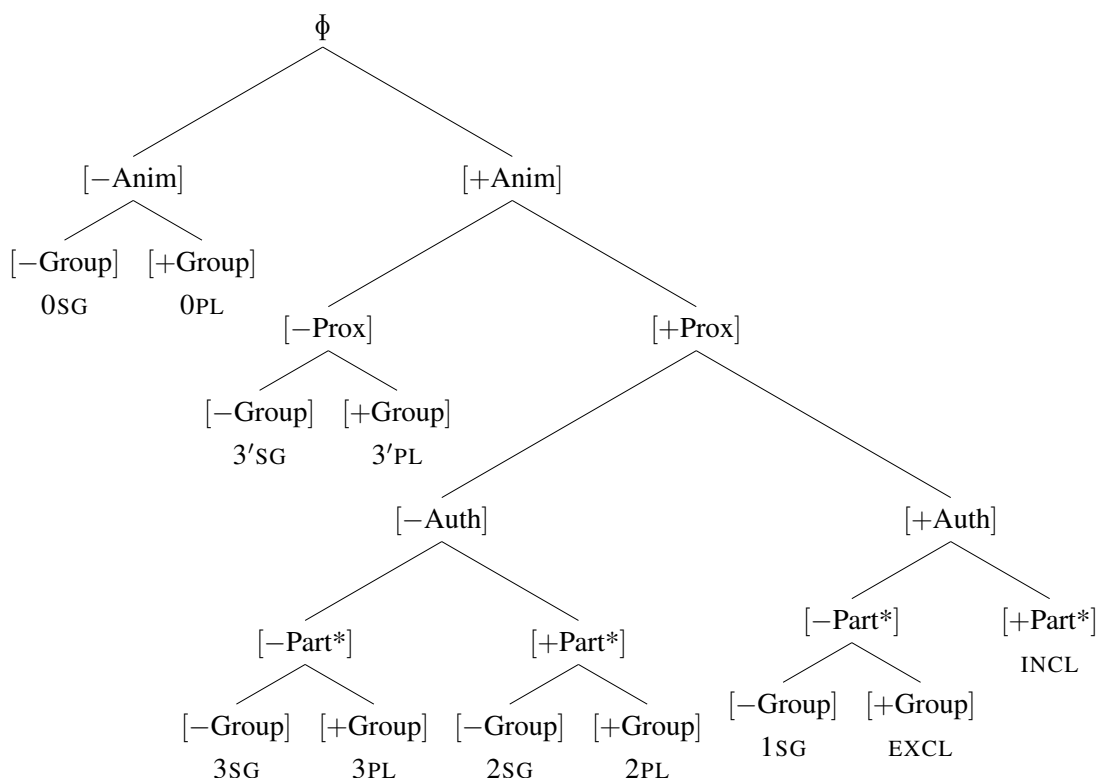
FIGURE 4. Lattices for each partition with singular-plural number distinction.

$\mathscr{L}_G$ and $\mathscr{L}_F$. Again, the existence of these differences is not problematic—despite all of these features serving to create partitions of lattices, the two features exist on different functional heads and create partitions based on different properties, thus we should not necessarily expect their semantics to be uniform.[7]

APPLICATION TO OJIBWE. I turn now to showing the derivation of number contrasts in Ojibwe with respect to the six person categories derived in §4. The most straightforward way of representing the partitions made by [Group] is through the use of the Hasse diagrams. These are given in Figure 4, with the cut by [Group] represented by the dashed line. For the PROXIMATE, OBVIATIVE, and INANIMATE lattices, the group feature makes a cut between the singleton elements on the bottom row (e.g. p, o, o', r, r'), and everything else. For EXCLUSIVE and SECOND, whose bottom elements are respectively the singleton sets $\{i\}$ and $\{u\}$, are similarly partitioned with these bottom elements on the $[-\text{Group}]$ side, and everything else falling into the $[+\text{Group}]$ partition. In the case of INCLUSIVE, none of the elements are atomic: the bottom element is the dyad $\{i, u\}$, so no element in that lattice falls into the $[-\text{Group}]$ partition. As a result, on the theory of contrastive interpretations, we should expect the inclusive person in Ojibwe to be unmarked for number: The group feature (and also, for the record, the atomic feature) fails to make a contrast in these cases, and thus is not expected to be active.

4.5. SUMMARY. In this section, the interaction of the representation of person with noun classification and number was considered for Border Lakes Ojibwe. This amounted to creating a partition of the ɸ lattice based on the noun classification feature $[\pm\text{Animate}]$, followed by the obviation feature $[\pm\text{Proximate}]$, then the two person features $[\pm\text{Author}]$ and $[\pm\text{Participant*}]$, and finally the number feature $[\pm\text{group}]$. The composition order of noun classification first, obviation/person in the middle, and noun classification last is motivated by the association of the features with different projections in the functional sequence. The overall result can be summarized with the contrastive hierarchy in 46. I have reverted to category labels for the terminals rather than the subset notation for clarity (number contrasts are difficult to represent with the notation), but emphasize that the hierarchy represents the derivation of partition elements rather than the categories per se.

(46)   *Final contrastive hierarchy for Ojibwe*

```
                                    ɸ
                    ┌───────────────┴───────────────┐
                [−Anim]                          [+Anim]
              ┌────┴────┐              ┌──────────────┴──────────────┐
         [−Group]  [+Group]       [−Prox]                       [+Prox]
           0SG       0PL        ┌────┴────┐         ┌──────────────────┴──────────────────┐
                           [−Group]  [+Group]   [−Auth]                               [+Auth]
                             3′SG      3′PL   ┌──────┴──────┐              ┌───────────────┴───────────┐
                                          [−Part*]     [+Part*]       [−Part*]                    [+Part*]
                                        ┌────┴────┐  ┌────┴────┐    ┌─────┴─────┐                   INCL
                                   [−Group][+Group][−Group][+Group][−Group] [+Group]
                                      3SG     3PL    2SG    2PL     1SG      EXCL
```

The hierarchy produces 11 non-overlapping partitions of the lattice denoted by the root node ɸ, which restrict the range of the variable introduced by this head, thereby determining the overall denotation of each of the categories.

5. A TYPOLOGICAL PREDICTION. The account proposed in the previous sections predicts that, in addition to Ojibwe-type languages, there should be languages that conflates the inclusive and exclusive persons but still shows distinct forms for proximate versus obviative persons. Indeed, based on the hypothesis that the functional hierarchy restricts possible contrastive scope relations, this is the only other type of language predicted. In this section I show that Ktunaxa, a language isolate spoke in British Columbia and Montana, has exactly such a system.

First, an important caveat. Unlike Ojibwe, Ktunaxa lacks a clear morphological contrast in grammatical animacy. For the purposes of this discussion, I will therefore focus on the relationship between obviation and the core persons. In other regards, Ktunaxa patterns with the Algonquian family in some key areas, including the use of proximate-obviative marking on third persons and a direct-inverse agreement system. Both of these features are shown in 47. 47a is a direct alignment, which is unmarked on the verb, where the subject is proximate and the object obviative. 47b exemplifies an inverse alignment, marked by *-aps-* on the verb, where the subject is obviative and the object proximate.

(47) *Direct/inverse in Ktunaxa*

    a.   wu·kat-i pałkiy-s   titqał
           see-IND woman-OBV man
           'The man (PROX) saw the woman (OBV)'

    b.   wu·kat-**aps**-i titqał-s   pałkiy
           see-**INV**-IND man-OBV woman
           'The man (OBV) saw the woman (PROX)'   (Dryer 1994: 65)

More broadly, the language shows object agreement, exemplified in 48 with plural local person objects. I assume that both the subject and object in these cases are encoded by a null *pro*. For the purposes of this discussion, I treat the null direct and inverse marker in 47 as a form of object agreement, making the agreement in 47 and 48 as part of a single paradigm.

(48) *Object agreement in Ktunaxa*

    a.   wu·kat-**awas**-ni
           see-**1PL.OBJ**-IND
           'He/she/it/they saw us'

    b.   wu·kat-**iskił**-ni
           see-**2PL.OBJ**-IND
           'He/she/it/they saw you (PL)'   (Dryer 1994: 67)

In the object agreement in 47 and 48, first, second, proximate, and obviative persons are distinguished from one another, but there is no difference in the exclusive versus inclusive. The same basic pattern holds with the subject proclitics in 49, but with no evidence of a distinction in obviation in the third persons, which does not have an overt subject proclitic form.
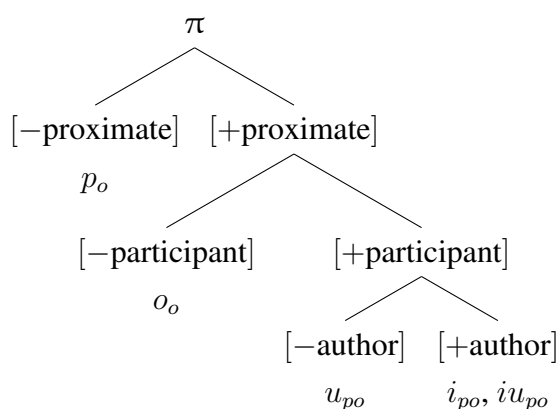
(49) *Subject clitics in Ktunaxa*

    a.   **hu**   cxa-nała ʔ-ni
           1.SUBJ talk-1PL-IND
           'We (EXCL/INCL) talked'

    b.   **hin**   cxa-kił-ni
           2.SUBJ talk-2PL-IND
           'You (PL) talked'   (Dryer 1994: 67)

    c.   cxa-ni
           talk-IND
           'He/she/they talked'   (Dryer 1997: 34)

On the whole, we can return to use of the superposition method introduced earlier, and see that the language conflates inclusive and exclusive, but makes distinctions between the second, proximate, and obviative persons.

(50)   *Superposition with Ktunaxa subject clitics and object agreement*

hin		*-awas-*				GENERIC FIRST (PL)
hu	+	*-iskił-*	=			SECOND (PL)
		-aps-				PROXIMATE (PL)
∅-		∅-				OBVIATIVE (PL)

As such, we have an example of a language with a different base partition than that of Ojibwe, but that still makes use of a system of obviation. The relevant contrastive hierarchy is given in 51. Like Ojibwe, the proximate feature composes prior to the other person features, and thus only makes a cut between proximate and obviative third persons. However, like the original tripartition, participant takes scope over author, and thus the set that participant denotes is not winnowed, and no clusivity distinction is derived.

(51)   *Ktunaxa proximate quadripartition*

$$\pi$$

$[-\text{proximate}]$ $[+\text{proximate}]$

p_o

$[-\text{participant}]$ $[+\text{participant}]$

o_o

$[-\text{author}]$ $[+\text{author}]$

u_{po} $i_{po},\ iu_{po}$

6. EVALUATING ALTERNATIVE ACCOUNTS. This section draws out two alternative solutions to the (extended) partition problem, giving way to a critical discussion. The first is that based in the proposal of Harbour (2016). While his account provides a solution for the original partition problem, I show his theory of feature composition is unable to derive the partition of Ojibwe, where only the third persons, and not the local persons, show a distinction in obviation. The second is the feature geometry (Harley & Ritter 2002, Béjar 2003, Oxford 2019). Here, the system has the means to derive the partition of Ojibwe, but at the cost of losing the possibility of explaining how languages that lack obviation might conflate these categories.

6.1. HARBOUR'S SOLUTION. Harbour's (2016) analysis included only the features [Author] and [Participant], and aimed only to derive distinctions in the core persons. For the purposes of introducing the system, I stick with the scope of the original account. In §59 I evaluate an extension of the proposal to [Proximate]. The first key difference from the present account is that Harbour's

features features denote LATTICES rather than sets. To arrive at a lattice representation for the features we can simply form the power sets for our two person features. The power set of any given set is a set of all possible subsets. I show the result for each of the features in 52.

(52)   *Power sets in lattice-theoretic terms*

    a. $\{i\}$ $= \mathscr{L}_{au}$

    b. $\{i, iu, u\}$ $= \mathscr{L}_{pt}$

Like the current account, the head π is also taken to denote a lattice formed from the powerset of a set containing these elements, repeated in 53. Note that since Harbour's account focuses on the core persons alone, only the slice of the ontology containing i, u, and the o's is relevant.

(53) $[\![\pi]\!] = \mathscr{L}_{\pi} = \{i_o, iu_o, u_o, o_o\}$

A second key difference between the adopted proposal and Harbour's original system is in the composition of features. In the system Harbour proposes, lattices combine via OPERATIONS defined by the positive ($+$) or negative ($-$) values. That is, features compose with the head π via function application rather than function modification (for discussion, see Harbour 2016: 66). Semi-informally, the $+$ value joins every possible duo of elements in a pair of lattices. The formal definition is shown in 54.

(54) $[\![+F(G)]\!] = \{g \sqcup f : f \in \mathscr{L}_F, g \in \mathscr{L}_G\}$

As written, F is POSITIVELY ACTING ON G. But the addition operation is commutative (as in regular arithmetic addition; $1 + 2 = 2 + 1$).

The $-$ value cumulatively subtracts every element in one lattice from every element in the other. This operation can be simplified, because each of the sets that will come into play have a UNIQUE MAXIMAL ELEMENT. Subtracting the maximal element of F from each element of G renders any further subtraction redundant since all other elements are subsets of the maximal element.

(55) $[\![-F(G)]\!] = \{g \backslash max(\mathscr{L}_F) : g \in \mathscr{L}_G\}$

Analogously to the positive value, $-F(G)$ is NEGATIVE ACTION of F on G. Therefore the maximal element of F is subtracted from each element of G. This operation is critically non-commutative (again, as in arithmetic subtraction; $1 - 2 \neq 2 - 1$). This marks a key difference between the proposed account, where features are freely ordered, and the account of Harbour, where features are strictly ordered.

In particular, Harbour proposes that the features on π are parameterized on two basic dimensions: (i) a feature can either be present or absent (an assumption shared with the adopted

account); and (ii) if two (or more) features are present, then the order that the features compose with π must be set (an assumption that is critically not necessary with the proposed theory). These parameters are given in 56.

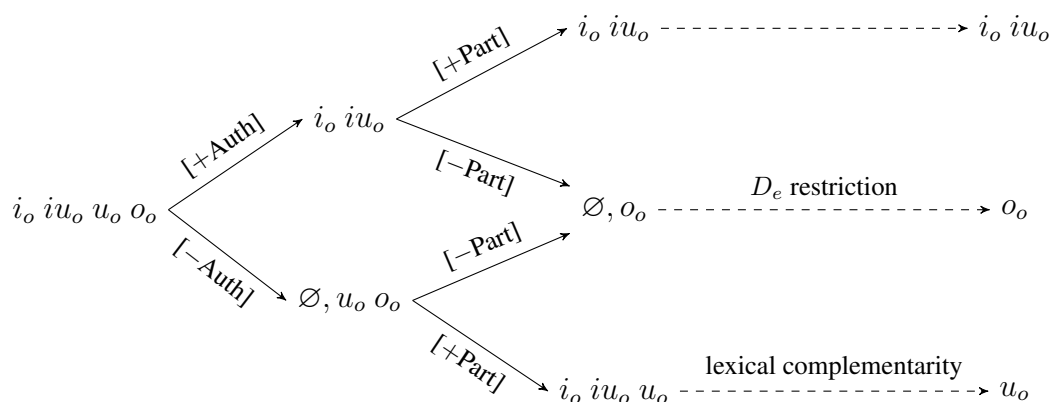(56) *Parameters of π from Harbour (2016)*

    a.   The author feature is (not) present.

    b.   The participant feature is (not) present.

    c.   The author/participant feature composes first.

This gives rise to five possible feature specifications and composition orders, corresponding to the five attested partitions. In the next section, I summarize the derivations for each case.

CAPTURING THE ORIGINAL FIVE PARTITIONS. The details of how the lattice operations give rise to a particular output in each step is not critical—the reader is referred to Harbour's book for a step-by-step exposition of the derivations. The following figures, which summarize the essence of the derivations for the tripartition and quadripartition, are reproduced from Cowper & Hall (2019).

    I begin with the tripartition in 57, where the composition of [±Author] precedes [±Participant]. The solid arrows show the result of the composition (lattice action) of each feature. The dashed arrows show the output follow two additional restrictions proposed by Harbour (2016).

(57) *Derivation of the tripartition (Harbour 2016)*

$i_o \ iu_o \ u_o \ o_o$
— $[+Auth]$ → $i_o \ iu_o$
    — $[+Part]$ → $i_o \ iu_o$ - - - - - - - - → $i_o \ iu_o$
    — $[-Part]$ → $\emptyset, o_o$ - - - D_e restriction - - - → o_o

$i_o \ iu_o \ u_o \ o_o$
— $[-Auth]$ → $\emptyset, u_o \ o_o$
    — $[-Part]$ → $\emptyset, o_o$
    — $[+Part]$ → $i_o \ iu_o \ u_o$ - - - lexical complementarity - - - → u_o

First, empty sets are introduced by negative actions between lattices. The presence of the empty set serves an important role over the course of the derivation, but causes problems in the final partition. Recall that these features create sets that restrict the set of entities that can be referenced by particular person categories. The presence of the empty set implies that it should be possible to make reference to nothing or no one—a possibility that is not attested. Harbour proposes adding a constraint to the domain restrictor D_e introduced by ɸ so that it cannot include the empty set.

Second, see that $[+\text{Author}]([+\text{Participant}](\pi))$ gives rise to i_o, iu_o, while the output of $[-\text{Author}]([+\text{Participant}](\pi))$ is i_o, iu_o, u_o. The issue here is that none of the feature combinations pick out the second person partition element u_o on its own—they fail to derive the second person category in the tripartition. The proposed solution comes from the principle of LEXICAL COMPLEMENTARITY—which, as Harbour points out, is related to other principles such as those used in the literature on scalar implicature. This is invoked when two distinct feature outputs stand in a subset-superset relationship, and is used to eliminate the overlap between the two denotations. The result is that the feature combination with the larger denotation is restricted to only those elements that are not already covered by the feature combination with the smaller denotation. The formal definition is given in 58.

(58)   LEXICAL COMPLEMENTARITY (Harbour 2016: 80)
        Let F and G be feature specifications where $[\![F(\pi)]\!] \subset [\![G(\pi)]\!]$. Then use of $[\![G(\pi)]\!]$ is restricted to $[\![G(\pi)]\!]\backslash[\![F(\pi)]\!]$.

The two overlapping feature combinations of the tripartition stand in a subset-superset relationship. Therefore lexical complementarity can be applied to restrict the $[-\text{Author}]([+\text{Participant}](\pi))$ feature combination such that it only includes the second person element u_o.

The same issue arises in the quadripartition, shown in 59. Lexical complementarity applies in two cases: (i) to restrict the $[+\text{Participant}]([+\text{Author}](\pi))$ combination to only the exclusive element iu_o; and (ii) to restrict the $[+\text{Participant}]([-\text{Author}](\pi))$ combination to only the second person element u_o.

(59)   *Derivation of the quadripartition (Harbour 2016)*
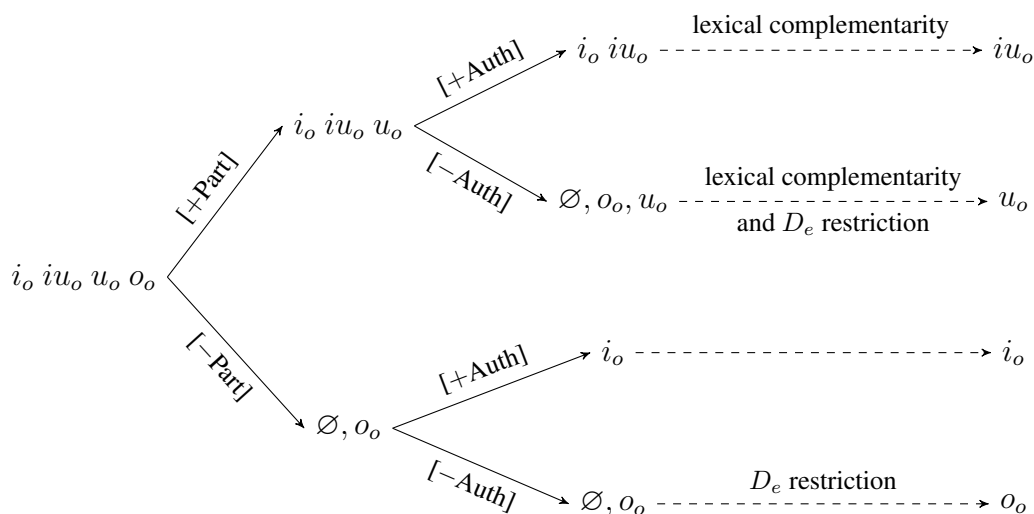
The final three partitions — the monopartition, the author bipartition, and the participant

bipartition — do not require the application of lexical complementarity. The monopartition is simple: there are no features specified, and the output is exactly the lattice denoted by π. The author and participant bipartitions are derived by the composition of the author and participant features with π, respectively. These derivations do require the application of the restriction on D_e to remove the empty set, but otherwise the feature combinations themselves produce the desired results.

Harbour's proposal therefore provides the means to derive all and only the five possible core person partitions. The immediate question is whether the system that Harbour proposes to solve the partition problem is capable of capturing the further distinctions in the third person introduced by the addition of obviation.

HARBOUR AND THE PROXIMATE FEATURE. To evaluate how the proximate feature could fit into Harbour's theory, let us first make a number of assumptions that mirror the adopted proposal.

First, let us take for granted a split in animacy and define the full ontology ϕ to be restricted only to the lattice in 60.

(60) $\mathscr{L}_\varphi = \{i_{po}, iu_{po}, u_{po}, p_o, o_o\}$

Second, let us assume that the denotation of the proximate feature is derived by taking the power set of the ontological subset consisting of i, u, and p. Like the two person features, we can treat this as a lattice ($\mathscr{L}_{px}$) and perform the additional step of removing the empty set. These steps are summarized in 61.

(61) $[\![[\text{Proximate}]]\!]$
$= \mathcal{P}(\{i, u, p\})$
$= \{\{i\}, \{i, p\}, \{u\}, \{u, p\}, \{i, u\}, \{i, u, p\}, \{p\}, \{\}\}$
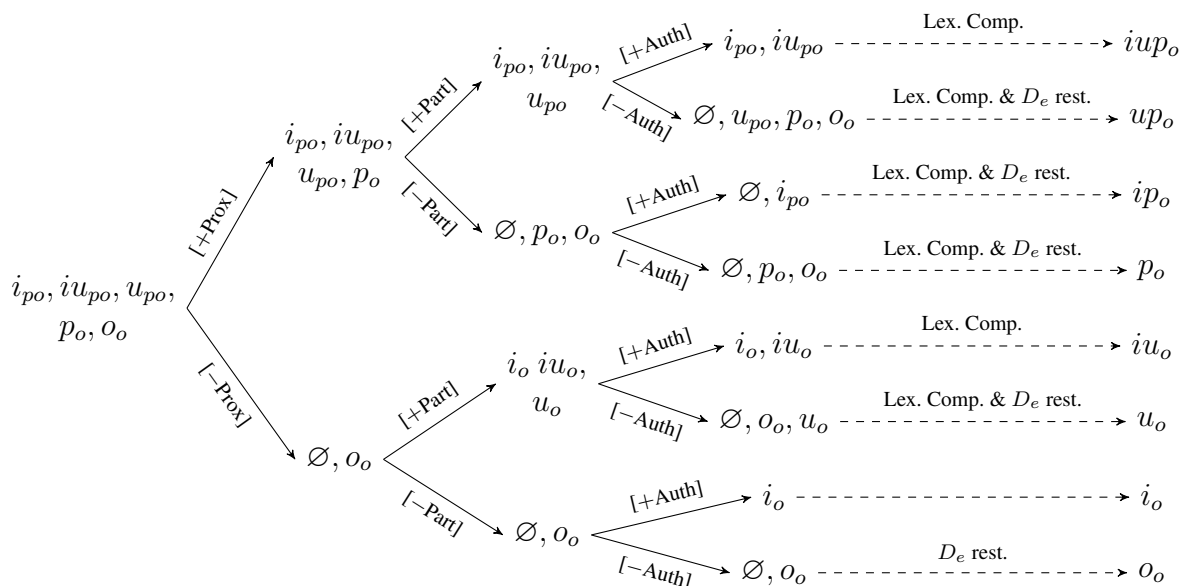$= \{iup, iu, ip, up, i, u, p\}$
$= \mathscr{L}_{px}$

Third, let us assume that [Proximate] is specified on a separate head that composes prior to the two person on π. This restricts the possible composition orders such that only [±Participant] and [±Author] can alternate.[8]

Finally, I only consider cases where both [±Participant] and [±Author] are present on π. Alternatives that lack either or both of these features can be ruled out simply because they can only generate a maximum of four contrasts. With only two features with binary values, there are only four total possible combinations of values. Having set aside animacy, the contrast between EXCLUSIVE, INCLUSIVE, SECOND, PROXIMATE, and OBVIATIVE requires a minimum of five combinations. With three features, a maximum of eight distinctions can arise. An immediate

suspicion can be raised, again based simply on the number of distinctions that these combinations predict. However, this property of Harbour's account has already been observed in the prior discussion, and it does not necessarily lead to overgeneration. The tripartition, which fully crosses two bivalent feature, has four unique feature-value combinations. Harbour shows that this does not result in four unique partition elements, but rather two paths to deriving the third person—one where the author feature takes a positive value, and one where the author feature takes a negative value. From this, we can conclude that it will not necessarily be the case that we will have eight distinct elements flowing from the eight feature-value combinations in a three-feature system. It is possible that some combinations will lead to identical partition elements.

With these assumptions in hand, the first derivation I consider is one where [±Participant] composes before [±Author]. This is summarized in 62.

(62)   *Derivation of $[\![\pm Author(\pm Participant(\pm Proximate(\varphi)))]\!]$*

Root: $i_{po}, iu_{po}, u_{po}, p_o, o_o$

- [+Prox] → $i_{po}, iu_{po}, u_{po}, p_o$
  - [+Part] → i_{po}, iu_{po}, u_{po}
    - [+Auth] → i_{po}, iu_{po} — Lex. Comp. → iup_o
    - [−Auth] → $\varnothing, u_{po}, p_o, o_o$ — Lex. Comp. & D_e rest. → up_o
  - [−Part] → $\varnothing, p_o, o_o$
    - [+Auth] → $\varnothing, i_{po}$ — Lex. Comp. & D_e rest. → ip_o
    - [−Auth] → $\varnothing, p_o, o_o$ — Lex. Comp. & D_e rest. → p_o
- [−Prox] → $\varnothing, o_o$
  - [+Part] → $i_o\ iu_o, u_o$
    - [+Auth] → i_o, iu_o — Lex. Comp. → iu_o
    - [−Auth] → $\varnothing, o_o, u_o$ — Lex. Comp. & D_e rest. → u_o
  - [−Part] → $\varnothing, o_o$
    - [+Auth] → i_o → i_o
    - [−Auth] → $\varnothing, o_o$ — D_e rest. → o_o

In this case, each value combination generates a unique partition element, for a total of eight: $iup_o, iu_o, up_o, u_o, ip_o, i_o, p_o,$ and o_o. This feature combination successfully generates a contrast between PROXIMATE and OBVIATIVE within the third persons, however, all of the local persons are also split between proximate and obviative counterparts. These partitions are not present in Ojibwe, so this combination over-generates.

The second possibility in 63 composes [±Author] prior to [±Participant].

(63)   *Derivation of $[\![\pm Participant(\pm Author(\pm Proximate(\varphi)))]\!]$*
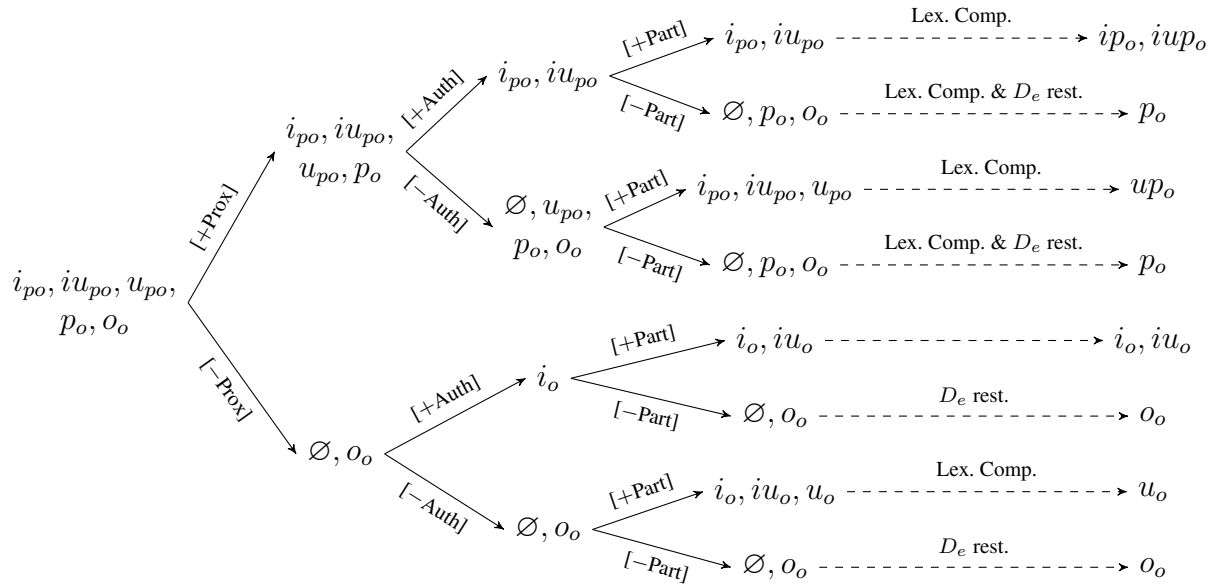
Once again, this composition order can generate the contrast in PROXIMATE versus OBVIATIVE, but also overgenerates a distinction in obviation within the local persons. Considering the unique elements, this creates a six-way contrast that is akin to the standard tripartition, but with a contrast in obviation within each category. Again, this is a case of overgeneration.

The conclusion is that it is not possible to generate the five-way split (setting aside animacy) that is characteristic of Ojibwe and nearly all other Algonquian languages. One objection to the above discussion is that much depends on the particular subset of the person ontology that the proximate feature denotes. It is the power set generated from $\{i, u, p\}$, which then interacts with the already established features from Harbour's original account. I argue that there is not an alternative feature with the ability to make these cuts, given only the machinery that Harbour proposes. The options for alternatives is rather limited. There are two types of live possibilities: One which includes only the proximate third person (i.e. $\{p\}$), or one that includes the proximate third person p and either i or u on its own (i.e. $\{i, p\}$ or $\{u, p\}$).

It is not necessary to consider derivations with each of these features to see why these alternatives will not provide the correct result. We are looking for a feature that creates a proximate/obviative distinction in the third persons, while leaving the local persons unchanged from the quadripartition. In terms of the lattice operations denoted by the feature values, the key is to ensure that the proximate p is removed from the third person only lattices, but retained when the lattice includes a local person as the bottom element. This requires restricting when the feature

can apply, not which particular elements are added or subtracted. That is, we need to ensure that [−Proximate] only applies when both author and participant feature also take negative values.

This highlights one of the major differences between Harbour's theory and one based in contrastive interpretations. Short of adding restrictions on the way features combine, Harbour's account is locked in to generating the number of logical combinations given the number of features crossed by their possible values. On the other hand, the addition of contrastive interpretations creates principled limits on these combinations, so that not all possibilities are generated. For example, the author feature does not combine following a negatively valued participant feature (as seen in the tripartition), and neither author nor participant combine following a negatively valued proximate feature. This occurs because in both cases the features would fail to make a contrast.

6.2. THE FEATURE GEOMETRY. The second alternative account to consider is that based in the feature geometric representation (Harley & Ritter 2002, Béjar 2003). The core of this account is the claim that features have a universal set of implicational relationships. These relations are motivated and constrained by the conceptual relationships that hold between the features, such that more specific features entail less specific ones. In the original system, the proposed features are PRIVATIVE—they are either specified or not, and do not take a value. The figure in 64 shows the geometry related to person, as proposed by Harley & Ritter (2002).

(64)   *The feature geometry for person (Harley & Ritter 2002)*

$$\pi$$
$$|$$
$$[\text{Participant}]$$
$$\diagup \quad \diagdown$$
$$[\text{Author}] \quad [\text{Addressee}]$$
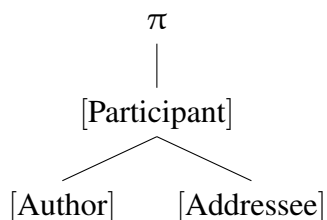
The geometry, it must be emphasized, is not a phrase structure representation, despite its appearance as a tree. The schematic represents the aforementioned implicational relations: the subordinate (lower, more specific) features cannot be specified without also specifying all superordinate (lower, less specific) features. Harley & Ritter add one additional restriction beyond the geometry that is relevant here: [Addressee] only appears if [Author] is present. With these restrictions, only the collections of features in 65 are possible.

(65)   *Possible person representations under the original feature geometry*

     a. $\{\pi, \text{Participant}, \text{Author}, \text{Addressee}\}$

     b. $\{\pi, \text{Participant}, \text{Author}\}$

     c. $\{\pi, \text{Participant}\}$

        d.   {π}

As Harbour (2016) points out, there are only four possible sets of features, while there are five possible person partitions to be captured. Therefore the original feature geometry cannot generate all of the possible core person partitions. Harbour shows that there are alternative geometries that can be put forward to get the right result (though, he argues against this hypothetical account too). The simplest solution, shown in 66, abandons the assumption that features are privative, adopting bivalent features instead. The positive versus negative variants can then respectively indicate that the set includes or does not include the property denoted by the predicate.

(66)   *An alternative geometry entertained (and ultimately rejected) by Harbour (2016)*

$$
\begin{array}{c}
\pi \\
[\pm\text{Participant}] \quad [\pm\text{Author}] \\
[\pm\text{Addressee}]
\end{array}
$$
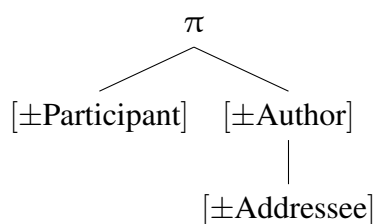
With this revised representation, we can generate all and only the five partitions (with two ways of capturing the quadripartition, either with or without [Participant]), as summarized in 67.

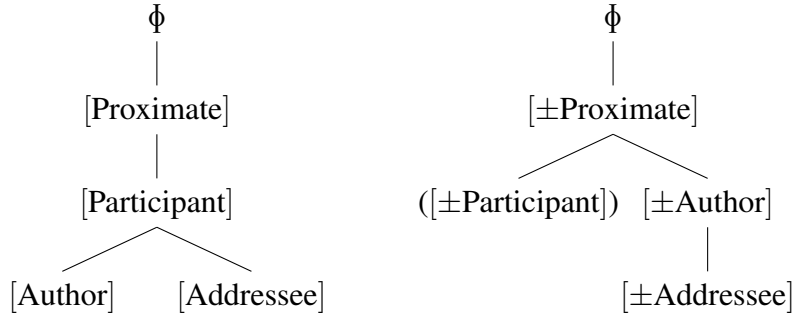(67)   *The alternative feature geometry solves the original partition problem*
     a.   MONOPARTITION: {π}
     b.   PARTICIPANT BIPARTITION: {π, ±Participant}
     c.   AUTHOR BIPARTITION: {π, ±Author}
     d.   TRIPARTITION: {π, ±Participant, ±Author}
     e.   QUADRIPARTITION: {π, (±Participant), ±Author, ±Addressee}

While we have generated a pure feature geometric representation that solves the original partition problem, we have lost our basis for positing a universal geometry in the first place. The alternative geometry in 66 fails to reflect the semantic entailments between the features in two different ways. First, [Author] and [Addressee] each entail [Participant], but they no longer stand in an implicational relationship. Furthermore, [Addressee] does not entail [Author], but the presence of [Addressee] implies [Author]. To the extent that these entailments provided an explanation for why a particular geometry (and not some other geometry) should be the one to exist, the geometry that actually allows us to capture the full empirical landscape has lost that grounding.

While the above discussion could already be taken to close the book on the feature geometry, let us still turn to the main question at hand: whether a feature geometry can be proposed that captures Ojibwe, without losing the ability to capture languages that lack distinctions in obviation (I'll set

animacy aside for now and return to it in §7). The standardly assumed geometry for Ojibwe is shown in the left in 68. However, given the arguments in the preceding paragraph, we may instead consider an extended version of the alternative geometry, shown on the right. The argument against the feature geometry will not rely on choosing between these two.

(68)   *Standard (e.g. Oxford 2019) and alternative extended geometries for person and obviation*

$$\phi \qquad\qquad\qquad\qquad \phi$$

$$[\text{Proximate}] \qquad\qquad [\pm\text{Proximate}]$$

$$[\text{Participant}] \qquad ([\pm\text{Participant}]) \quad [\pm\text{Author}]$$

$$[\text{Author}] \quad [\text{Addressee}] \qquad\qquad [\pm\text{Addressee}]$$

Let us run the arguments with the standard extension, since it is more likely to be familiar. This geometry suffices to capture the five-way contrast between INCLUSIVE, EXCLUSIVE, SECOND, PROXIMATE, and OBVIATIVE, as shown in 69. Note that, like the proposed account, these features are interpreted as first-order predicates. To get the right result, we can apply lexical complementarity, where the presence of a more marked form limits the interpretation of those forms that are less marked (the application of this principle is indicated by '$\equiv$'), the various possible combinations of these features can generate the contrasts characteristic of the quadripartition.

(69)   *Capturing Ojibwe with the extended geometry*

    a. $[\![\{\pi, \text{Proximate}, \text{Participant}, \text{Author}, \text{Addressee}\}]\!]$
        $=$ the set contains a pers. $\wedge$ a prox. $\wedge$ a part. $\wedge$ an auth. $\wedge$ an addr. $= iu_{po}$

    b. $[\![\{\pi, \text{Proximate}, \text{Participant}, \text{Author}\}]\!]$
        $=$ the set contains a pers. $\wedge$ a prox. $\wedge$ a part. $\wedge$ an auth. $= i_{po}, iu_{po} \equiv i_{po}$

    c. $[\![\{\pi, \text{Proximate}, \text{Participant}\}]\!]$
        $=$ the set contains a pers. $\wedge$ a prox. $\wedge$ a part. $= i_{po}, iu_{po}, u_{po} \equiv u_{po}$

    d. $[\![\{\pi, \text{Proximate}\}]\!]$
        $=$ the set contains a pers. $\wedge$ a prox. $= i_{po}, iu_{po}, u_{po}, p_o \equiv p_o$

    e. $[\![\{\pi\}]\!]$
        $=$ the set contains a pers. $= i_o, iu_o, u_o, p_o, o_o \equiv o_o$

The issue arises when we consider how we might capture the original five partitions with our new geometry. Both geometries considered above imply that all languages with a distinction between participants and non-participants, and by extension all languages with distinctions

among the participants, will activate [Proximate] and make distinctions in obviation in the third persons. Clearly, this is a highly undesirable result. Unless we entertain a massive conspiracy of syncretisms, one need not look further than English to see that this prediction is incorrect. Very few languages distinguish obviation at all, and certainly there is not an implicational relationship of the sort predicted here. Furthermore, if we attempt to break the implicational relationship between [Proximate] and the features related to the participants, we run into trouble. Without such a relationship, we erroneously predict that both third persons and the various categories related to the participants should alternate in obviation: the same problem that plagued Harbour's original lattice-based account.

This all points to a bigger, and ultimately fatal, problem for geometries: positing direct implicational relationships between the features themselves is simply too strong. Without going into the fine details, Harbour provides an extended argument against these relations from a morphological point of view. He shows that requirement of the geometry that the deletion of subordinate features entails the deletion of all superordinate features misses the mark (Harbour 2016: 195-6). Issues also arise for geometries in the syntactic domain, where they have been fruitfully applied to capture patterns of agreement (e.g. Béjar 2003, Preminger 2014, Coon & Keine 2021). Hammerly (2020, 2021a) shows that, because of the implicational relations between features, the feature geometry under-generates the possible set of person probes, in particular lacking the means to capture so-called ME-FIRST (and YOU-FIRST) type effects found with the Person-Case Constraint and other person-sensitive agreement phenomena. The conclusion to be drawn from all of this is that geometries, while useful descriptive tools for mapping the various relations that hold between features, should not be used to actually encode these relationships.

6.3. INTERIM DISCUSSION. The goal of this section was to show that the two primary alternatives, one based in Harbour's original theory of lattice interaction, and one based in the feature geometry, both fail (albeit in different ways) to capture the full empirical landscape covered by the proposed 'set-based' account grounded in the theory of contrastive interpretations. In this section, I consider a number of additional points of difference between the accounts that deserve some rumination.

The first is that both the feature geometry and lattice operations must lean heavily on the principle of lexical complementarity to derive the proper partitions—the features themselves do not produce the right result. The current account leans on a somewhat similar set of principles through the theory of contrastive interpretations, but its point of influence is quite different. Lexical complementarity operates on the output of feature composition, while contrastive interpretations is operative during the acquisition of features.

The second difference is that the current theory need not avail itself of additional parameters on feature combination or composition. With the feature geometry, where, for example, the presence

of [Author] necessarily entails the presence of [Participant], it is not possible to generate feature combinations that exclude a less specific feature such as [Participant] or [Proximate] when a more specific feature such as [Author] is present. This is not the case in the current set theory, where all feature combinations are possible (though, the ones that fail to result in a contrast are unattested). In the lattice operations account, all possible feature combinations are allowable, but the order of composition is not free of restrictions. When two features are on a single head, as is the case for [Author] and [Participant], their order of composition must be specified in an additional parameter. In the current theory, when two features are on a single head, their order of composition makes no difference to the final output — the conjunction-based semantics allows for the commutability of features. Therefore the set-based account is fully free of restrictions both on the combination and composition of features, providing a more elegant solution that combines the best of both of these previous analyses.

While a conjunction-based account was shown to be sufficient here, Harbour (2016) argues rather forcefully against conjunction-based solutions to the partition problem. The main line of objection is the requirement that a third feature be introduced into the system — this additional feature is [Addressee]. With a conjunctive semantics and only [Participant] and [Author] features, it is not possible to generate an inclusive/exclusive distinction. The [Addressee] features makes the clusivity distinction possible.

Harbour argues that once a third feature is added, unless we add additional restrictions on feature combinations (e.g. as in the feature geometric account), we lose the possibility of explaining Zwicky's problem (and therefore the original partition problem). If [Addressee] were allowed to combine with [Participant] in the absence of [Author], as shown in 70, the unattested tripartition with a GENERIC SECOND category would be generated.

(70) *The unattested tripartition with the generic second person*

    a. $[\![\{\pi, \text{Participant}, \text{Addressee}\}]\!]$

       = the set contains a person $\wedge$ a participant $\wedge$ an addressee $= u_o, iu_o$

    b. $[\![\{\pi, \text{Participant}\}]\!]$

       = the set contains a person $\wedge$ a participant $= i_o, iu_o, u_o \equiv i_o$

    c. $[\![\{\pi\}]\!]$

   = the set contains a person $= i_o, iu_o, u_o, o_o \equiv o_o$

Following the insight of Cowper & Hall (2019), the adopted account gets around the third feature problem by instead deriving [Addressee] from [Participant] itself under constrained conditions grounded in a general theory of the acquisition of features. In the proposed system, there are only two features, but [Participant] lives a double life as either [Participant] or [Participant*],

where [Participant*] is functionally equivalent to an [Addressee] feature. The critical difference is that there is a tradeoff between these two variants: it is not possible for a language to have both [Participant] and [Participant*] active at the same time (the same way, for example, that it is not possible for *Spiderman* and *Peter Parker* to be seen in the same room together). As a result, it is impossible to generate the unattested pattern of conflation in 70.

The final point, and the major contribution of this paper, is that the current account was the only one that adequately captured the partition made by [Proximate]. For the feature geometry, the options end up being (i) capture the original partition problem, but overextend obviation contrasts to the local persons; or (ii) capture the right partition for Ojibwe, but incorrectly predict that all languages with contrasts between participants versus non-participants should show an obviation distinction in the third persons. Neither of these pass empirical muster. For Harbour's theory, only with the addition of the theory of contrastive interpretations (or some other theory that prevents all logical feature-value combinations from arising) could obviation be restricted to apply only to the third persons. Given that a rather simple conjunctive semantics free of restrictions on feature composition is also adequate when combined with the theory of contrastive interpretations, the present proposal has the edge.

7. NOUN CLASSIFICATION BEYOND ANIMACY. Up to this point, only the animacy-based noun classification system of Ojibwe (which is more or less representative of the state of affairs in Algonquian languages) has been considered. In this section, I sketch how the account can be extended to capture other types of noun classification such as those found in Zapotec, Romance, and Bantu languages. I provide a formal typology of two different types of noun classification. The first, CONTAINMENT-TYPE classification (e.g. Algonquian, Zapotec), leads to proper subset-superset relations between partitions related noun classification and person. The second, CROSSCUT-TYPE classification (e.g. Romance), results in partitions where such containment relations do not hold. Bantu languages show a combination of these two types.

I start with containment-type systems, which were the focus of the present paper. As schematized in 71, a critical property of the person, obviation, and animacy features in Ojibwe is that they stand in CONTAINMENT RELATIONS, with ϕ being the maximal set, and [Animate], [Proximate], [Participant], and [Author] forming smaller and smaller proper subsets of the overall ontology.

(71) *Containment relations between features in Ojibwe*
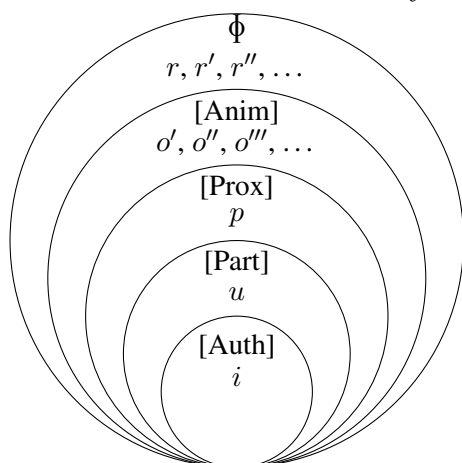
These containment relationships underlie the PERSON-ANIMACY HIERARCHY (PAH; e.g. Silverstein 1976, Aissen 1999), which provides a description of a wide range of syntactic phenomena related to case, movement, and agreement. A general scale for Algonquian is given in 72.[9]

(72) FIRST > SECOND > PROXIMATE > OBVIATIVE > INANIMATE

To take a commonly discussed example, so-called DIRECT-INVERSE Voice marking in Ojibwe can be described as 'hierarchy sensitive'. Consider again the sentences in 73, repeated from 12.

(73) a. o-gii-waabam-**aa**-n ikwe-wan   gwiiwizens
          3-PAST-see-**DIR**-OBV woman-OBV boy
          'The boy (PROX) saw the woman' (OBV)'

      b. o-gii-waabam-**igoo**-n gwiiwizens-an ikwe
          3-PAST-see-**INV**-OBV boy-OBV   woman
          'The boy (OBV) saw the woman' (PROX)'   (Hammerly 2021b)

When the higher ranked proximate argument is the external argument and the lower ranked obviative argument the internal argument, as in 73a, a DIRECT marker *-aa* is exponed as Voice. When the alignment between argument position and obviation status is reversed, an impoverished form of Voice, the INVERSE marker *-igo(o)*, appears instead.

Going into the mechanics of how these types of agreement effects arise is beyond the scope of this paper (for recent analyses of hierarchy effects in Ojibwe and beyond, see Oxford 2019, Hammerly 2020, 2021a, Coon & Keine 2021, Foley & Toosarvandani 2022). What underlies each account, and what is relevant here, is an appeal to the containment relations between features, either directly through syntactic analogues of the sets that each feature ultimately denotes (Hammerly 2020, 2021a), or indirectly by appealing to a feature geometric representation (Oxford 2019, Coon

& Keine 2021, Foley & Toosarvandani 2022).

Recent work by Foley & Toosarvandani (2022) on clitic restrictions in Zapotec languages is particularly relevant. Clitic combinations in some varieties of Zapotec show effects akin to the PERSON-CASE CONSTRAINT (PCC)—a hierarchy-sensitive phenomenon commonly found in Romance languages—but with restrictions targeting categories related to noun classification in addition to person. Noun classification in Sierra Zapotec partitions third persons on four dimensions: ELDER human, non-elder HUMAN, ANIMAL, and INANIMATE. Like with direct-inverse marking in Ojibwe, the effects can be described by a scale that places both person and the categories related to noun classification on a single cline, as shown in 74.

(74)   FIRST/SECOND > ELDER > HUMAN > ANIMAL > INANIMATE

Foley & Toosarvandani sketch a semantics for the features that encode these contrasts (I change their [Elder] feature to the more general [Rel(ational)] following Coon & Keine (2021)). Like the cline formed by person, obviation, and animacy, and as expected based on the hierarchical relations in 74, these features stand in proper containment relations, as schematized in 75.

(75)   *Containment-type noun classification in Sierra Zapotec*
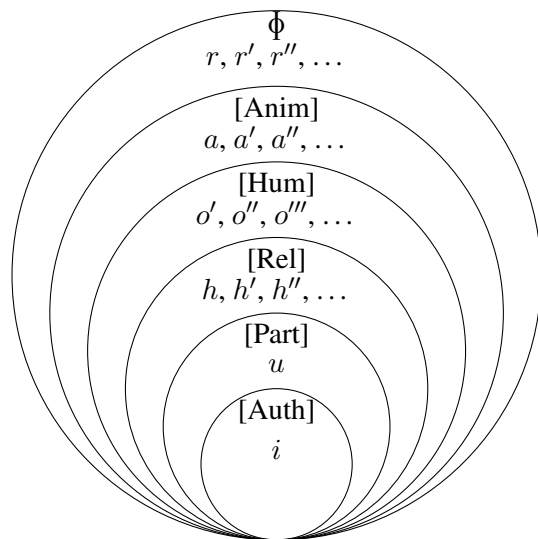
The presence of this type of system suggests further additions to the ontology, with the h's representing a honorific status related to being an elder, mayor, or the like, the o's representing other humans, the a's non-human living things, and finally the r's non-living things. As mentioned in §2.2, the expansion of these categories is likely due to the addition of ontological distinctions that have emerged diachronically. While it remains possible that all humans have an innate and universal set of ontological categories with features conspiring to either conflate or distinguish these various concepts, it is perhaps more likely that at least certain aspects of the ontology related

to the various types of others are learned, and therefore not strictly fixed.

I turn now to considering what I have termed crosscut-type systems. For example Romance languages (and indeed, Indo-European languages more broadly) tend to have a binary noun classification system roughly based in gender or sex, with the MASCULINE category indicating that the referent is masculine or male, the FEMININE category indicating that the referent is feminine or female. That said, the 'semantic core' of noun classification in these languages is often not observable, especially in the binary systems, where inanimate and abstract nouns are still classified as MASCULINE or FEMININE without any meaningful indication of 'maleness/masculinity' or 'femaleness/femininity'. To the extent that there is a semantic core to these systems, the cut being made does not result in the same sorts of containment relations as was seen with Algonquian and Zapotec. Continuing with the binary MASCULINE/FEMININE system, consider the figure in 76, which represents the state of affairs in French.[10]

(76)   *Crosscut-type noun classification in French*
$[+\text{Masc}]\,[-\text{Masc}]$
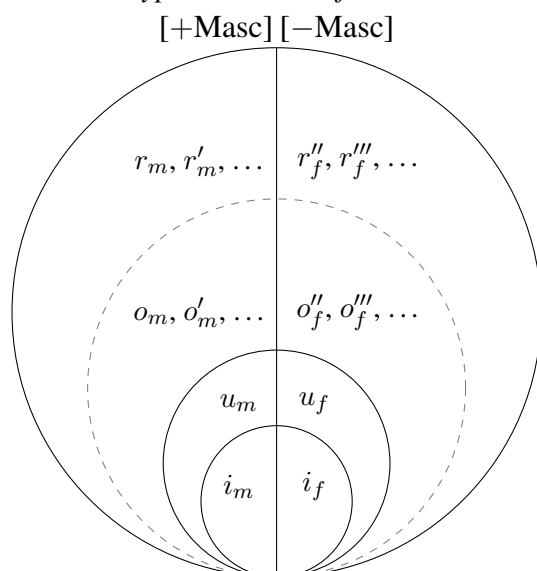
The distinction between MASCULINE and FEMININE crosscuts all members of the ontology rather than creating a sub-division of the ontology. This is evidenced most clearly in the patterns of agreement, shown in 77, where the others 77a, the addressee 77b, and the author 77b can all be associated with either MASCULINE or FEMININE agreement on predicative adjectives.

(77)   a.   Il/elle   est   heureu(-x/-se)
            3.MASC/3.FEM be.3 happy(-MASC/-FEM)
            'He/she is happy'

       b.   Tu es   heureu(-x/-se)
            2   be.2 happy(-MASC/-FEM)
            'You are happy'

c. Je suis heureu(-x/-se)
    1 be.1 happy(-MASC/-FEM)
    'I am happy'

Roughly, the MASCULINE variant asserts or presupposes (the distinction is not particularly important here, but see Cooper 1983, Heim & Kratzer 1998, Sauerland 2008) that the referent is masculine or male, while the FEMININE variant asserts or presupposes that the referent is feminine or female. This can conjunctively combine with the predicate that dictates the referent is the author, the addressee, or an other, as the case may be.

Much more needs to be said about the semantics of this type of system of noun classification, particularly given the fact that not all alternations between MASCULINE and FEMININE lead to straightforward meaning alternations based in sex or gender, and the fact that the masculine variant tends to be used as the 'unmarked' or default form when gender or sex is unknown (for a recent account for French, see Hammerly 2019). For now, I leave the reader with the fact that this general characterization of crosscut-type noun classifications systems captures the fact that, unlike containment-type noun classification, these systems do not give rise to Person-Animacy Hierarchy effects like the PCC (Stegovec 2020). This is predicted by the fact that the denotations that underpin these features are not described by appealing to subset/superset relationships between MASCULINE versus FEMININE categories.

Finally, Bantu languages appear to combine containment-type and crosscut-type classification in what we can term a HYBRID-TYPE system. I take Swahili as an immediate example (Pesetsky 2019), though many other Bantu languages show the same type of contrast (see, e.g. Carstens 1991, 2008, 2010). The containment-type portion of the system is found with class 1/2, which only picks out animate-denoting nouns (though, not all animate-denoting nouns fall into this class). The examples in 78 give a sample reported in Pesetsky (2019).

(78)   *m-toto* 'child', *m-walimu* 'teacher', *m-dudu* 'insect', *m-nyama* 'animal', …

While short threads of semantic coherence can be found in the other noun classes, for example, 3/4 includes nouns referring to most trees, no class is uniform in the same way as 1/2—3/4 also includes many other types of nouns. Across a number of Bantu languages, class 1/2 often shows exceptional morphosyntactic behavior that can be readily described as a hierarchy effect—for example, by aligning with the first and second person to the exclusion of all other noun classes in patterns of anti-agreement (e.g. Diercks 2010, Baier 2018). Like Romance, many additional complexities have been glossed over in this short discussion, but the main point stands: Noun classification in Bantu languages generally shows a mixture of containment-type behavior (with class 1/2) and crosscut-type behavior (with all other classes). The consequences of the proposed

typology of different noun class systems should be rich ground for future work.

8. CONCLUSION. The goal of this paper was to advance an ontologically-based theory to capture distinctions in person, animacy, and obviation in Ojibwe. I showed that the addition of ontological primitives related to obviation and animacy, and two binary features [±Animate] and [±Proximate], is able to capture the six-way partition that distinguishes EXCLUSIVE, INCLUSIVE, SECOND, PROXIMATE, OBVIATIVE, and INANIMATE in addition to distinctions in number. I provided set-based denotations for features related to person, animacy, obviation, and number with composition based in predicate modification (i.e. conjunction) and governed by binary values. I joined Cowper & Hall (2019) in arguing that the theory of contrastive interpretations provides the proper means to derive patterns feature interpretation, providing a novel formalization of the system and a new extension to Ojibwe. A major boon of the proposed system is freedom from restrictions on feature combination (i.e. there are no universal implicational relations between features) and composition order (i.e. composition between features is fully commutable).

The extension to Ojibwe gave way to a critical discussion of alternative accounts including the feature geometry (Harley & Ritter 2002) and lattice action (Harbour 2016), which have previously been argued to capture the partition problem in the core persons. I showed that accounts based in the feature geometry are not able to capture the partition of Ojibwe without over-predicting the typological distribution of the distinction. The lattice action account could not capture the partition of Ojibwe on its own, requiring the theory of contrastive interpretations (or some similar account) to restrict possible feature combinations and prevent obviation distinctions from arising in the local persons.

The paper sheds light on the similarities between person, obviation, and certain types of noun classification. All three of these types of features are connected by serving to carve up the ontological space of possible persons. While the animacy-based noun classification system of Ojibwe was the primary focus, the account showed promise in being applied to other noun class systems exemplified by languages in the Zapotec, Romance, and Bantu families. Further explication of the account to these systems and beyond is sure to bear more fruit.

A. DERIVATION OF THE FULL ONTOLOGY.

(79) $\llbracket \phi \rrbracket = \mathcal{P}(\{i, u, p, o, o', \ldots, r, r', \ldots\})$

$= \{\{i\}, \{i, o\}, \{i, o'\}, \ldots, \{i, o, o'\}, \ldots,$

$\{i, r\}, \{i, r'\}, \ldots, \{i, r, r'\}, \ldots,$

$\{i, r, o\}, \{i, r', o\}, \{i, r, o'\}, \{i, r', o'\}, \ldots,$

$\{i, r, r', o\}, \{i, r, r'o'\}, \{i, r, o, o'\}, \{i, r', o, o'\}, \ldots, \{i, r, r', o, o'\}, \ldots,$

$\{i, p\}, \{i, p, o\}, \{i, p, o'\}, \ldots, \{i, p, o, o'\}, \ldots,$

$\{i, p, r\}, \{i, p, r'\}, \ldots, \{i, p, r, r'\}, \ldots,$

$\{i, p, r, o\}, \{i, p, r', o\}, \{i, p, r, o'\}, \{i, p, r', o'\}, \ldots,$

$\{i, p, r, r', o\}, \{i, p, r, r'o'\}, \{i, p, r, o, o'\}, \{i, p, r', o, o'\}, \ldots, \{i, p, r, r', o, o'\}, \ldots,$

$\{u\}, \{u, o\}, \{u, o'\}, \{u, o, o'\}, \ldots,$

$\{u, r\}, \{u, r'\}, \ldots, \{u, r, r'\}, \ldots,$

$\{u, r, o\}, \{u, r', o\}, \{u, r, o'\}, \{u, r', o'\}, \ldots,$

$\{u, r, r', o\}, \{u, r, r'o'\}, \{u, r, o, o'\}, \{u, r', o, o'\}, \ldots, \{u, r, r', o, o'\}, \ldots,$

$\{u, p\}, \{u, p, o\}, \{u, p, o'\}, \ldots, \{u, p, o, o'\}, \ldots,$

$\{u, p, r\}, \{u, p, r'\}, \ldots, \{u, p, r, r'\}, \ldots,$

$\{u, p, r, o\}, \{u, p, r', o\}, \{u, p, r, o'\}, \{u, p, r', o'\}, \ldots,$

$\{u, p, r, r', o\}, \{u, p, r, r'o'\}, \{u, p, r, o, o'\}, \{u, p, r', o, o'\}, \ldots, \{u, p, r, r', o, o'\}, \ldots,$

$\{i, u\}, \{i, u, o\}, \{i, u, o'\}, \ldots,$

$\{i, u, r\}, \{i, u, r'\}, \ldots, \{i, u, r, r'\}, \ldots,$

$\{i, u, r, o\}, \{i, u, r', o\}, \{i, u, r, o'\}, \{i, u, r', o'\}, \ldots,$

$\{i, u, r, r', o\}, \{i, u, r, r'o'\}, \{i, u, r, o, o'\}, \{i, u, r', o, o'\}, \ldots, \{i, u, r, r', o, o'\}, \ldots,$

$\{i, u, p\}, \{i, u, p, o\}, \{i, u, p, o'\}, \ldots, \{i, u, p, o, o'\}, \ldots,$

$\{i, u, p, r\}, \{i, u, p, r'\}, \ldots, \{i, u, p, r, r'\}, \ldots,$

$\{i, u, p, r, o\}, \{i, u, p, r', o\}, \{i, u, p, r, o'\}, \{i, u, p, r', o'\}, \ldots,$

$\{i, u, p, r, r', o\}, \{i, u, p, r, r'o'\}, \{i, u, p, r, o, o'\}, \{i, u, p, r', o, o'\}, \ldots, \{i, u, p, r, r', o, o'\}, .$

$\{p\}, \{p, o\}, \{p, o'\}, \ldots,$

$\{p, r\}, \{p, r'\}, \ldots, \{p, r, r'\}, \ldots,$

$\{p, r, o\}, \{p, r', o\}, \{p, r, o'\}, \{p, r', o'\}, \ldots,$

$\{p, r, r', o\}, \{p, r, r'o'\}, \{p, r, o, o'\}, \{p, r', o, o'\}, \ldots, \{p, r, r', o, o'\}, \ldots,$

$\{o\}, \{o'\}, \ldots, \{o, o'\}, \ldots,$

$\{o, r\}, \{o, r'\}, \{o', r\}, \{o', r'\}, \ldots, \{o, o', r\}, \{o, o', r'\}, \ldots, \{o, o', r, r'\}$

$\{r\}, \{r'\}, \ldots, \{r, r'\}, \ldots, \{\}\}$

$= \{i_o, i_r, i_{or},$

$ip_o, ip_r, ip_{or},$

$$u_o, u_r, u_{or},$$
$$up_o, up_r, up_{or},$$
$$iu_o, iu_r, iu_{or},$$
$$iup_o, iup_r, iup_{or},$$
$$p_o, p_r, p_{or},$$
$$o_o, o_r,$$
$$r_r\}$$
$$= \{i_{por}, u_{por}, iu_{por}, p_{or}, o_{or}, r_r\}$$
$$= \mathscr{L}_\varphi$$

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NOTES

[1]In §8, I provide evidence that the proximate and obviative categories can include mixed reference to both animate beings and inanimate things. At present, there is no direct evidence of this for the other categories of person in Ojibwe, but the account predicts and that this should be possible (e.g. exclusive referring to the author and inanimate things). Future work should put this prediction to the test.

[2]A cognate morpheme *-yi-* in Plains Cree (Central Algonquian) has been argued by Muehlbauer (2012) to be a SWITCH-REFERENCE marker rather than obviative agreement. At least for Ojibwe, such an analysis runs into issues with the example in 10b, where the matrix and embedded subjects are different, but *-ni-* is ungrammatical.

[3]Also relevant to note here is that certain dialects of Blackfoot also show a contrast between proximate and obviative in the first and second persons (Frantz 1991, Wiltschko et al. 2015). However, like the inanimate nouns (and unlike animate third persons), these forms are restricted in their syntactic distribution (Bliss 2005a, Wiltschko et al. 2015). Following Bliss (2005a) and subsequent work, I assume that this represents an extension of the system outside of the immediate scope of the current paper (e.g. into point-of-view marking) and leave further discussion and analysis to future work (though see Hammerly 2020: for some initial directions).

[4]A point of motivation for the notation: I have chosen r as a shortening for *res*, meaning 'thing' in Latin. I opted not to use t (would-be for *thing*) in order to avoid any potential confusion with truth values; furthermore i (would-be for *inanimate*) is already used for the first person, and should not do double duty.

[5]This subscript notation is taken from Harbour (2016), and the reader is referred to pg. 72 for formal details.

[6]The reader may wonder about the representational status of contrastive hierarchies. In short, they are schematic devices — it is not the case that features are literally organized into such hierarchies. It is a way of showing how features can differ in what divisions they make depending on what other features in the inventory are dividing. As a result, the contrastive hierarchies should not be construed as mental representations, but purely as a way of schematizing the contrastive scope relationships between features, which allows the particular interpretation of the features to be established over the course of acquisition. This marks an important conceptual difference from alternatives such as the feature geometric approach, where a (geometric) hierarchy is directly represented and manipulated by the grammar (e.g. Harley & Ritter 2002, Preminger 2014).

[7]As a point of reference, the semantics of values and lattice action/interaction is not uniform in Harbour (2016) either. Harbour takes positive and negative values on person to represent pairwise addition and cumulative subtraction, respectively (see §6.1 for details), while negative values on number features to be logical negation of the predicate denoted by the number feature (and positive values to be the absence of negation with the predicate). From this point of view, to the degree that unifying the denotation of values across features should be a goal, the current account satisfies this desideratum with negative values on person, number, and noun classification all denoting logical negation.

[8]While I do not consider the additional alternatives here, the further composition orders that are allowed when the assumption is relaxed are also unable to derive the proper partitions for Ojibwe. For details, see Hammerly (2020).

[9]There is variation and debate with the ranking of the first and second persons in Algonquian. As Hammerly (2020) shows, Algonquian languages show two patterns: They either collapse the ranking between FIRST and SECOND, or show evidence of a ranking of FIRST over SECOND. The apparent 2 > 1 effects in the person prefix agreement marker (e.g. Lockwood & Macaulay 2012) more likely reflect conditions on the spell-out of morphology rather than underlying agreement preferences. For the purposes of this discussion, which centers around animacy and obviation, the rankings of the participants is not particularly important.

[10]The line that divides ANIMATE/INANIMATE is greyed and dashed as to not take a strong stance on whether or not such a feature is present. The presence or absence of this distinction does not affect the main point being made here.