Natural Language Conjunction: Universal Grammar or Universal Logic?

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Abstract:

In this paper I argue that conjunction does not adhere to minimalist principles because NP conjunction is a set of potentially 'equal' elements that may, or may not, be interpreted as collective. As a concatenation of individual elements (interpreted either plurally or collectively singular), NP conjunction does not project relations as words with 'special content' do, creating predictable and reproducible patterns which result in syntax. Thus, a foundational logic, or protologic, allows natural human language syntax and rather than being generative, syntax is itself generated by logical relations among concepts. While norms and conventions are easily and predictably abstracted and interpreted from simple constructions, the interpretation of semantic features such as number and gender appears to add a level of uncertainty and complexity that results in varied coordination systems among the world's languages. This 'issue' is solved if we accept that semantics—that is, meaning-- drives syntax and that the structures we use to communicate are the basic structures of logic utilized across the cognitive spectrum.

Keywords: Logic, syntax, conjunction, philosophy of language, grammar, natural language

1. Introduction: The conjunction problem in logic and linguistics.

Noun Phrase conjunction is a remarkably common feature of natural human languages, so simple that it is apparently intuitive to speakers. Yet syntactic theories following Universal Grammar have great difficulty describing its structure, and NP conjunction is rarely, if ever, included in syntax textbooks. Particularly since the introduction of X-bar theory, syntactic descriptions following Chomsky have failed to provide a comprehensive or consistent account of Noun Phrase (NP) coordination, a topic almost invariably avoided in syntax textbooks. Although X-bar syntax expects binary branching for all derivations, this is arguably counterintuitive to native English speakers (at the very least), for whom it is difficult to imagine an asymmetric, hierarchical relationship of a particular Noun Phrase over other NPs. This intuition—that the members, the conjuncts, of a coordinated noun phrase are 'equal'—is in fact contradicted by X-bar syntax, which would expect the conjuncts to be binary results of a hierarchical merge operation.

1.1 'And' as Logical Operator: The Philosophy of Conjunction.

The problems associated with conjunction do not begin with generative syntax; in fact, fitting conjunction into modern theories of syntax brings to light long-argued debates regarding the very foundations of logic and the nature of the relationship between logic and natural language. While in philosophies of logic conjunction is considered a primitive operator integral to any logic, Universal Grammarians following Chomsky have had great difficulty fitting conjunction into their syntactic systems (i.e., conjunction is invariably left out of syntax textbooks), which seems, at the same time, not only to point to a fundamental flaw in generative linguistics but also to provide an impetus to investigate the often-overlooked relationship between natural

language and logic. While logical conjunction, as Frege characterized it, "always indicates a certain equal footing" [Frege, 2007, p. 73], in Chomskyan syntax, all utterances are results of an asymmetrical binary-merge operation, which always place a head at the top of a rigidly hierarchical structure.

1.1.1.   Conjunction as Combinitivity and Unity

The idea of an a priori intuition of unity or combinitivity was integral to Kant's conceptualization of the understanding of the external world. First, in the combination of received presentations to form a whole–a unified idea— the synthesis of external impressions precedes the logical functional categories [*Critique of Pure Reason* B130-131]. The sequential additivity of presentations results, in fact, in a consciousness, the very "I" that determines cognition. Importantly, combination precedes experience, because there is no object that intrinsically contains a combination; the presentation of a combination or a unity (a set, a category, a whole) is only interpretable as such by an "I" [B135]. We call a *whole* that which includes components we cannot or do not distinguish.

In logic, words (signs) have been traditionally divided into content words and function words; Carnap [1958] divided such signs into the *descriptive*, "those which serve to refer to objects, properties, relations, etc., in the world"; and *logical*, which include the connectives [1958, p. 7]. It is significant, perhaps, to note that for the descriptive (non-logical) signs, "meaning is attached…only when we apply them… The use of logical signs is determined by the logical rules of the language; on the other hand, meaning is arbitrarily attached to the descriptive signs when they are applied to a *given domain of individuals*" [Carnap, 1958, p. 8, my emphasis]. Conjunction (represented by the English 'and', the logical product) stands alongside disjunction (English 'or', alternation or logical sum), negation ('not'), material implication ("if A then B"), and equivalence ("if and only if").

Chomsky [1955] was quick to point out the ambiguity between common speech and logical sense in the uncertain usage of English forms of logical connectives, but these issues had long been discussed by philosophers such as Russell, Tarski, and Quine. Tarski, writing in the early 1930s, was concerned with the abstraction of truth values from formalized structures from natural language, resulting in a recursive, generative syntax in which a conjunction, x, is the true logical product of y and z if and only if both y and z are true (if only y or z were true, x would be a disjunction) [Tarski 1983, pp. 175-176]. Quine emphasized the rhetorical conditions under which the 'and' is used, but was unconcerned as long as the truth value holds [1980, p. 10]. The same is true of disjunction, which can have an inclusive sense (in which "one or more of the components are true" [1980, p. 13] or an exclusive sense (in which only one of the components has to be true). Russell, who opined sarcastically that grammar was more logical than "the current opinions of philosophers" themselves [1996, p. 42], was concerned with the ambiguity of logical conjunction in grammar.

1.2.   Conjunctions as Sets in Natural Language

The arbitrariness of signs, as well as the function of logical signs to combine with descriptive signs to create sense, was a common theme among Carnap, Quine, and Russell, but the cognitive gap between class semantics and their logical relations becomes evident in the conjunction problem in grammar as described by Russell. In *Principles of Mathematics*, Russell attempted to clarify the idea of a collection, an aggregate or manifold as classes and sets–as being the

result of conjunctions, either enumerations (extensions) or by characteristic properties (intensions). Importantly, Russell noted that a class, "a numerical conjunction of terms" [Russell, 1996, p. 67], "may be regarded as logical fiction, manufactured out of defining characteristics" [Russell, 2005, p. 12n2, see also pp. 163-164]. Even if there appear to us reasonable features to combine into a class or category, there remains a gap between intentional meanings (extensions and intensions) and the logical relationships between them.   Conjunction, to Russell, is "a fundamental way of combining terms" [Russell, 1996, p. 69], the nature of which creates

> a grammatical difficulty which, since no method exists of avoiding it, must be pointed out and allowed for. A collection, grammatically, is singular, whereas A and B, A and B and C, etc. are essentially plural. The grammatical difficulty arises from the logical fact that whatever is many in general forms a whole which is one; it is, therefore, not removable by a better choice of technical terms. [Russell, 1996, p. 69-70]

This becomes a grammatical problem, because we can construct classes (in our case, noun phrases) that contain features or elements that can be contradictory to each other, but that grammar expects to correspond ("match up") to a verb or feature category.

Further, conjunction can be read either collectively, as in (1)

(1)   Brown and Jones are two of Miss Smith's suitors.

or distributively, as in (2):

(2)   Brown and Jones are paying court to Miss Smith.

In (1), Brown and Jones (each, together) make up a class, a combination of elements; the predicate is not true of either Brown or Jones individually. The distributive reading in (2), however, is true of either Brown or Jones, as this is a case of sentential or prepositional conjunction; proposition (2) is in fact the *conjunction* of *Brown is paying court to Miss Smith* and *Jones is paying court to Miss Smith* [1996, p. 70].

Set theoretically, natural language conjunction can be described distributively, resulting in a union (Example 1, from [Winter, 1996]):
Example 1:

$$\text{Mary and John are tall}$$
$$M \cup J \subseteq \text{tall}$$

or collectively, which results in an intersection, as in (Example 2, [Winter, 1996]):

Example 2:

$$\text{Mary is tall and thin}$$
$$M \subseteq \text{tall} \cap \text{thin}$$

Attempts to unify the semantics of natural language conjunction have generally proved fruitless, as have attempts to universalize conjunction syntax. But recently [Mitrović and Sauerland, 2016] have proposed a dual conjunction syntax which, cross-linguistically, allows two interpretations of conjunction, one which represents the English *and* of nominal and clausal conjunction (represented by mereological sum, $P(r_1 \oplus r_2) = P(r_1) \land P(r_2)$), while another assumes a quantificational role, represented by Japanese *mo* (example 3).

Example 3.

<p style="text-align:center">dono gakusei **mo** don sensei **mo** hanashita
INDET student CO INDET teacher CO talked
"Every student and every teacher talked."</p>

In Japanese, according to [Mitrović and Sauerland, 2016], the morpheme *mo*, while unifying nominal and quantitative conjunction, is not capable of clausal conjunction [Mitrović and Sauerland, 2016, p. 473], as in "Mary is Tall, *and* John is thin." Further, Mitrović and Sauerland point out that in mathematical logic, "universal quantification can be reduced to a sequence of conjunctions (Figure 1). Larson points out [Larson 2013, p. 624] that constructions headed by a quantifier such as *every* "are not coordinated DPs; rather, they are single DPs headed by a quantifier that involve coordinated inner NPs." In natural languages, universal quantification solves the problem of number agreement in conjunctions.

Figure 1.

$$\bigwedge P(x) \Leftrightarrow P(r_1) \wedge \cdots \wedge P(r_n)$$

Thus while formal languages of logic attempt to clarify ambiguity from the symbols of natural language, the result of noun phrase (or nominal) conjunction is a set of enumerated members, either a mereological sum or a distributive set of subsets, determined typically by context if not directly from a verb or preposition, whether considered as one 'whole' consisting of atomic elements ($X[x_1, x_2, x_n...]$) or as a distribution of enumerated objects $X = (x, y, z...)$, the result is a *set* of elements.

Russell also mentioned the uncertainty of the status of *and* as a word: does the use of the operator add a conceptual notion beyond that of merely listing elements (as in juxtaposition)? If we accept that no word is "meaningless", he argued, does and contain a "propositional concept" or impose a relationship between the elements [Russell, 1996, p. 71]? Russell was suggesting that in a conjunction relation $a \wedge b$, the merge of two concepts *a* and *b* might involve a third meaning, *and*, rather than simply the set (a, b); thus the set (a, b) would contain three meanings: a, b, and *and*, or (a, and, b). Such logical problems with conjunction are illustrated by grammatical variation in the distribution of semantic features (case and agreement) among the world's languages.

1.3.1 Cognitive development of logical conjunction

In contrast to Chomsky's notion of a poverty of the stimulus, "grammatical development is typically slow and piecemeal" [Dabrowska 2004, p. 173]; and conjunction use is no different. Inherent in a coordinating conjunction like 'and' is a wide range of semantic variability, and Bloom et al [1980] found that the usage of coordination according to its polysemousness follows a specific acquisition order. Children's first use of coordination is *additive*, in which separate clauses are conjoined (along the lines of "I'm doing this *and* you're doing that"). Second comes *temporal relations*, indicating an order of events to take place. Lastly, coordination is utilized to represent a causal relationship. But these three usages for 'and' are not exclusive, and as children develop beyond the limited stage of phrasal/sentential coordination, they begin using conjunctions in a variety of ways, as Gleason and Ratner explain: "object specification— 'it looks like a fishing thing and you fish with it'—and adversative relation (expressing opposition)—'Cause I was tired and now I'm not tired'" [2009, p. 172]. Bloom et al's description of 'and' semantic emergence showed Additivity beginning at 26 months, Temporal relations at 28, Causality at 31, Object Specification at near 34, and, finally, Adversative relations at around 35 months [1980, p. 249].

Most syntax acquisition research indicates that children begin to use conjunctive coordination at between 23 and 28 months [Gleason and Ratner 2009; Tager-Flusberg et al 1982; Lust and Mervis 1980]. At this stage use of conjunction is limited semantically and not in the manner of adult usage [Gleason and Ratner 2009, p. 171-172]. Lust and Mervis [1980] and Ardery's [1980] research indicates a period of 'lag' before a full "correct and productive coordination" occurs; comfortable, adult-like usage of coordination seems to appear between 5 and 6 years of age [Lust and Mervis 1980, p. 303].

Lust and Mervis [1980] explained that sentential coordination precedes the use of phrasal coordination, but this is contrary to the rather overwhelming evidence that phrasal coordination, particularly of NPs occurs first; this is an important distinction as it seems to negate ideas concerning conjunction reduction [Gleason 2009 and references therein; Ardery 1980; Tager-Flusberg et al 1982]. Further, Tager-Flusberg et al explain that both children (as young as 4) and adults view sentences presumably containing a conjunction reduction like "John and Mary jumped" as being different from "John jumped and Mary jumped" [Tager-Flusberg et al 1982, p. 207].

Clearly coordination is not a simple thing and represents a variety of meaning, and can be used in a number of ways. The method in which children learn this is "constructive" according to Lust and Mervis, taking "several developmental periods" [1980, p. 302]. Further, "the existence of heterogeneous coordinations also suggest that this learning is gradual" [1980, p. 302]. They point out that this construction is "active" and can be compared to the method by which children acquire phonological rules [1980, p. 303]. This active, constructive learning of the use of coordination provides a counterexample to Chomksy's vague notion of "the poverty of the stimulus" to a primitive logical and communicative act.

1.3.2 Cognitive development of arithmetical abilities

Central to the question of the relationship of conjunctive (or additive) coordination with syntax is the nature of the acquisition or development of mathematical abilities in children. In the 1980s Jonas Langer showed that infants were capable of 'protological' operations, contradicting earlier assumptions "that logic requires a formal symbolic language" unusable by children until they "are ready to manipulate formal symbols" [1980a, p. xi]. Elementary logical operations are available and useable to infants, according to Langer's studies, including logicomathematical and physical cognition, and are "structured by the children's interactions with their environment" by the time they reach 12 months [1980b, p. 11].

Addition and subtraction are available to pre-linguistic infants, and even to monkeys [Houdé and Tzourio-Mazoyer 2003]. Butterworth's [2005] review of arithmetical development research indicates that by 4 months children can add and subtract one, by 11 months can distinguish increasing and decreasing numerosity sequences, and by 2 years begin to understand sequential linguistic counting. By 3;6 children "can add and subtract one with objects and number words" and can determine the numerosity of a set using the cardinality principle (the last number counted is the number of the set), by 5;6 they comprehend commutativity (that $2 + 4 = 4 + 2$) and, finally, complementarity (*if* $2 + 4 = 6$ *then* $6 – 4 = 2$) is understood by 6;6 [Butterworth 2005, p. 12 and references therein].

2. Conjunction syntax in natural languages

There is wide variability in the methods by which languages coordinate NPs. While in symbolic logic the conjunction marker commonly takes a central position (between two variables), natural languages offer a variety of positions for the operator. As in formal logics, the most common type of NP coordination appears to be monosyndetic central (x ∧ y), described as [A] co [B], as claimed by [Haspelmath, 2004] exemplified by English.

Some languages exhibit overt affixation (that is, the conjunction marker is 'attached' to a conjunct), and as further claimed by [Haspelmath, 2004], the prepositive [A][coB] is the most frequent of the affixational types, while the initial postpositive [Aco][B] appears less commonly. In the case of Oromo (Afroasiatic, North Kenya), case affixation in the form of a dative (DAT) suffix results in [Aco][B] [Gragg, 1976, p. 192]:

Example 4.

fard**aaf** haree
horse.DAT donkey
"a horse and a donkey"

Example 5.

haaDakoot**iif** abbaakoo
mother.POSS.DAT father.POSS
"my mother and my father"

According to [Underhill, 1976, p. 83] Turkish not only exhibits the monosyndetic central affixation [Aco][B], as in:

Example 6.

gazetey**le** kitabi okudum
newspaper.CO book.OBJ read.1SG …

but also allows an unaffixed conjunction marker, resulting in [A] co [B], here in example (7) showing asymmetrical case assignment between the verb and its closest conjunct, while (8) exhibits symmetrical coordination, both conjuncts taking the objective case from the verb:

Example 7.

gazete **ve** kitabi okudum
newspaper.NOM CO book.OBJ read.1SG

Example 8.

gazeteyi **ve** kitabi okudum
newspaper.OBJ CO book.OBJ read.1SG

All: "I read the newspaper and book"

The second most common structure of NP conjunction is the bisyndetic [A]co [B]co [Haspelmath, 2004], as in the Ethiopian Omotic language, Dizi [Allan, 1976, p. 390]:

Example 9.

yinu **ka** yetu **ka**
I CO you.NOM CO
"you and I"

Although Haspelmath claimed (2004) that there is no evidence for an initial prepositive monosyndetic ([coA][B]) construction, in Kongo (Narrow Bantu, Angola and Congo), the bisyndetic prepositive [coA][coB] seems to be standard, and in this case is affixed to the article [Bentley, 1887, p. 468]:

Example 10.

yo nge **yo** mono
CO.art 2SG CO.art 1SG
"you and I" or "you, with me"

In a number of other languages, postpositives ([Aco][Bco]) seem to exist because of a lack of a specific, standardized method of conjunction. That is, it may be one of many methods used to conjoin NPs. Consider these examples from Gurage (or Chaha; Ethiopian Semitic; [Leslau, 1950, p. 121]:

Example 11.

dängʸa tägräd(~**m**)
boys CO.girls(.CO)
"boys and girls"

Example 12.

dängʸa**m** gräd**em** yefäqär
boys.CO girls.CO play
"The boys and the girls play"

Example 13.

täqamfʷariyätä **tä**wåšer bäsär
CO.gazelle CO.water-gazelle the meat
"the meat of the gazelle and the water-gazelle"

In these examples (11-13, above) from [Leslau, 1950], we can see that in Gurage the conjunction can appear not only in either the prepositive [coX] or postpositive [Xco] positions, but the prepositive seems restricted to bisyndetic constructions. Notice also that the conjunction morpheme (t-, -m) is different depending on its place as a prefix or suffix.

The very rare type [A][Bco] [Haspelmath, 2004] is exemplified by Bolivian Quechua (Uto-Aztecan; [Bills et al., 1969, pp. 50, 107]:

Example 14.

hamusaq tokoman t'arataman-**wan**
come.FUT.1SG Toco.DAT Tarata.DAT.CO
"I shall come to Toco and Tarata."

Example 15.

runas warmis**wan** tusunqanku

man.PL woman.PL.CO dance.FUT.3PL
"The men and women will dance."

...but is also exhibited in Inuit (Eskimo-Aleut; [Bok-Bennema, 1991, p. 91]:

Example 16.

tuluit qallunaat kalaallil -**lu**
Englishmen Danes Greenlanders -CO
"Englishmen, Danes, and Greenlanders"

… at least one, Piraha (Brazil) has no syntactic nominal conjunction (that is, logical conjunction exists, because it must: but there is no conjunction exclusive to natural language syntax). According to [Everett, 2007], conjunction appears to only occur sententially (example 9; [Everett, 2007, p. 5]:

Example 17.

Ko'oi' (hi) hoaga'itaha'. Kohoi (hi pi'o) hoaga'itaha'
Ko'oi (he) came. Kohoi (he additionally/too) came
"Ko'oi came. Kohoi came (too)."

Juxtaposition can occur in NPs, in which there is no overt conjunction marker, just as Bertrand Russell asked; we find examples in several Southeast Asian languages, including the Tibeto-Burman language Garo (Assam), which often utilizes juxtaposition rather than a coordinator [Burling, 1961]. Similarly in Austro-Tai Nung (Viet Nam), below (examples 18 and 19), which utilizes the conjunction marker *sau* only occasionally [Saul and Freiberger Wilson, 1980, p. 17]:

Example 18.

pɨ bạo pɨ nang dạ láí
elder brother elder sister scold much
"The elder brother and elder sister scolded much"

Example 19.

áu có màc này **sạu** báh māy này ma kíhn
take plant fruit this CO leaf tree this come eat
"Bring this fruit and this leaf and eat them."

And the conjunction marker *nè* only used to mark an object conjunct; note that the plural marker, *maˌhn*, is nested hierarchically over the conjuncts, marking all of them plurals [Saul and Freiberger Wilson, 1980, p. 91]:

Example 20.

mhn àu mạhn thōi **nè** thụ **nè,** pôn **nè** áu ma
she take PL bowl CO.OBJ chopstick CO.OBJ plate CO.OBJ take come
"She brought bowls, chopsticks, and plates."

Similarly in Mulao (Austro-Tai, China), which can utilize juxtaposition or sentential coordination like Piraha [Drellishak, 2004, pp. 34-35]:

Example 21.

me ljem me tsui
have sickle have hammer

mɛ ljem **wɔ** tsui
have sickle CO hammer

Both: "There are sickles and hammers."

2.1 Case and Agreement in Conjunction

Since at least 1995, Chomsky has been describing the essential feature of generative grammar as the "basic compositional operation MERGE, which applies to two objects X and Y, yielding a new one, K = {X,Y}" [Chomsky, Gallego and Ott 2019, p. 232]. But the intuition that conjuncts are 'equal', symmetrical, and thus flat syntactically, would be captured by a symmetrical distribution of case, as well as a collective (plural) reading of a conjunction of singular nouns.

Because contemporary X-bar theory abhors flat, unheaded structures, minimalist researchers have argued that asymmetrical, often *deviant* (i.e., ungrammatical), case-marking or agreement resolution are, in fact, evidence of the asymmetrical generative X-bar nature of natural language syntax.

While a number of researchers have attempted universalizing or at least elucidating the distribution of case or agreement in NP conjunctions, the varieties of case assignment and feature agreement in coordinated noun phrases has been a thorn in the side of universal grammar syntax for decades. A number of languages, in fact, prescribe an asymmetrical relationship and even native English speakers of a wide range of social classes frequently mistake case assignment within conjoined pronoun NPs. Deviant case assignment has been described in terms of Unbalanced Coordination (UC) by Johannessen, including this example (example 4) from Norwegian [Johannessen, 1998, p. 18]:

Example 4.

*han **og** meg* var sammen om det
3SG.NOM CO 2SG.ACC were together about it
?? "He and me were in it together."

While this example below (example 5) from English demonstrates what Johannessen calls Extraordinarily Balanced Coordination, coordinated phrases in which both or all conjuncts take an unexpected, deviant, or unconventional [Johannessen, 1998, p. 62]):

Example 5.

Them and us are going to the game together.

Deviant case and agreement in English has been described as usually occurring among "not so upwardly mobile persons" [Johannessen, 1998, p. 2], and a number of explanations

may be put forward for an educated, generally grammatical adult's misuse of pronoun case assignment, including the "polite I," and hypercorrection, when nominative (subject) forms are used because they are believed to be "proper" (and, conversely, avoided by others because they're perceived as pompous). Deviant agreement in English, however, is perceived more exclusively in the domain of specific social classes ("they is..." etc.).

Johannessen argued that the linear relationship of the adjunct to the head determines the relationship of the non-deviant conjunct to its verb [Johannessen, 1996, Johannessen, 1998]; similarly, some UG theories such as Close Conjunct Agreement (CCA) provide a linearity-based argument as an explanatory of UC (see [Nevins and Weisser, 2019] for review). CCA seems intuitive to some extent, as the conjunct closest to the verb is the easiest to which to project appropriate agreement features, leaving the further conjunct(s) more open to interpretation. But while CCA and UC may be somewhat common among languages of the world, they are far from universal.

The primary argument of minimalist/X-bar explanations of feature distribution in NP conjunctions has been that Case/AGR is determined by the structural position of the specifier to head relationship. In Chomsky's minimalist theory, "we assume that Case is always present abstractly" [Chomsky, 1995, p. 110], and "[w]e now regard both agreement and structural Case as manifestations of the Spec-head relation," [Chomsky, 1995, p. 174]. The result of this is a hierarchical binary-branching structure that is always asymmetrical, the features of which constrain movement of classes (roles) into class-positions (θ-positions). In colloquial speech, however, it appears that, both inter- and intra-linguistically, in languages that express phonological case or agreement, all combinations and distributions are acceptable. Some have categorized the phenomena by types (CCA, ECP, etc), but the fact remains that the overt expression of case or agreement does not simply follow the pattern of simple sentence without the interruption of a conjunction marker.

In Afar, for instance, according to Bliese's informative grammatical sketch, coordinated nominals (other than pronouns) always take the accusative while verbs take singular feminine agreement: Afar (or Qafar, Afroasiatic, Horn of Africa [Bliese, 1976, p. 143]:

Example 27.

num **'ke:** bar:r'ra   teme:'te
man CO woman.ACC came.FEM.SG
"a man and a woman came"

Example 28.

'awka **'ke:** sa'?ala barit-'t-e
boy.ACC CO older brother.ACC-learned.FEM.SG
"the boy and his older brother learned"

In many languages, agreement occurs according to complex hierarchies, or class systems, as part of gender agreement. In his grammar of Kongo, Bentley, a Baptist missionary, explained that verbs agree with the most important conjunct (often the plural if mixed), usually humans [Bentley, 1887, p. 710]; SEC=secondary, PRI=Primary, Cl*n*=class):

Example 29.

<div align="center">

yo mwana aku **ye** lekwa yandi wijidi
CO.ART child 2.PRI.POSS.PL CO.ART things 3.SEC.POSS.PL 3SG have come
"your child and his things have come"

</div>

Example 30.

<div align="center">

yo nkele andi, **ye** mbongo zandi jijidi
CO.ART gun 3POSS.SG CO.ART guns 3.PRI.POSS.PL Cl2.PL.PF.come
"his gun and his things have come"

</div>

If the conjuncts are not ordered by significance, the verb tends to agree with the rightmost (nearest) conjunct [Bentley, 1887]:

Example 31.

<div align="center">

yo mbongo zandi, **ye** nkele miandi mijidi
CO.ART goods 3POSS.PL CO.ART guns 3.PRI.POSS.PL Cl3.PL.PF.come
"his good and guns are come"

</div>

Another Khoisan language, Ila, has a method of avoiding pronominal case assignment confusion by including conjunction/comitivity morphologically within pronouns. In addition to nominative and accusative pronominal forms, there is also a conjunctive/comitative form, so that *ame* = "and I/me" as well as "with me" and *abo* = "with them", "and them", "they also" etc. [Smith, 1964, p. 92]. The Khoisan languages of Sub-Saharan Africa allow a distinctively wide array of such variability. This is interesting—perhaps predictable—because genetically Khoisan is one of the most variable and most ancient human populations.

It is important at this point to emphasize that only some languages overtly exhibit case. Among 50 languages I've investigated, only 21 had explicit case morphology, and according to the World Atlas of Language Structures, 100 of 261 languages have no morphological case [Iggesen, 2013].

2.2.   Comitivity

Comitivity is a relationship of association or accompaniment, indicated in English by 'with'. While English maintains a fairly clear distinction between comitivity and conjunction, many languages enjoy much overlap and others make no distinction between the two, exemplified by Ila pronouns as discussed above. Unlike the uncertain case and agreement features of typical conjunctive coordination, the relationship implied by accompaniment creates a natural asymmetry (i.e., a distinct *head* is accompanied) and is often clearly distinguished by case marking and unambiguous agreement patterns, as in English,

There is a spectrum of overlap between *with* and *and*, but in 103 out of 234 languages in WALS.info, the terms are completely synonymous, as in Luganda (Khoisan, Great Lakes; [Ashton, 1954, p. 434]):

Example 33.

<div align="center">

leeta amazzi **ne** ssabbuuni
bring water CO soap
"bring water and soap"

</div>

Example 34.

<div style="text-align:center">

jjangu **n**-affe mu katale

come CO.POSS.1PL to market

"come with us to the market"

</div>

In Catalan, a Romance (Indo-Hittite, Spain) language, comitative (COM) conjunctions can occur when the logical subject is singular, as in [Hualde, 1992]:

Example 35.

<div style="text-align:center">

amb la Irene som cosines

COM ART.F Irene be.1PL cousins.F.PL

"Irene and I are cousins"

</div>

But such a construction is not available when the conjunction is distributive:

Example 36.

<div style="text-align:center">

* **amb** en Pere som de Banyoles

COM ART.M Peter be.1PL from Banyoles

"Peter and I are from Banyoles"

</div>

Many of the languages of the Khoisan family have comitative conjunction, while it is rarely exhibited in our more familiar Eurasian languages (Indo-Hittite and Elamo-Dravidian families). Comitivity affects NP coordination because with is a preposition which projects case features. As opposed to conjunction, then, *with* is a content word from which relationships can be semantically interpreted, namely accompaniment, which then projects case; *and* does not seem to have this semantic role, simply signaling a concatenation of individual elements, as it does in its logical role.

3. Structural vs. Semantic hierarchies

Flat, unheaded conjunction structures may be contradicted by evidence of FCA, LCA and case asymmetries, but the hierarchical structure for which Minimalist syntacticians argue may be based not on an innate syntactic hierarchy as much as a semantic one: a conjunct receiving case or assigning agreement may be 'chosen' as the collector or projector of semantic features.

Khoisan is not alone in its resolution of features through a complex semantic hierarchy. Saeed's 2015 investigation of partial agreement in noun phrase conjunctions in Standard Arabic (SA) found that varying agreement patterns can be explained by a feature-driven hierarchical analysis: "there seems to be a featural hierarchy governing the order of the nominal DPs inside the ConjP." [Saeed 2015, p. 57]. He described the featural (that is, *semantic*) hierarchy as:

<div style="text-align:center">

Animacy>humanness>definiteness>honorificity>gender>number

</div>

<div style="text-align:right">

[Saeed 2015, p. 57]

</div>

He goes on to explain that "any agreement discrepancy that might arise is to be accounted for in terms of feature specification on the inflectional head" [Saeed 2015, p. 67], and that "all features are usually computed in favour of the first conjunct in SA" [Saeed 2015, p. 68].

A number of studies of the South Slavic languages have described an array of agreement patterns, of which linearity—linear closest conjunct-plays a role. In an analysis of Serbo-Croatian, Bošković states that "with plural conjuncts we get both LCA and FCA when the individual conjuncts are mixed feminine/neuter. When the non-agreeing conjunct is masculine, we still get FCA, but LCA is blocked" [Bošković 2009, p. 466]. Further, LCA and FCA are blocked when individual conjuncts are singular. Ultimately, "uninterpretable features do not need to undergo feature checking" [Bošković 2009, p. 494]. Further investigations of Serbo-Croatian [Murphy and Puskar] find that while CCA "is an illusion," "the phenomenon of CCA may seem to require some sensitivity to linear order in the agreement, we have shown that this step is not necessary." Experimental studies of NP coordination in South Slavic languages have led to the conclusion that "linearly based coordination proved the most common, the most readily available, and the highest-rated agreement pattern" [Willer Gold et al 2018, p. 499]. Importantly, these results were based on gender, and the "semantic import" of number appeared to drive expected agreement patterns [Willer Gold et al 2018, p. 499]. Similarly with case, according to Johannessen, "default case (or no case) occurs only in positions which are not assigned case in the ordinary way by spec-head agreement" [Johannessen 1996, p. 125].

So we know that both linearity (a *structural*—but non-hierarchical-- resolution) and semantics may resolve the conflict among coordinated NPs. Such decisions seem to reflect the speaker's experience, related to contextual factors—one still needs to have an understanding of plurality, for instance, as distinguished between British and American English:

Example 37.

<p style="text-align:center">The team is/are travelling to the arena.</p>

A speaker or hearer requires no structural interpretation for (37): purely the understanding of the NP as either a collective singular or as a plurality of individuals is based on the speaker's interpretation of this set of elements, and presumably based on learning experience [Haskell et al 2010; Montrul et al 2014; Lorimor et al 2018], i.e., one's notion of number. And one's knowledge of grammar may not correspond to one's own semantic conceptualizations: the standard English 2nd person plural, for example, seems unsatisfying to native speakers, and alternatives are typically used: "you guys," "y'all," even "yous," which seems to indicate again some semantic import to plurality that appears not to be unambiguously expressed in the prescribed "you." Further, speakers may interpret imaginary collective members of a labelled group even when the group is represented by a title, as commonly overheard in the USA:

Example 38.

<p style="text-align:center">*The Simpsons* are on every Sunday evening.[1]</p>

But,

Example 39.

<p style="text-align:center">*Friends* is on every night.</p>

The syntax of these sentences (examples 37-39), including the assignation of agreement, is clearly driven by semantics. The determiner in example 38, similar with The Beatles, appears to signal a familial plurality; the plural of the word "friend" doesn't seem to carry plurality without an expected determiner in this case. That a title or name should be referred to as singular has little influence on speakers. And a speaker's regard of a construction like "John and Mary" as a collective plural or based on a semantic hierarchy (e.g., masculine as a kind of default gender, etc.) should similarly *contribute* to the choice of agreement or case assignment.

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[1] Examples 38 and 39 are personal observations

4. Discussion: Syntactic explanations of Case/Agr in conjunctions

The variation in the attribution of case and the resolution of agreement features both st and within the world's languages pose a number of questions, if not serious challenges, to universalist notions of generative syntax. Many studies have comprehensively described phenomena such as CCA [Nevins & Weisser 2019] while a much smaller number have addressed the asymmetrical distribution of case. However, no explanation has provided a cohesive syntactic account for the variation seen in spoken natural languages, particularly English (represented by a proliferation of social classes, nations, and attitudes) which accepts or allows any or all possibilities of agreement and case resolution only rarely resulting in the prescribed grammar of textbooks. We have shown that the same semantic uncertainties present in NP conjunction may be present in simple sentences even without the intervention of a conjunction.

Case is abstractly present, of course, because thematic role is integral to a propositional concept. As we have seen, case is not universally expressed morphophonologically. In languages that expect or prescribe morphological case, linearity or semantic contexts may eliminate the need for expressing case, or result in unexpected case.

Linearity has played a significant role in analyses of conjunction, and word order often determines the *choice* of resolution. "The direction of unbalancedness correlates with the general direction of head-complement," Johannessen said of the languages she deliberately selected to analyze. Informatively, Johannessen explains that much of this is driven by thematic (i.e., semantic) properties. Thus, the structure--the syntax--is driven by semantics; that is, *meaning*. [Johannessen 270-271].

Experimental studies have shown that linearity can and does play a role in choosing agreement patterns [Gold etc], and linear adjacency has been posited as a motivator for CCA [Bennamoun 2009; Nevins & Weisser 2013], but linear features, such as intervention by adverbs, can also disrupt the application of CCA according to some researchers [Marusic in N&W]. In addition to examples 37-39, consider these examples which do not include conjoined NPs:

Example 40.

One of those **are** mine.

Example 41.

The key to all the doors **are** missing. [Boskovic 2009: 465]

It seems that linear adjacency may play a role in feature resolution whether or not a NP conjunction is involved; distributing case and agreement according to hierarchical structure seems less than intuitive, despite the Minimalist notion that a recursively hierarchical *merge* is the UG's sole defining operation [Chomsky, Gallego and Ott 2019].
Significantly, Nevins and Weisser note that "[i]t is still unclear whether all or any of these adjacency effects can or should receive a uniform explanation." [Nevins & Weiser 2013, p. 237]. A "uniform explanation" may be posited, however: that language is an *event* [Grattan-Guiness 2015], conjunction a *moment*; that choices are made by speakers according to individual knowledge of or attitudes toward normative grammatical rules and, often, social conventions, interfacing with semantic and/or temporal contexts. I won't even begin to discuss the who/whom situation in American English. Perhaps it is more appropriate that case and agreement in NP conjunction be studied by sociolinguists and semanticists: structure is driven by meaning.

Within a conjoined NP, there may be features contradictory to each other, or of dubious number, as eloquently discussed by Bertrand Russell in the early 20th century. Gender and number have some universal semantic import, as opposed to, say, color and width, and linear structure, typically adjacency, can play a role in agreement or case assignment. Decisions have to be made if the grammar expects feature resolution, that is, if one expects this level of inter-personal interpretability. If this is the case for conjoined NPs, is it an outlier from syntax? Does the conjunction throw a monkey wrench into what would otherwise be a straightforward, innate structure just waiting to roll off of our tongues? (One would have to wonder why it is sometimes so difficult to express oneself, or why it takes so many years for a child to learn to speak ade-quately.) Or rather is an NP conjunction a more obvious example of the distance between speech and our knowledge and experience of the world, telling us that neither case nor agree-ment is essential, but instead simply a normative convention to aid interpersonal sensibility? Examples 37-41 appear to support this latter suggestion.

Thus conjunction creates a logical problem in language, and syntax cannot provide a solution. Features (such as gender, number, agency/case) cannot percolate up or filter down, because such features cannot be resolved logically–logic is about relations not things or fea-tures of things (these logical "fictions" according to Russell). Things are represented in lan-guage as "abstract categories called lexical items" [Nordstrom 2017: 18] or "words with special content" (Frege); extensional or intensional sets, as opposed to those operations that express relations among things, which we refer to as logical terms.

Conclusion: Universal Grammar or Universal Logic?

The linguistic act of conjunction–the expression of the foundational act of set-building– does not project relationships, there is no "structure"; it describes the formation of a concept, a sim-ple, we might suggest primal, concept of concatenation. In the absence of a highly standardized language offering—rather conventionalizing—a grammatical solution, on-the-fly, often devi-ant constructions occur ("her and I are dating"). In the case of mixed conjuncts-those in which, perhaps, one conjunct is feminine and the other masculine, or one animate the other inanimate, and so on, languages develop conventions for resolving this issue. The implication, then, is that conjunction, as a primal logical operator, precedes language. If logical operations precede language, language itself may be allowed by this natural logical syntax available from our ex-perience of the outside world and normativized to aid interpersonal communication. Thus, "flat unheaded" constructions may exist, but the expectation to choose a collector or repre-sentative conjunct to express case or agreement features often results in a construction that, superficially, appears heirarchical.

The fundamental cognition of concatenation is not always binary, nor hierarchical, and this causes a major problem with *merge* in generative and minimalist syntax (which in fact may be a vague cover-term for the primacy of binary logical operations)—it is difficult for speakers to parse out which feature of an intensional set or which element of an extension shall carry semantic features, forcing a reliance on speaker's individual understanding of learned gram-matical rules. The hierarchy of binary structures that represent syntax is a result of multidi-mensional semantic projections from concepts that are forced to be expressed in spatio-tem-poral linearity, not an structure that exists somewhere in the human mind aprioristically.

This suggests an approach to syntax, at once Kantian and constructivist, that recognizes the evolution of cognition, the importance of meaning, and the significance of a foundational logic—not as a human-specific trait but rather as the abstraction of rules from experience of the outside world—that follows from the natural relations among concepts. The variability of

feature resolution in NP conjunctions supports non-generativist theories for syntax such as suggested by Jackendoff (2006) and Nordstrom (2017), as well as cognitive theories of language development (see Debrowska 2004); and further promotes an idea of Universal Logic as a science of patterns (Gaines 2015), consisting of primal logical structures (such as discussed by Béziau), which are themselves generative of syntax. Thus syntax is not itself generative, but is rather generated by the natural relationships among concepts.

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