

# Conjunction Weakening and Morphological Plurality

Ron Artstein  
*Rutgers University*

## 1. Introduction

This paper examines a characteristic which I will call “multiple plurality”, where the conjunction of two morphologically plural predicates requires a subject whose denotation consists of at least four individuals. I argue that this should be taken as evidence that plural expressions only include plural entities in their extension, and as evidence for the existence of cumulative (“non-Boolean”) conjunction on predicates.

As an example, think of the following situation: a teacher is asked to send all the children of medium height to participate in a play; however, the class only consists of tall children and short children. The teacher can explain why no children were sent by uttering (1) in Hebrew or (2) in English:

- (1) ha-yelad-im gvoh-**im** ve-nemux-**im**  
the-child-pl tall-**pl** and-short-**pl**
- (2) The children are tall and short.

The two sentences above appear like straightforward translations of one another; however, they are not exactly synonymous. English (2) can also be uttered by a parent of two children, one tall and one short, while Hebrew (1) requires at least two tall children and two short children to make the sentence true. It is natural to attribute this characteristic of multiple plurality in Hebrew to the plural morphology that appears on each of the conjuncts. A similar thing happens in Spanish: each conjunct is marked with plural morphology, and the sentence receives a multiple plurality interpretation.

- (3) Esos niño-s son alto-s y bajo-s  
those child-pl are tall-**pl** and short-**pl**

---

\* This paper was presented at WCCFL 20 at USC, and in a different form at TLS at the University of Texas; travel support from the Graduate School—New Brunswick is gratefully acknowledged. I thank the participants at both conferences for their comments and insights. I owe particular thanks to Chris Barker, Rajesh Bhatt, José Camacho, Sandy Chung, Veneeta Dayal, Beto Elias, Manuel Español Echevarría, Ed Keenan, Chris Kennedy, Hilda Koopman, Frida Morelli, Vieri Samek-Lodovici, Barry Schein, Phillippe Schlenker, Roger Schwarzschild, Yael Sharvit, Karina Wilkinson, and Yoad Winter. Of course, the responsibility for the views expressed in this paper, as well as any resulting inadequacies, is solely my own.

(For reasons unclear to me, Spanish speakers only accept this sentence with *esos niños* “those children” in the subject, not with *los niños* “the children”. While many speakers of Spanish and Hebrew require that there be at least two children of each height, some are content with two of one height and only one of the other; all speakers reject the sentences if there is one child of each height. I will ignore this variability now, accepting the majority judgment.)

The goal of this work is to explain how the multiple plurality requirement comes about, and the consequences this has on our understanding of plurality and conjunction. Multiple plurality receives a straightforward explanation if we accept the following assumptions.

- (4) Plural morphology in (1) and (3) is interpreted literally as semantic plurality: the morphologically plural expressions only include pluralities in their extension.
- (5) Cumulative (plural-forming, “non-Boolean”) conjunction is available for adjectives as well as for nominals.

Literal interpretation of the plural morphemes (Chierchia 1998) ensures that each conjunct will be instantiated by at least two individuals; cumulative conjunction (Krifka 1990) allows conjoined adjective phrases like *tall and short* to have a denotation with mixed referents, some of which are tall while the others are short. Cumulative conjunction of plural predicates thus results in a multiply plural predicate.

However, cumulative conjunction and multiple plurality are not as common as we might expect them to be. This is because the availability of cumulative conjunction is restricted by two additional factors.

- (6) Cumulative conjunction of adjectives is only available in cases of conjunction weakening.
- (7) Syntactic number agreement is needed independently of semantic interpretation of plural morphology.

Conjunction weakening (Winter 1996, 1998) allows cumulative conjunction of non-nominals only when their meanings are incompatible, that is when intersective (“Boolean”) conjunction is contradictory; syntactic number agreement does not allow the coordination of singular adjectives to be plural, blocking the cumulative conjunction of singular adjectives. The rest of the paper examines the above four claims in detail.

## 2. The representation of plurality

In order to account for the facts in (1)–(3) we need a theory of plurality. I will assume a structured domain of individuals, where plural objects are of

the same type as singular individuals, namely type  $e$  (Leonard and Goodman 1940). The choice of representing pluralities as mereological sums rather than sets is just a matter of convenience, in order to keep the types low. The domain of individuals has the structure of a free  $i$ -join semilattice (in the terms of Landman 1991), which is isomorphic to a structure where plurals are freely formed sets of individuals.

My claim is that expressions that bear plural morphology only include plural objects in their extensions, and thus contrast with expressions that lack number marking. English *tall* is unspecified for number; it has both singular and plural objects in its extension, and is closed under plural formation (8). Hebrew *gvoh-im* has an overt plural morpheme, so it only has plural elements in its extension; it is the closure under plural formation of singular *gavoah*, minus the singular individuals (9). I use direct interpretation and set notation in my representation; in the metalanguage  $AT$  is a function which returns the set of atomic individuals that make up a plural object, and  $PL$  is the set of all plural objects (individuals that are not atomic).

$$(8) \llbracket \text{tall} \rrbracket = \{ \alpha \mid \forall \alpha_1 \in AT(\alpha) [\alpha_1 \in \llbracket \text{tall} \rrbracket] \}$$

$$(9) \llbracket \text{gvoh-im} \rrbracket = \{ \alpha \mid \alpha \in PL \wedge \forall \alpha_1 \in AT(\alpha) [\alpha_1 \in \llbracket \text{gavoah} \rrbracket] \}$$

The assumption that morphologically plural expressions do not include singularities in their denotation is not unproblematic. Examples like (10) below (van Eijck 1983) suggest that morphologically plural common nouns like *men* should include singularities (individual men) in their extension, because the sentence is false if even one man walks.

(10) No men walk.

The argument goes as follows: examples like (10) suggest that singularities need to be included in the extension of plural expressions; this assumption does not pose other problems to the semantics of plurals; so it is safe to conclude that as a general rule, extensions of plural expressions include singular individuals.

The above argument rests crucially on the second premise, that the inclusion of singularities in the extension of plural expressions does not do any harm. An obvious challenge to this premise is that a sentence like *I saw boys in the park* is judged false if I only saw one boy. This can be argued to be a matter of pragmatics: the sentence may be semantically true, but pragmatically inappropriate given the alternative expression *I saw a boy in the park*. This pragmatic account does not generalize to the cases of multiple plurality. A situation with one tall child and one short one cannot be characterized by the Hebrew sentence (1). Yet there is no alternative sentence with singular expressions: sentence (11) is ungrammatical (the source of ungrammaticality will be discussed in more detail in section 5).

- (11)\*ha-yelad-im gavoah ve-namux  
 the-child-pl tall.sg and-short.sg

If the plural expressions *gvoh-im* and *nemux-im* include singularities in their denotations, we expect Hebrew (1) to be semantically true for two children, one of whom is tall and the other short, just like English (2). The pragmatic account given above fails to explain why the sentence is inappropriate.

Chierchia (1998) makes another argument against including singularities in the extension of plural expressions: he argues that it explains why mass nouns do not appear in the plural. In his theory, expressions with plural morphology receive a denotation that is disjoint from that of the corresponding singular expressions; mass nouns are inherently plural, so with plural morphology they end up denoting nothing. In response to examples like (10), Chierchia rejects the naive interpretation that *no* requires disjointness of its restrictor (*men*) and scope (*walk*); instead he proposes that *no* operates on the *ideal* generated by its restrictor, where an ideal  $\pi(\alpha)$  is defined as the set of all elements which are components of the join of  $\alpha$ :  $\{\beta | \beta \leq \bigvee \alpha\}$ . This allows him to maintain the idea that plural expressions only include pluralities in their extension.

Chierchia has provided a solution for the problem of the quantifier *no*; something similar could be done for *only* (Hoeksema 1983), treating it as a quantifier of some sort. However, the problem posed by (10) is much more pervasive. Plural expressions appear to include singularities in their denotation in a variety of negative contexts (the following are modeled after examples by Karina Wilkinson and Roger Schwarzschild, respectively).

- (12) It is not the case that students from Germany came to the conference.  
 (13) Students from Germany failed to come to the conference.

In a situation where one student from Germany came to the conference, are the above sentences true or false? A naive interpretation of *it is not the case* as propositional negation and of *failed to come* as the complement of *came* would predict that if plural expressions denote literal pluralities, the sentences are true in the above situation, but if plural expressions include singularities in their extension then the sentences are false. On the most accessible reading, sentences (12) and (13) are indeed false, pointing toward the inclusion of singularities in the denotation of plural expressions. However, I believe that at least (12) can also be construed as true, if there is a pitch accent on *students*. The source of the ambiguity is the negative expression, and the latter interpretation looks like a case of “external negation” (Horn 1985), where it is exactly plurality which is denied.

It appears then that Chierchia was right in identifying the negative expression in (10) as the reason the common noun *men* looks as if it ranges over singularities and pluralities alike, but he was wrong in describing this as a lexical

property of the quantifier *no*. Rather, the applicability of *men* to singularities should be tied to the fact that it appears in a negative context, in a way that is yet to be explained. The ambiguity of (12) shows that even in negative contexts it is possible to pick out plural denotations for common nouns.

I conclude that the assumption that plural expressions include singularities in their extension is no less problematic than the assumption I make, that plural expressions only denote pluralities; the difference between negative and positive contexts should be addressed through an examination of the semantics of negative expressions. In the meantime it is safe to assume that plural morphology is interpreted literally as semantic plurality; this literal interpretation forms the first part of the explanation of multiple plurality.

### 3. Cumulative conjunction of predicates

The other element in the account of multiple plurality is the interpretation of conjunction. The most basic meaning of the English word *and* and its counterparts in other languages is often considered to be propositional conjunction—a binary operation on truth values that is true in case both of the operands are true, false otherwise. This accounts for the use of *and* between sentences. The use of *and* between other constituents can be explained via a general type shifting paradigm which interprets all constituent coordination at the propositional level (Gazdar 1980; Partee and Rooth 1983). I will call this use *intersective* conjunction. Some uses of the word *and*, however, appear to fall outside this paradigm. For example, sentence (14) is not equivalent to (15).

(14) John and Mary met.

(15) John met and Mary met.

Given our theory of plurality, this non-equivalence receives a natural explanation if the coordinate subject of (14) is taken to denote a plural object, the join of John and Mary. Following Link (1983), I will assume that when *and* coordinates individuals of type *e* it can denote the join operation; I use the symbol  $\oplus$  in the metalanguage to stand for this operator.

(16)  $[[\text{John and Mary}]] = [[\text{John}]] \oplus [[\text{Mary}]]$

This use of *and* will be called *cumulative* conjunction; it is argued to apply in the nominal domain, at least for referring nominals (Hoeksema 1988). Cumulative conjunction on type *et* will be defined in (22) below.

My claim is that the multiple plurality requirement in (1) is evidence for the existence of cumulative (plural-forming) conjunction not only on nominals, but on adjectives as well (cf. Krifka 1990; Sharvit 1999). An alternative possibility is that the coordinate predicate in (1) may actually be a nominal,

perhaps with the adjectives as modifiers of a null pronoun, meaning something like “tall ones and short ones” (Hilda Koopman, personal communication). Hebrew does allow lexical adjectives to act as nominals in certain contexts, as in the following sentence.

- (17) ha-namux (ha-ze) hu sofer mefursam  
 the-short the-this PR writer famous  
 “The/this short [person] is a famous writer”

Notice however that predicative nominals usually require a pronominal copula (glossed as PR in the above example), while the adjectives in (1) appear without such an element. Furthermore, a nominal interpretation is impossible when the adjective is modified by a degree phrase.

- (18)\*ha-namux mi-meter va-xeci (ha-ze) hu sofer mefursam  
 the-short than-meter and-half the-this PR writer famous  
 “The/this shorter than 1.50m...”

However, a cumulative reading is possible with degree-modified adjectives, as seen below in (19); this sentence is also subject to a multiple plurality requirement (thanks to Rajesh Bhatt for pointing out the relevance of this example).

- (19) ha-yelad-im gvoh-**im** mi-meter va-xeci ve-nemux-**im** mi-meter šlošim  
 the-child-pl tall-**pl** than-met and-half and-short-**pl** than-met thirty  
 “The children are taller than 1.50m and shorter than 1.30m.”

I conclude that the predicates in (1) and (19) are indeed adjectives, so we need cumulative conjunction outside the nominal domain as well.

The need for cumulative conjunction on categories other than nominals is independent of multiple plurality. Take for example the following sentence.

- (20) Students from Germany and from Switzerland met at the conference.

On the most natural reading of (20), the PP *from Germany and from Switzerland* does not pick out individuals who are both from Germany and from Switzerland. Rather, it picks a collection of individuals, based on a cumulative inference such as the following (Scha 1981).

- (21) Hans is from Germany.  
 Fritz is from Switzerland.  
Hans and Fritz are from Germany and from Switzerland.

In order to capture this kind of inference, cumulative conjunction of the PPs should have the meaning below. This is an instance of the general paradigm for cumulative conjunction of type *et* (Link 1983; Krifka 1990).

- (22)  $\llbracket \text{from Germany and from Switzerland} \rrbracket =$   
 $\{ \alpha \mid \alpha = \alpha_1 \oplus \alpha_2 \wedge \alpha_1 \in \llbracket \text{from Germany} \rrbracket \wedge \alpha_2 \in \llbracket \text{from Switzerland} \rrbracket \}$

Coordination of the predicative adjectives in (1) and (2) is interpreted much the same way: the cumulative conjunction of *tall* and *short* is analogous to the meaning in (22) above; the fact that the Hebrew adjectives bear plural morphology will give rise to the multiple plurality requirement.

As an illustration of conjunction with multiple plurality we can take an English sentence similar to (20) above, where instead of coordinating PPs we coordinate full NPs, which are marked for number. The subject NP in (23) gets a meaning through cumulative conjunction, which is given below in (24).

- (23) Students from Germany and students from Switzerland met at the conference.
- (24)  $\llbracket \text{students from Germany and students from Switzerland} \rrbracket =$   
 $\{ \alpha \mid \alpha = \alpha_1 \oplus \alpha_2 \wedge \alpha_1 \in \llbracket \text{students from G.} \rrbracket \wedge \alpha_2 \in \llbracket \text{students from Sw.} \rrbracket \}$

Assuming that each of the plural conjuncts only includes pluralities in its extension, we get a multiple plurality meaning for the conjoined NP subject. A similar interpretation of the conjoined plural predicates in (1) will give rise to the multiple plurality requirement.

- (25)  $\llbracket \text{gvoh-**im** ve-nemux-**im**} \rrbracket =$   
 $\{ \alpha \mid \alpha = \alpha_1 \oplus \alpha_2 \wedge \alpha_1 \in \llbracket \text{gvoh-**im**} \rrbracket \wedge \alpha_2 \in \llbracket \text{nemux-**im**} \rrbracket \}$

Notice that multiple plurality arises in the above example because the denotations of *gvoh-im* (“tall-pl”) and *nemux-im* (“short-pl”) are necessarily disjoint. The objects  $\alpha_1$  and  $\alpha_2$  in the above formula must therefore be non-overlapping, and since each of them is a plurality, their join  $\alpha$  is a multiple plurality. If  $\alpha_1$  and  $\alpha_2$  were allowed to overlap then a simple plurality of children, each of whom is both tall and short, would suffice to make sentence (1) true. But this is impossible, given the lexical meanings “tall” and “short”.

#### 4. Conjunction weakening

If cumulative conjunction is available for predicates, we should expect to see cumulative conjunction with all kinds of coordinated expressions. However, we only see cumulative conjunction when the predicates are incompatible in their meaning, as are “tall” and “short”. In other cases the only reading we get is one with intersective (propositional) conjunction.

- (26) ha-yelad-im gvoh-**im** ve-raz-**im**  
 the-child-pl tall-**pl** and-thin-**pl**
- (27) The children are tall and thin.

Sentences (26) and (27) are virtually identical in meaning; unlike (1) and (2) they entail the sentence *the children are tall*, and the Hebrew sentence does not have a multiple plurality requirement. This is all expected if *and* is interpreted as intersective conjunction. But how come the above sentences are not ambiguous between an intersective and a cumulative reading?

The answer lies in the strongest meaning hypothesis (Winter 1996, 1998, following work on reciprocals by Dalrymple *et al.* 1994, 1998). This hypothesis states that plural predicates receive an interpretation using “the logically strongest truth conditions ... that are not contradicted by known properties of the singular predicate(s)” (Winter 1998, p. 323). Applied to coordination, the strongest meaning hypothesis states that the weaker form, i.e. cumulative conjunction, is only available when the stronger (intersective) one is contradictory (this idea is already present in Krifka 1990). Given the architecture of our theory, the strongest meaning hypothesis is a filtering strategy: from the two meanings for coordination it selects the strongest one which is consistent. A similar architecture is advocated by Dalrymple *et al.* (1994, 1998).

An alternative is Winter’s own rendering of the strongest meaning hypothesis. In his theory conjunction is always intersective; plural objects are formed only in the nominal domain, as a result of type shifts that apply to DPs. In this architecture, the strongest meaning hypothesis has to be seen as a repair strategy: coordination of predicates is always strong (intersective), but when the result is contradictory the meaning is weakened. Weakening is a general process that applies to a variety of constructions, and in the case of coordinate structures it yields a reading which is virtually identical to what would be derived via cumulative conjunction.

I believe that multiple plurality gives reasons to adopt the view that the strongest meaning hypothesis is a filtering strategy rather than a repair strategy. Sentence (28), with plurality marked on each conjunct, is subject to a multiple plurality requirement, so it requires at least two children of each age; sentence (29), with plurality marked above the conjunction, does not have such a requirement, and it can be true with one child of each age. These judgments are very robust (I have not found a good English gloss for *ben*; the construction *ben n* means “*n* years old”).

(28) ha-yelad-im bn-**ei** šeš ve-bn-**ei** ševa  
 the-child-pl ben-**pl** six and-ben-**pl** seven  
 “The children are six years old and seven years old.”

(29) ha-yelad-im bn-**ei** šeš ve-ševa  
 the-child-pl ben-**pl** six and-seven  
 “The children are six and seven years old.”

The above readings are indeed the result of conjunction weakening: sentences with similar structures but non-contradictory predicates do not have such read-



ings. In (30) and (31) the predicates are compatible; the sentences are synonymous, and each of them entails both of the sentences *ha-yelad-im šxor-ei* ‘*enayim* (“the children are black-eyed”) and *ha-yelad-im šxor-ei se‘ar* (“the children are black-haired”). Neither sentence exhibits multiple plurality.

- (30) *ha-yelad-im šxor-ei* ‘*enayim ve-šxor-ei* se‘ar  
 the-child-pl black-pl eyes and-black-pl hair  
 “The children are black-eyed and black-haired.”
- (31) *ha-yelad-im šxor-ei* ‘*enayim ve-se‘ar*  
 the-child-pl black-pl eyes and-hair  
 “The children are black-eyed and -haired.”

In (28) and (29), however, the predicates turn out to be contradictory on the intersective interpretation of *and*. I take the denotation of *ben* to be a relation between individuals and lengths of time;  $[[ben]](\alpha, \tau)$  is true if  $\alpha$  is an individual of age  $\tau$ . The words *šeš* and *ševa* denote the lengths of six years and seven years, respectively (numerals denote length in years by convention; for ages that are not measured in years the unit length must be given explicitly, as in *ben šiša xodašim* “six months old”). Given these meanings, we can derive the denotations of the predicates *bnei šeš ve-bnei ševa* and *bnei šeš ve-ševa*. I use lambda abstraction and variables in the metalanguage for clarity; the metalanguage symbols 6 and 7 stand for the lengths of six years and seven years, respectively.

- (32)  $[[bnei \text{ šeš } ve\text{-}bnei \text{ ševa}]] = [[bnei \text{ šeš}]] \cap [[bnei \text{ ševa}]]$   
 $= \lambda\alpha. [[bnei]](\alpha, 6) \cap \lambda\alpha. [[bnei]](\alpha, 7)$   
 $= \lambda\alpha. [[bnei]](\alpha, 6) \wedge [[bnei]](\alpha, 7)$
- (33)  $[[šeš \text{ ve-ševa}]] = \lambda P.P(6) \wedge P(7)$   
 $[[bnei \text{ šeš } ve\text{-}ševa]] = \lambda T \lambda\alpha. T(\lambda y. [[bnei]](\alpha, y)) ([[šeš \text{ ve-ševa}]])$   
 $= \lambda\alpha. \lambda P.P(6) \wedge P(7)(\lambda y. [[bnei]](\alpha, y))$   
 $= \lambda\alpha. [[bnei]](\alpha, 6) \wedge [[bnei]](\alpha, 7)$

We see that on the strong interpretation of *and*, the predicate *bnei šeš ve-ševa* turns out to have an identical meaning to *bnei šeš ve-bnei ševa*. This meaning is contradictory, so the strongest meaning hypothesis will apply. The strongest meaning hypothesis must yield different readings for (28) and (29): the former must receive a multiple plurality reading, while the latter must not. However, a repair strategy that only looked at the meanings in (32)/(33) would not be able to assign these sentences distinct meanings.

The current model will give each predicate the meaning derived independently by cumulative coordination. In (28), where two full predicates are coordinated, the predicate will receive a reading akin to (25).

- (34)  $[[bnei \text{ šeš } ve\text{-}bnei \text{ ševa}]] =$   
 $\{\alpha \mid \alpha = \alpha_1 \oplus \alpha_2 \wedge \alpha_1 \in [[bnei \text{ šeš}]] \wedge \alpha_2 \in [[bnei \text{ ševa}]]\}$

In (29), coordination takes place at the level of the object, below the predicate. I will assume that transitive verbs allow a cumulative relation between their subjects and objects (Scha 1981); plural morphology on transitive *bnei* restricts its subject to pluralities, in a manner analogous to that in (9).

$$(35) \llbracket \text{bnei šeš ve-ševa} \rrbracket = \{ \alpha \mid \llbracket \text{bnei} \rrbracket(\alpha, 6 \oplus 7) \} \\ = \{ \alpha \mid \alpha \in \text{PL} \wedge \forall \alpha_1 \in \text{AT}(\alpha) \exists \beta_1 \in \text{AT}(6 \oplus 7) \llbracket \text{ben} \rrbracket(\alpha, \beta) \\ \wedge \forall \beta_1 \in \text{AT}(6 \oplus 7) \exists \alpha_1 \in \text{AT}(\alpha) \llbracket \text{ben} \rrbracket(\alpha, \beta) \}$$

Our model thus produces the desired readings: the meaning in (34) is multiply plural while that in (35) is not.

In Winter's system the strongest meaning hypothesis will have to weaken the meaning derived through intersective conjunction in (32)/(33). Coordination of the nominals *šeš* and *ševa* could in fact receive a cumulative interpretation (precisely because they are nominals), but according to Winter's assumptions the plural marker on the predicate in (29)/(33) is inherently distributive, so the meaning of the predicate turns out to be the same. So if we want to sustain the architecture of Winter (1996, 1998) and still get distinct weakened readings, the weakening process must have access to the units below the level of the conjoined predicate.

Let us be a bit more explicit about what a modification of Winter's theory would look like if we want it to account for the multiple plurality facts. Winter defines weakening at the propositional level based on the *normal universal form* of the proposition, which is derived from the proposition's basic meaning relative to a tuple of predicates involved. We have seen that the basic meaning of the predicates in (28) and (29) is the same, namely the one derived in (32)/(33). The difference must be attributed to the tuple of predicates which make up the normal universal form: for (28) it will be the two unary predicates *bnei šeš* and *bnei ševa*, whereas for (29) it will be the single binary predicate *bnei*. In Winter's system pluralities are not mereological sums but rather sets of individuals, and predication takes place on the individuals that make up these sets. The normal universal forms of (28) and (29) will therefore be as follows.

$$(36) \llbracket \text{ha-yelad-im bnei šeš ve-bnei ševa} \rrbracket \\ = \forall \alpha \in \llbracket \text{ha-yelad-im} \rrbracket \forall \beta \in \{ \llbracket \text{bnei šeš} \rrbracket, \llbracket \text{bnei ševa} \rrbracket \} : \beta(\alpha) \\ (37) \llbracket \text{ha-yelad-im bnei šeš ve-ševa} \rrbracket \\ = \forall \alpha \in \llbracket \text{ha-yelad-im} \rrbracket \forall \tau \in \{ 6, 7 \} : \llbracket \text{bnei} \rrbracket(\alpha, \tau)$$

The weakened reading is derived from the normal universal form in light of some known lexical properties of the predicates involved, in this case the knowledge that a child cannot be six and seven years old at the same time. In the weakened reading, the universal quantifiers of the normal universal form are replaced by the requirement that the number of relations be maximal, given

the above lexical knowledge. Now for both sentences, the weakened reading will be true if each child is either six or seven, since any additional instantiations of the relations in (36) and (37) would contradict the lexical knowledge.

We still haven't derived distinct meanings for the two sentences above, that is we haven't accounted for the multiple plurality requirement of (28). Worse, the weakened reading as it stands does not even capture the correct truth conditions without multiple plurality: the relations in (36) and (37) are maximized if all of the children are of one age (say six), so in such a case the sentences are predicted to be true, contrary to intuition. One line of defense (Yoad Winter, personal communication) is that in the above situation the sentences are pragmatically inappropriate, just like a disjunction implies that both of the disjuncts are applicable. I believe this line of defense doesn't hold, in light of the following contrast.

(38) The children are six or seven—in fact, they're all six.

(39)#The children are six and seven—in fact, they're all six.

Sentence (38) shows that the disjunction gives rise to a conversational implicature, which is cancelable with additional context. This is not the case in (39), where the addition makes the sentence contradictory. The requirement that each of the conjuncts should be instantiated is therefore stronger than a conversational implicature. In a weakening theory, this requirement has to be explicitly made part of the strongest meaning hypothesis; however, this requirement is already built into the definition of cumulative coordination, so in the architecture advocated here, where the strongest meaning hypothesis chooses between two independently constructed meanings, no additions have to be made (Heycock and Zamparelli 1999, 2000 make a similar observation: cumulative or "split" coordination requires at least one element from each conjunct; this is built into their semantics through the set product operation, which is isomorphic to the cumulative conjunction used here).

Now we can see how a weakening theory would deal with the multiple plurality requirement of sentence (28): we first require that every conjunct be instantiated by at least one relationship (as deemed necessary by the discussion in the preceding paragraph), and then add the requirement that every *plural* conjunct be instantiated by at least *two* relationships. This complicates Winter's definition of a weakened reading, but it seems necessary in light of the data.

How does this compare to my proposal? In the modification I proposed to the weakening theory, plural morphology plays a double role: predicates that apply to plural arguments must have a plural denotation (which includes singular individuals), regardless of morphology; in addition, the definition of weakened readings must refer explicitly to plural morphology. This latter role

is remarkably similar to the claim that morphologically plural expressions, including plural predicates, literally denote pluralities. In my theory this applies generally, while in the modified weakening theory it is specific to the weakening process. The main difference between the theories, then, comes out to be that I accept cumulative conjunction, whereas the modified weakening theory derives these effects in a roundabout way. The weakening theory fits in well with Winter's program, which sets out to show that conjunction is always intersective, and any apparent cumulative effects come about as the result of independent processes. The cost, however, is the admission of a weakening process which includes an ad-hoc mechanism that is built specifically to mimic cumulative conjunction and multiple plurality.

### 5. Conjunction of singular predicates

Admitting non-propositional conjunction for predicates leads to the expectation that the cumulative conjunction of two singular predicates should yield a plural predicate. After all this is what happens with the coordination of proper names, e.g. *John and Mary*, as well as other nominals. But for APs and VPs this is hopelessly wrong.

- (11)\*ha-yelad-im gavoah ve-namux  
the-child-pl tall.sg and-short.sg
- (40)\*dani ve-yosi gavoah ve-namux  
Danny and-Yossi tall.sg and-short.sg
- (41)\*John and Bill eats a doughnut and drinks coffee (respectively).

The sentences above are all ill formed, even though the intended meaning is perfectly clear. Having a coordinate subject in (40) or the word *respectively* in (41) doesn't help. Based on the interpretation of conjoined plural predicates, I have argued above that the semantics should allow cumulative conjunction; it would seem odd if this were not available for singular predicates. Indeed, it seems to me that the problem in the above sentences is not with the meaning, but with the syntax.

We may note that coordination of singular NPs in Hebrew is syntactically plural, but coordination of singular APs is singular. We can check this with words that are ambiguous between nouns and adjectives, like *sini* ("Chinese") and *yapani* ("Japanese"). We can put these words in a context where they must be interpreted as one category rather than the other: only nouns can be modified by locative PPs, and only adjectives can be modified by the adverbial *meod* ("very"). We now get a stark contrast between (42) and (43).

- (42) ha-xaver-im šel dana hem sini mi-beijing ve-yapani mi-tokyo  
the-friend-pl of Dana pl. Chi.sg from-Beijing and-Jp.sg from-Tokyo

- (43)\*ha-xaver-im šel dana hem meod sini           ve-meod yapani  
 the-friend-pl of Dana pl. very Chinese.sg and-very Japanese.sg

I believe the above contrasts are not due to a difference in meaning, or to differences in the availability of cumulative conjunction between nouns and adjectives. Indeed, when the adjectives are plural as in (44) below, we do get a coherent reading, with cumulative conjunction and multiple plurality.

- (44) ha-xaver-im šel dana hem meod sini-**m**       ve-meod yapani-**m**  
 the-friend-pl of Dana pl. very Chinese-**pl** and-very Japanese-**pl**

I conclude that on top of the semantic interpretation of plurality, there are syntactic requirements of agreement. Cumulative conjunction is available for adjectives in general, but we cannot see it on singular ones because such constructions are ruled out by syntax.

## 6. Conclusion

In this paper I argued that multiple plurality outside the nominal domain should be taken as evidence that plural morphology on an expression excludes singularities from its denotation, and that cumulative conjunction is an operation that is generally available. The limited occurrence of cumulative conjunction is the result of the strongest meaning hypothesis and syntactic number of conjoined adjective phrases.

A question that remains open is why does the strongest meaning hypothesis exist in the first place, that is why should natural language employ such a filtering strategy when it tolerates ambiguity in many other places? And why should this filtering strategy apply to adjectives, while coordinated nominals routinely receive a cumulative interpretation? Adopting Winter's architecture, where the strongest meaning hypothesis is a repair strategy, only reverses the question: why does natural language employ such a repair strategy, while other structures are simply understood as contradictory? I do not have an answer to this question, but the data suggest that it may be related to the question of syntactic number: how come coordinated singular APs form a singular AP, whereas coordinated singular NPs form a plural NP. The difference does not seem to lie in the semantics of coordination, because cumulative coordination is available for plural adjectives.

Another question concerns speaker variation: as I mentioned in the introduction, some speakers of Hebrew and Spanish accept sentences (1) and (3) with a weaker multiple plurality effect, whereby only one of the conjuncts must have a plural referent (all speakers reject the sentences if all conjuncts have single referents). My theory does not predict that such variation should be possible. At the moment I do not see how this can be treated without an ad hoc stipulation, so I leave the question open.

## References

- Chierchia, Gennaro (1998). Plurality of mass nouns and the notion of “semantic parameter”. In Susan Rothstein (ed.), *Events and Grammar*, pp. 53–103. Dordrecht: Kluwer.
- Dalrymple, Mary, Makoto Kanazawa, Yookyung Kim, Sam Mchombo, and Stanley Peters (1998). Reciprocal expressions and the concept of reciprocity. *Linguistics and Philosophy* 21(2), pp. 159–210.
- Dalrymple, Mary, Makoto Kanazawa, Sam Mchombo, and Stanley Peters (1994). What do reciprocals mean? In Mandy Harvey and Lynn Santelmann (eds.), *Proceedings from SALT IV*, pp. 61–78. Ithaca, NY: Cornell University Department of Modern Languages and Linguistics.
- van Eijck, Jan (1983). Discourse representation theory and plurality. In Alice G. B. ter Meulen (ed.), *Studies in Modeltheoretic Semantics*, vol. 1 of *Groningen-Amsterdam Studies in Semantics (GRASS)*, pp. 85–106. Dordrecht: Foris.
- Gazdar, Gerald (1980). A cross-categorial semantics for coordination. *Linguistics and Philosophy* 3(3), pp. 407–409.
- Heycock, Caroline and Roberto Zamparelli (1999). Toward a unified analysis of DP conjunction. In Paul Dekker (ed.), *Proceedings of the Twelfth Amsterdam Colloquium*, pp. 127–132. University of Amsterdam: ILLC.
- Heycock, Caroline and Roberto Zamparelli (2000). Friends and colleagues: Plurality and NP-coordination. In Masako Hirotsu, Andries Coetzee, Nancy Hall, and Ji-Yung Kim (eds.), *Proceedings of NELS 30*, pp. 341–352. Amherst, MA: GLSA.
- Hoeksema, Jack (1983). Plurality and conjunction. In Alice G. B. ter Meulen (ed.), *Studies in Modeltheoretic Semantics*, vol. 1 of *Groningen-Amsterdam Studies in Semantics (GRASS)*, pp. 63–83. Dordrecht: Foris.
- Hoeksema, Jack (1988). The semantics of non-Boolean “and”. *Journal of Semantics* 6(1), pp. 19–40.
- Horn, Lawrence R. (1985). Metalinguistic negation and pragmatic ambiguity. *Language* 61(1), pp. 121–174.
- Krifka, Manfred (1990). Boolean and non-Boolean “and”. In László Kálman and László Polos (eds.), *Papers from the Second Symposium on Logic and Language*, pp. 161–188. Budapest: Akadémiai Kiadó.
- Landman, Fred (1991). *Structures for Semantics*, vol. 45 of *Studies in Linguistics and Philosophy*. Dordrecht: Kluwer.
- Leonard, Henry S. and Nelson Goodman (1940). The calculus of individuals and its uses. *Journal of Symbolic Logic* 5(2), pp. 45–55.
- Link, Godehard (1983). The logical analysis of plurals and mass terms: A lattice-theoretical approach. In Rainer Bäuerle, Christoph Schwarze, and Arnim von Stechow (eds.), *Meaning, Use and Interpretation of Language*, pp. 302–323. Berlin: de Gruyter.
- Partee, Barbara and Mats Rooth (1983). Generalized conjunction and type ambiguity. In Rainer Bäuerle, Christoph Schwarze, and Arnim von Stechow (eds.), *Meaning, Use and Interpretation of Language*, pp. 361–383. Berlin: de Gruyter.
- Scha, Remko J. H. (1981). Distributive, collective and cumulative quantification. In Jeroen Groenendijk, Theo M. V. Janssen, and Martin Stokhof (eds.), *Formal Methods in the Study of Language, Part 2*, vol. 136 of *Mathematical Centre Tracts*, pp. 483–512. Amsterdam: Mathematisch Centrum.
- Sharvit, Yael (1999). Connectivity in specificational sentences. *Natural Language Semantics* 7(3), pp. 299–339.
- Winter, Yoad (1996). What does the strongest meaning hypothesis mean? In Teresa Galloway and Justin Spence (eds.), *Proceedings from SALT VI*, pp. 295–310. Ithaca, NY: Cornell University Department of Modern Languages and Linguistics.
- Winter, Yoad (1998). *Flexible Boolean Semantics: Coordination, Plurality and Scope in Natural Language*. Ph.D. thesis, University of Utrecht.