universität
wien

# DISSERTATION

Titel der Dissertation

„More Pluralities“

Verfasserin

Mag. Viola Schmitt

angestrebter akademischer Grad

Doktorin der Philosophie (Dr. phil.)

Wien, 2013

| | |
|---|---|
| Studienkennzahl lt. Studienblatt: | A 092 328 |
| Dissertationsgebiet lt. Studienblatt: | Doktoratsstudium Allgemeine/Angewandte Sprachwissenschaft |
| Betreuer: | Univ.Prof. Dr. Daniel Büring |

# More pluralities

Viola Schmitt

**Acknowledgements** This thesis, or at least its plausible parts (if there are any), is the result of a collaborative effort. It would not exist without the support of my advisors Daniel Büring and Ede Zimmermann, who I wish to thank sincerely not only for their substantial help with the subject, but also for their patience (as well as for numerous jokes, "jokes" etc.). I am also very lucky to know Clemens Mayr, Manuel Križ and Jan Köpping (listed here in the order of my encountering them) who played an equally important role. A large part of this thesis evolved from discussions with them. To mention just a few points, the general idea of dealing with conjunction arose from joint work (and fights) with Clemens, several issues concerning pluralities and plural predication as well as the behavior of conjunction and disjunction came up in excessive discussions with Manuel ( "excessive", here as always, is a positive, and not a negative property), whereas various questions relating to the ontology but also to the technical implementation go back to long conversations (mainly on bikes, in the cold) with Jan.

For their help and for the discussion of various questions relating directly to this thesis (as well as a large amount of other topics) I would also like to thank in particular Katharina Hartmann, Winnie Lechner and Martin Prinzhorn. My office mates (at various stages) Daniel Gutzmann, Claudia Poschmann, and Sarah Zobel have not only entertained me (which was probably exhausting) but have also provided several intelligent comments which had a direct influence on matters discussed here. Henk van Riemsdijk and Arnim von Stechow have, in a sense, acted as "shadow"- advisors, as they followed the (lack of) progress attentively and were always available and willing to answer strange questions. Johannes Schmitt has patiently clarified points of confusion.

There are also a number of colleagues (and friends) who I very much enjoyed having conversations with which turned out to have lot of impact on the coming about of this thesis: Elena Anagnostopolou, Erich Groat, Magdalena Kaufmann, Hilda Koopman, Cécile Meier, Andreas Pankau, Uli Sauerland, Felix Schuhmann, Tim Stowell, Dominique Sportiche, Michael Wagner and Edwin Williams.

I also wish to thank Eva Backhaus, Leah Bauke, Sascha Duemig, Caroline Féry, Eric Fuß, Patrick Grosz, Tim Hirschberg, Benny Hübner, Vasiliki Koukoulioti, Marika Lekakou, Hans-Christian Luschützky, Friedrich Neubarth, Pritty Patel-Grosz, Juliane Rebentisch, Caro Reinert, John Rennison, Adam Szczegelniak, Jochen Schuff, Matthias Schulze-Bünte, and Hedde Zeijlstra.

I want to thank Günther Grewendorf for providing me with the opportunity to work in his project at the University of Frankfurt. I further would like to thank the faculty of UCLA for letting me teach there and Irene Heim for enabling me to spend a semester at MIT and for being so hospitable. The excellent course on plurals that she and Gennaro Chierchia co-taught there has raised my initial interest in the subject.

Finally, I would like to thank the people at the various departments that I have been at for creating a pleasant surrounding and being so helpful, in particular Sigrid Adam, Elke Höhe-Kupfer, Anke Stakemann and Pia Weber.

# Contents

# 1 Introduction

Most languages seem to have formal strategies at their disposal by means of which they express what corresponds to conjunction and disjunction in classical propositional logic (cf. von Stechow (1974) a.o.). In English, we standardly associate the morphemes *and* and *or* with these functions.[1] This association is based on the assumption that the result of connecting two sentences by means of *and*, as in (1a), is a sentence which is considered true if both conjuncts are considered true and false otherwise and that the result of connecting two sentences by means of *or*, as in (1b) is a sentence which is considered true if at least one of the conjuncts is considered true and false otherwise.

(1) a. John is a pervert and Mary is a crook.
    b. John is a pervert or Mary is a crook.

In other words, *and* and *or* seem to correspond to functions on the truth-values denoted by their arguments and these functions have the same extensions as the connectives $\wedge$ and $\vee$, respectively, in classical propositional logic, (3).

(2)

| $\wedge$ | **true** | **false** | $\vee$ | **true** | **false** |
|---|---|---|---|---|---|
| **true** | true | false | **true** | true | true |
| **false** | false | false | **false** | true | false |

The syntactic occurrences of English *and* and *or* and their counterparts in other languages are not limited to a position where they connect sentential expressions as in (2), but can occur cross-categorically Ross (1967), as illustrated in (3).[2] As each of these sentences has a natural language paraphrase involving *and* or *or* with sentential arguments, (4), it seems that the meaning of *and* and *or* when occurring on sub-sentential levels, can be derived from the meaning they have when occurring on sentential level (cf. von Stechow (1974), Gazdar (1980), Partee and Rooth (1983), Keenan and Faltz (1984) a.o.). The coordinates in (3) denote functions which (eventually) map their argument(s) to sentential values, *true* and *false*. We can thus state that *and* and *or*, in these cases, take the extensions of the two coordinates as arguments and produces a function, which, for any argument(s) of the kind that would serve as arguments for the individual coordinates, yields that value which is the

[1] I say "most languages" rather than "all languages" because some languages have been argued to employ the same formal strategy to express both conjunction and disjunction, cf. Payne (1985).

[2] The morpheme expressing negation might be another such element, but, as opposed to *and* and *or*, lacks a (morphologically) identical sub-word-level version. Some other languages show formal variation depending on the syntactic position, cf. Payne (1985), Haspelmath (2007).

result of applying the extensions of the individual coordinates to the argument(s) in question and takes the outputs of this application as the input of $\wedge$ or $\vee$, respectively. In other words, *mean and stupid* denotes that function that maps any individual argument $u$ to *true* if is the case that $u$ is mean and $u$ is stupid, and to *false* otherwise. *mean or stupid*, on the other hand, denotes that function that maps any individual argument $u$ to *true* if it is the case that $u$ is mean or $u$ is stupid, and to *false* otherwise. If we view our ontology as built up from a set of primitives – the individuals– and derive higher ontological layers as Boolean algebrae from this basic set of primitives, we can view *and* and *or* as corresponding to Boolean operations on these higher ontological layers: *and* corresponds to set-intersection, and *or*, to set-union.[3] Accordingly, I will sometimes refer to traditional account of *and* the *interesective* analysis (or account) of *and* (it is often also referred to as the *Boolean* analysis) and to the traditional analysis of *or* as the *union* analysis (or account) of *or*.

(3) a. John is mean and/ or stupid.
 b. John molested and / or insulted Peter.
 c. John is a wine lover and / or producer.
 d. A nice and / or affable man entered the room.

(4) a. John is mean and / or John is stupid.
 b. John molested Peter and / or John insulted Peter.
 c. John is a wine lover and / or John is a wine producer.
 d. A man that was such that he was nice and / or that he was affable entered the room.

Intuitive and straightforward as it may be, I submit that this traditional view is at least partially flawed. Assuming that *and* corresponds directly to the propositional connective $\wedge$ in classical propositional logic or also in other salient logical systems which we might deem suitable representations of natural language, is a non-innocent idealization which does not properly capture the linguistic properties of *and*–coordinations. Obviously, I am not the first to note this – Link (1983, 1984), Hoeksema (1983, 1987), Partee and Rooth (1983), Landman (1989a, 1996), Krifka (1990), Schwarzschild (1996), Heycock and Zamparelli (2005), amongst others, have made similar claims or at least discussed evidence that points into this direction. However, my claim here is more general in its scope than most of the existing work – I contest the traditional position for all occurrences of *and*, irrespective of the semantic value of the coordinates. To my knowledge, Krifka (1990) (based on Link (1983, 1984)) and Heycock and Zamparelli (2005) are the only authors that take a similar stance.

The present investigation further differs from previous explorations in the conclusions that it draws from these initial observations. In particular, the empirical evidence that I present does not only indicate that the standard analysis of *and* cannot be on the right track, it also leads me to an altered perspective on *and*–coordinations (by which I mean the entire

[3]This carries over to sentential values if *true* is taken to correspond to $\{\emptyset\}$ and *false* to $\emptyset$.

coordinate structure). I show that in English and German, they behave exactly like morphologically plural DPs, i.e. like phrases such as *the cats*. Various authors have come across instances of this parallel behavior and have remarked, mostly in the form of a an aside, that plurals and *and*–coordinations must be "the same thing", but no principled implementation of this basic intuition has been pursued. I here take the data at face value and argue that both morphologically plural DPs and *and*–coordinations are plural expressions and that all plural expressions denote the same *kind* of object. More precisely, I develop a view where pluralization – understood as both a morpho-syntactic as well as a semantic process – is completely general and persists across all syntactic and semantic domains. I argue that all plural expressions, including morphologically plural DPs as well as all *and*-coordinations, form a discrete part of the language, so to speak, subject to its own set of syntactic rules and, crucially, involving a particular set of semantic rules. Only in a limited set of cases, application of these rules will yield a meaning that is similar (albeit not identical) to that derived by universal quantification or the traditional analysis of *and*.

The following gives an informal sketch of my reasons for assuming this position and the resulting proposal. For the sake of brevity, I write *AC* for *and–coordination*.

## 1.1 The basic problem for the traditional analysis of *and*

The exploration of the meaning of plural sentences – by which I mean sentences containing a plural DP as in (5)– could start off with idealization analogous to what I just sketched for AC: (5) seems equivalent in meaning to (6): both are true only if all (salient) individual cats are sleeping.[4] We thus could assume all all plural sentences, *qua* the plural DP itself or via some phonologically null operator associated with that DP, involve universal quantification (cf. Barwise and Cooper (1981) a.o.). In order to emphasize the parallel with the analysis of AC, I call this the *traditional account of plurals*.

(5) The cats slept.

(6) Every cat slept.

Various properties of plural sentences have been observed that are incompatible with this hypothesis. One important point, initially raised by Langendoen (1978) and Scha (1981), is that the direct analogy between plurals and universal quantifiers makes the wrong predictions about the meaning of sentences which contain more than one plural as in (7a). Consider a scenario with three cats, Jimmy, Johnny and Jack, and three dogs, Hasso, Harro and Hork. A fight just took place, where Jimmy bit Hasso, Johnny bit Hasso and Hork and Jack bit Harro. In this scenario, (7a) is true, but (7b) isn't. In other words, the meaning we find for such plural sentences is weaker than the meaning the traditional account would predict. The

[4] As pointed out below, using *every NP* as an instance of the universal quantifier, might not be the best strategy. For my present purposes, it will suffice.

actual truth-conditions of (7a) are the following: The sentence is true as long as every cat bit some dog and every dog was bitten by some cat.

(7) a. It was a terrible fight. The cats bit the dogs.
b. It was a terrible fight. Every cat bit every dog.

My criticism of the traditional account of AC starts off with a data point that is exactly analogous. As noted by Link (1984), Krifka (1990), Winter (2001b), amongst others, if an AC occurs in the context of a plural (or, as we will see below, another *and*-coordination), its truth-conditions are weaker than those predicted by the traditional analysis. Consider first the sentences in (8). Both contain only one plural DP – *the animals* – and, just like (5) above, seem to have a universal meaning: (8a) is true only if all salient animals were crowing and (8b) is true only if all salient animals were barking.

(8) a. The animals were crowing.
b. The animals were barking.

Now consider (9) (adapted from Krifka (1990)). The traditional account of *and* predicts that it is true only if every animals is both crowing and barking, but the actual truth-conditions are much weaker: The sentence is true as long as some animals were crowing and some animals were barking, as long as all animals were either crowing or barking. Imagine a scenario where roosters and dogs are the only animals around and the roosters are crowing (but not barking) and the dogs are barking (but not crowing). In this scenario, the sentence is true.

(9) *My night at the farm was terrible.* The animals were crowing and barking. *The farmer went beserk. The car was stolen. ...*

An obvious reaction from the stance of the traditional account of plurals and the traditional account of AC is to maintain this traditional account and argue that the semantic weakness of the sentences in (7a) and (7b), respectively, is due to independent, possibly pragmatic factors. To my knowledge, no one has seriously taken such a standpoint for plurals, but it seems to be quite a common view, taken explicitly by Winter (2001b), w.r.t. the weak construal of sentences with AC. I discuss this strategy for both plurals and *and*–coordinations, thus emphasizing that the reasoning is parallel.

### 1.1.1 Maintaining a traditional analysis for plurals

Consider first plural sentences. The traditional account assumes that either the plural DP itself or some operator directly associated with the plural DP corresponds to a universal quantifier. How, then, can we explain that (7a) is true in a scenario where a universal–universal configuration would be false?

The first possible explanation makes reference to a particular conception of what I here call *imprecision*, following Križ and Schmitt (2012a), and under which I subsume the various phenomena described under the headings of *non-maximality* (cf. Brisson (1998, 2000), Malamud (2012)), *team credit* (cf. Dowty (1986)) and *partial predication* (cf. Yoon (1996), Krifka (1996)). *Imprecision* refers to the fact that standard plural sentences, such as (10a) (adapted from Krifka (1996), Malamud (2012)) can be uttered felicitously even there are exception, i.e. even when the predicate does not hold of all the individuals in the collection that the plural DP picks out. (10a) is an appropriate utterance, even if I left only two of the six windows open. This does not have to do anything with the predicate *open* itself: (10a) (again adapted from Krifka (1996), Malamud (2012)) conveys that *all* the windows are open.

(10) a. God! We have to go back home. I left the windows open!
b. The painters will arrive in ten minutes to the paint the window frames. I don't think I have to do anything anymore. The windows are open. The beer is in the fridge. I'll go and read.

Obviously, imprecision itself is already at odds with the traditional account of plurals. A universal quantifier does not allow for imprecision (but cf. Križ and Schmitt (2012a)): (11) is not a felicitous utterance if I left two of the six windows open.

(11) God! We have to go back home. I left every window open!

For the sake of the argument, however, I make the following assumption (which we argue against in Križ and Schmitt (2012a)): I assume that utterances can be subject to so-called pragmatic slack and that imprecision is an instance of pragmatic slack. In Lauer's 2011 conception, pragmatic slack means that false sentences can be uttered felicitously (and without the intention of misleading the hearer) in some contexts. As an example, Lauer cites cases such as the following: In a conversation where two strangers, *A* and *B*, start a conversation on the streets of Brooklyn and *B* is thus unlikely to have any detailed knowledge about Austrian geography, *A* may felicitously make the utterance below, even if she is from Pitten, about 50 kilometers south of Vienna. The felicity of the utterance is tied to the context: If the conversation takes place in a bar in the first district of Vienna and *B* is a local, *A*'s utterance will be viewed as intentionally misleading *B*.

(12) *B*: So where are you from?
*A*: I am from Vienna.

Assume further that plural DPs and *every NP* both denote or introduce universal quantifiers but that something in the morpho-syntactic make-up of the former makes them more prone for licensing pragmatic slack.[5] In other words, (10a) would be an instance of pragmatic slack: The sentence is false in the scenario given but can still be uttered felicitously in the given context for some reason.

Given this set-up, can we assume that the weak construal in (7a) is the result of pragmatic

[5] To fit Lauer's picture, we would have to claim that plurals are less marked than *every NP*.

slack, i.e. that the actual meaning of (7a) is identical to that of (7b) but that (7a), as opposed to (7b) can be uttered felicitously in some contexts where it is false?

I don't think so. First, the weak construal of sentences with more than one plural is very regular (cf. in particular Scha (1981), Krifka (1986), Sternefeld (1998)) and does not require a particular context, as opposed to (12). Further, these sentences aren't false in scenarios in scenarios that would make only the weak construal true. This can be shown by contrasting them with actual instances of pragmatic slack. According to Lauer (2011), once the content of an utterance involving pragmatic slack comes under discussion, the speaker will have to retract. Return to the scenario in the streets of Brooklyn and assume that *B* turns out to be an expatriate from Vienna and the discourse continues as in (13). Then *A* will have to retract. No such strategy is required once the content of an utterance of a sentence with two plurals – such as (7a) above – comes under discussion, as shown in (14). Accordingly, (7a) is not the same type of phenomenon as those sentences which Lauer considers instances of pragmatic slack.

(13) *B*: Really? I'm from Vienna! Where exactly are you from?
*A*: # From Pitten.
*A*: Well, actually, I am not from Vienna, but from Pitten.

(14) *A*: It was a terrible fight. The cats bit the dogs.
*B*: Oh God. These evil cats. What happened exactly?
*B*: Jimmy and Johnny bit Hasso, Johnny also bit Hork (who he first chased through the whole apartment) and Jack bit poor little Harro.

Even if we found an explanation for imprecision that does not involve pragmatic slack but is still compatible with the traditional account of plurals, the weakness of (7a) cannot be reduced to imprecision. In particular, imprecision gives rise to certain discourse phenomena that sentences such as (7a) do not trigger. In Križ and Schmitt (2012a) we note that albeit exceptions (closed windows) will still allow the utterance of (10a) to be felicitous, these exceptions cannot be made linguistically explicit unless we use additional linguistic material such as the adverb *of course*. This is illustrated by the contrast in (15). In a sentence such as (7a), on the other hand, we do not need this extra material if we want to make explicit what happened, as illustrated in (16). This is unexpected from the perspective of the traditional account, as the fact that Jack didn't bite Hasso, etc. should count as exceptions to the universal - universal relation.

(15) God! We have to go back home. I left the windows open! . . .
  a. # The bathroom windows are closed. But the bedroom windows are open. Fuck!
  b. The bathroom windows are closed, of course. But the bedroom windows are open. Fuck!

(16) It was a nasty fight. The cats bit the dogs. Jack is kind of scared of Hasso and Hork,

so bit Hork, Jimmy bit Hasso, his arch-enemy and Johnny, that little bastard, bit both Hasso and Hork.

If imprecision isn't the remedy for the problems of the traditional account, is there any other independent mechanism which will leave the traditional account untouched but still derive the weak construal for sentences such as (7a)?

In his discussion of reciprocal sentences, Langendoen (1978) notes that reciprocal sentences, as a class, exhibit both a strong and a weak construal. Sentences such as (17a) have been argued to only have a strong construal (cf. in particular Beck (2001)), i.e. to convey that each of the six boys hates every other boy in this collection of boys. (17b), on the other hand, seems to only have a weak construal, expressing that each of the six boys holds the hand of some other boy(s) in the collection. Dalrymple et al. (1994, 1998) argue that this difference has to do with the relation in question and our knowledge about when such a relation typically holds. One can hate an enormous amount of people at the same time, but one cannot hold hands with more than two people at the same time – as least if one is a standard human being and has only two hands.

(17) a. The six boys hate each other.
b. The six boys are holding hands with each other.

Winter (2001b) argues that the strict meaning of all these sentences is indeed a universal-universal structure – every boys hates / holds hands with every boy excluding himself. However, as this universal-universal relation has no chance of ever being the case with some predicates – such as holding hands– we pragmatically weaken the relation until the sentence has chance of being true. In other words, instead of requiring that the relation of holding hands connects every boy to every other boy, we check the maximal number of connections – which means that for every boy, there are two other boys that he his connected to by holding hands – and then require that the relation involves the maximal number of such connections.

We could try use the same reasoning for sentences such as (7a) above: If the relation is such that it cannot possibly hold between all cats and all dogs, we employ weakening, requiring the relation to hold between as many cats and as many dogs as possible. Yet, there is no plausibility to this explanation. (18a) can be true in a scenario where the universal-universal construal would be false, albeit *hate* shouldn't license pragmatic weakening. The sentence is true if Jimmy exclusively hates Hasso, Johnny exclusively hates Hasso and Hork and Jack exclusively hates Harro. Further, our original example from above, (7a), involves the relation *bite*, and biting is something that can be done to several dogs at more or less the same time (at least during the during of a standard fight), as illustrated by the fact that (18ai) is a perfectly fine sentence.

(18) a. The cats hate the dogs.
(i) It was a terrible fight. Jimmy bit all the dogs.

In sum, I conclude that the traditional account of plurals – where a plural DP is identified with or introduces a universal quantifier – is incorrect. There is no possibility to maintain this story in light of sentences such as (7a), as we cannot find an independent mechanism by means of which the weak construal can be derived from an underlyingly strong meaning. As I pointed out above, noone has seriously attempted such an explanation for these data, however, the strategies by means of which we could try to save the traditional meaning of *and* in light of sentences such as (19), repeated from (9) above, turn out to be very similar. They, too, fail.

(19) *My night at the farm was terrible.* The animals were crowing and barking. *The farmer went beserk. The car was stolen. ...*

### 1.1.2 Maintaining a traditional analysis for *and*

Let us go through those mechanism which could qualify as candidates by means of which we could derive the weak construal of (19) while maintaining the traditional analysis for *and*.

Pragmatic slack is the first candidate: Here, we would claim that (19) is false in the scenario given but for that some reason, the statement of a false sentence qualifies as a felicitous utterance. My arguments against this hypothesis are the same as above: First, if the weak construal is indeed pragmatic slack, whether or not the utterance qualifies as felicitous should vary with context. It doesn't. I can utter (19) in a report I gave to an uninvolved hearer the next, but my utterance in the little play below is just as felicitous (at least, it doesn't give the impression that I am trying to mislead the farmer).

(20) *A lot of noise on the farm. I step out of my bedroom and observe the scene. The farmer, in his nightgown, dashes out of the farm door and comes up to me.*
FARMER: What the hell is going on?
I: I don't know. The animals are crowing and barking. The barn is on fire. And I think your wife just jumped off the roof.

Further, a speaker does not have to retract if her utterance comes under discussion. Imagine a scenario where 20 children were having a party, 10 were dancing, 5 were smoking but not dancing and the rest was doing both. *A*'s first utterance in (21) is appropriate, and when it comes under discussion, as it does by *B*'s response, *A* does not have to retract.[6]

(21) *A*: What a great party. The children were dancing and smoking in the street.
*B*: My son was there, I think. What was he doing?
*A*: Smoking.

A second possibility is to appeal to imprecision without identifying the latter with pragmatic slack. Recall that the utterance in (22) is appropriate in a scenario where I left only half of

[6] Note also that the fact that *B* can ask this question at all indicates that *B* does not take the sentence to convey that each child was both dancing and smoking.

the windows open. If we give up the tie to pragmatic slack, we could even venture to say that it is a true utterance in this scenario (cf. Brisson (1998), Malamud (2012), Križ and Schmitt (2012a)). So couldn't we just say that the cases that seem to pose a problem for the traditional account are simply the result of imprecision? We would then assume that it suffices that some children / animals have the property denoted by the respective VP for the sentences in (23) to be true. Evidently, this doesn't make any sense. In the scenario given above for (23b), none of the animals are both crowing and barking. Accordingly, no animal has the property denoted by the VP and (23b) in that scenario should have the same status as (22) in a scenario where all of the windows are closed – namely, it should simply be false.

(22) Shit! I left the windows open!

(23) a. The children are dancing and smoking.
b. The animals are crowing and barking.

We could try to alter our structural assumptions about the sentences and assume that they involve sentential AC as in (24). Recurring again to imprecision, the first sentence could be true if some were crowing and the second sentence could be true if some animals were barking and conjoining them via *and* yields a sentence that is true if some animals are crowing and some animals are barking (cf. Malamud (2012)). Again, I do not think that this can be the solution. First, it is syntactically implausible, a point which involves a rather lengthy discussion and is thus omitted here in this expository section. Second, I noted above that in all cases of imprecision, explicit mentioning of the exceptions without additional material such as *of course* is blocked. However, making the facts explicit in (25) does not require such additional material, accordingly, the non-dancing girls or the non-smoking cannot have the status of exceptions.

(24) The animals are crowing and the animals are barking.

(25) The children were dancing and smoking in the street. The girls, being fat and unhealthy, were smoking. They didn't move at all. John and Peter were dancing and Billy was doing both.

The last candidate under consideration is Winter's idea of pragmatic weakening. In analogy to what was discussed w.r.t. reciprocals above, he argues that if the two properties coordinated by means of *and* are such that no individual can have both of them (and the sentence thus doesn't stand a chance of being true), we are allowed to employ pragmatic weakening, which, sloppily put, boils down to the requirement that all of the individuals must have one of the two properties. (24) represent a case where we would predict pragmatic weakening to apply: Animals that both crow and bark are rare. However, examples such as (26a), which is true in a scenario where half of the children are dancing and the other half is smoking immediately contradict his hypothesis. There is no reason why *dancing and smoking* should license pragmatic weakening. Dancing and smoking are not disjoint properties, as is witnessed by the fact that (26b) is a perfectly fine sentence.

(26) a. What a great party. The children were dancing and smoking, the adults were singing the Beasts of Bourbon and the police was on the other side of town!
b. I was dancing and smoking.

Let me recapitulate: If we are to maintain the traditional, i.e. intersective, account of *and*, we must find an independent mechanism *qua* which to derive the observation that sentences such as (26a) are true in scenarios where the tradition account would predict them to be false. There is no mechanism around by means of which this result could be achieved, therefore, I suggest that we give up the traditional analysis of *and*.

Note also that this is not some kind of freakish phenomenon, witnessed only by two or three sentences in the language. I use only few examples in this expository section, this thesis shows that the phenomenon is persistent and can be found all over the place. There are restrictions, but they have there causes elsewhere (see below).

## 1.2 Non-intersective *and*

If the intersective analysis of *and* is incorrect, we need something to replace it with. Analogously, if the universal quantifier-account of plurals is incorrect, we must replace that, too.

As all existing proposals for an alternative meaning of *and* (including my own) are inspired by the most prominent alternative take on plurals, I start with a brief sketch of the latter. Note that I here and throughout, I ignore the possibility of imprecision that I brushed upon above as it would (possibly unnecessarily) complicate the exposition significantly.

### 1.2.1 Cumulation

As we have the concluded that plural DPs such as *the cats* do not correspond to universal quantifiers, we have to backtrack and decide what meaning to assign to them. Intuitively, a singular DP such as *the cat* denotes an individual, whereas a plural DP, such as *the cats* denotes a collection made up from such individuals, which, henceforth, I refer to as a *plurality* of individuals. For the moment, I use this term on a purely intuitive level, and make the simplifying assumption that *the cats* is that collection that contains all and only salient cats.

Pluralities of individuals can apparently be attributed properties directly, as in (27). *meet* seems to inherently denote a property of pluralities of individuals – as opposed to (27a), the sentence in (28) seems almost uninterpretable. (27b), on the other hand, can convey that all the individuals *together* performed the act of lifting the piano.

(27) a. The children met.
b. The children lifted the piano.

(28) John met.

In other cases, however, we seem to infer the property of the plurality from the properties of the individuals that make up this plurality. Intuitively, being blond is a property of individuals and *being blond* can be attributed to DPs that denote individuals, as shown in (29a), (29b). However, once we know that (29a) and (29b) are true, and if John and Peter are the only boys around, we infer that (29c) is true. In other words, the property of the atomic individuals is inherited by the collection that consists of these atomic individuals. This type of inference – so-called *cumulative inferences* (cf. Link (1983) a.o.) – can be generalized: If, in addition to (29c), the sentences in (30a) are true, and Mary and John are short and Peter and Mary are tall, we can infer that all of the sentences in (30b) – (30f) are true. Accordingly, if a predicate holds of a number of individuals, its plural counterpart will also hold of any pluraly we can form from these individuals. This inference can be implemented in the object language by a pluralization, or rather, cumulation operator, that transforms basic intransitive predicate extension into pluralized – cumulated – predicate extensions, Link (1983).

(29) a. John is blond.
b. Peter is blond.
c. The boys are blond.

(30) a. Mary is blond. Sue is blond.
b. The boys are blond.
c. The girls are blond.
d. The short children are blond.
e. The tall children are blond.
f. The children are blond.

Cumulation of intransitive predicates such as *blond* derives the universal effect witnessed above for sentences such as (30f). Following our intuitions, the basic predicate *blond* denotes a property of individuals and not of pluralities of individuals. Applying predicate cumulation will yield a predicate that holds of individuals and all the pluralities we can form from these individuals. As we "know" that *blond* can only be a derived property of pluralities of individuals, we also "know" that the cumulated predicate can only hold of a plurality if it holds of the individuals that this plurality is made up from. (The question is, of course, whether (and if so, how) this "knowledge" is to be encoded linguistically, cf. Link (1983), Landman (1989a) and below.)

Now consider the sentences in (31). Assume that Jimmy and Johnny and Hasso and Harro have black fur and that Johnny and Jack and Harro and Hork are small. Again, we find cumulative inferences: If the sentences in (31) are true, we infer that any of the sentences in (32) are true.

(31) a. Jimmy bit Hasso.
b. Johnny bit Harro.
c. Jack bit Hork.

(32) a. The black cats bit the black dogs.
b. The small cats bit the small dogs.
c. The cats bit the dogs.

This shows is that if a basic relation holds of pairs of individuals $\langle u, v\rangle$, $\langle u', v'\rangle$, then its plural counterpart will also hold of the pair $\langle (u, u'), (v, v')\rangle$, where $(x, x')$ stands for "the plurality consisting of $x$ and $x'$ ". More generally, the plural counterpart of *bite* will also hold of all pairs $\langle U, V\rangle$, where $U$, $V$ are pluralities and the individuals making up $U$ were each bitten by individual that is part of the individuals making up $V$ and the individuals making up $V$ each bit some individual that is part of the individuals making up $U$. This observation can be linguistically implemented via a cumulation operator for binary relations, Krifka (1986), Sternefeld (1998). As we find that cumulative inferences also obtain for $n$-ary relations with $n > 2$, as illustrated by (33), where we may infer the truth of (33b) from the truth of the sentences in (33a) (assuming there are no other salient boys, girls and weapons), we may assume that such operators are available for relations of any arity.

(33) a. Mary killed John with the dagger. Sue killed Peter with the pistol. Jane killed Bill with the shotgun.
b. The girls killed the boys with the weapons.

Note that this derives the weak truth-conditions that we observed in the sentences above that contained more than one plural, such as (32c). Given what I just stated, the relation *bite* will hold between the pluralities (hasso', harro', hork') and (jimmy', johnny' jack') if Hasso was bitten by Jimmy, Johnny or Jack, Harro was bitten by Jimmy, Johnny or Jack and Hork was bitten by Jimmy, Johnny or Jack and if Jimmy bit Hasso, Harro or Hork, and if Jack bit Hasso, Harro or Hork. More concisely, (34) is true if for all salient $E$s there is *some* salient $F$ such that $E$ $R$-ed that $F$ and for all salient $F$ there is *some* salient $E$ such that that $F$ was $R$-ed by that $E$.

(34) The $E$ R-ed the $F$

At this point, we can return to the initial question, namely, what the traditional analysis of *and* should be replaced with.

### 1.2.2 Previous non-intersective analyses of *and*

Krifka's 1990 work represents the most articulate proposal for an alternative meaning for *and*. However, I should emphasize that what I here and henceforth refer to as *Krifka's proposal /account ...* isn't what he actually ends up proposing in the cited paper, but rather a potential analysis that he discusses at some length and subsequently dismisses (for reasons that I ignore in this introductory section). However, as I believe it to be more promising than the analysis he eventually opts for, I treat it here as though it were his actual proposal.

Both Krifka and I have the same point of departure. Up to this point, I have not mentioned the most evident and most thoroughly discussed problem for the traditional analysis of *and*, namely, (some instances of) AC where the coordinates denote individuals, as in (35) (cf. Link (1983), Hoeksema (1983, 1987), Partee and Rooth (1983) a.o., but cf. Winter (2001a)). The intersective analysis of *and* clearly does not derive the correct result for (35), as it predicts that *meet* should apply to the denotation of each conjunct individually.[7]

(35) John and Mary met.

Rather, *and*, when coordinating phrases that denote individuals, seems to form a semantic object from (the denotation of) its coordinates that is equivalent to the denotation of a plural DP. This does not only become evident in the context of collective predicates, but also when considering examples like (36a) below, which exhibit the same weak construal as (36b). Let us therefore posit that *and*, whenever it coordinates denoting individuals, forms the plurality of these individuals.

(36) a. Jimmy, Johnny and Jack bit Hasso, Harro and Hork.
b. The cats bit the dogs.

Recall that the traditional analysis assumed that there is one basic occurrence of *and*, namely that where *and* coordinates sentential expressions. The meanings of sub-sentential occurrences were derived from the meaning of this basic occurrence. Krifka proposes to change the perspective and assume that we consider *and* in the context of individual-denoting phrases as its basic occurrence, from which we derive the meaning of the other occurrences.

The basic rationale of his proposal is as follows: Coordinating individual-denoting expressions by means of *and*, as in (37a), means that we add the individuals denoted by the conjuncts together to form a plurality. Now recall from the discussion above that properties of individuals are inherited by the plurality formed from these individuals. What Krifka essentially suggests is to generalize this strategy to cases where the individuals do not have the same properties. We can infer the truth of (37c) from the truth of (37b), just as we could infer the truth of (29c) above from the truth of (29b) and (29a). Krifka takes this to implemented by the meaning of *and* itself, i.e. *and* is a version of the pluralization or cumulation operator from above: If one individual has the property $P'$, expressed by a predicate $P$, and another individual as the property $Q'$, expressed by the predicate $Q$, then the plurality formed from these two individuals has both properties, $P'$ and $Q'$ and this is expressed by the phrase *P and Q*. In other words, the VP-coordination in (37d) denotes that function that maps any plurality to true if some "part" of it is smoking and some "part" of it is dancing and no"part" is neither smoking nor dancing.[8] This notion is then generalized to all occurrences

[7] I omit the further complication that *John and Mary* are instances of sub-sentential coordination where, as opposed to the cases considered above, the conjuncts do not seem to denote functions. This, in itself, is not a problem. See below.

[8] I simplify Krifka's proposal here, as it is not limited to pluralities.

of *and* where it coordinates are predicates (of any arity) of (predicates of) individuals. For my present purposes, simple cases such as (37d) suffice.

(37) a. John and Bill
b. John was smoking. Peter was dancing.
c. John and Peter were smoking and dancing.
d. smoke and dance

Krifka derives the weak truth-conditions for the sentences repeated in (38). He predicts, correctly, that (38a) is true only if some of the children are dancing and some of the children are smoking and all of the children are either dancing or smoking and that (38b) is true only if some of the animals are crowing and some of the animals are barking, as long as all of the animals are either crowing or barking.

(38) a. The children are dancing and smoking.
b. The animals are crowing and barking.

Krifka's account exhibits some flaws (most of which he himself already lists) and has been subjected to severe criticism by Winter (2001a) (which mainly misses the point, I believe), but it works surprisingly well for a number of cases.

However, there is one problem for his analysis which has not been discussed so far and for which I see no obvious remedy.

Schematically, we could represent the weak truth-conditions of sentences such as (38) as an abstract relation between the denotation of the plural DP and the individual conjuncts. Take the schema in (39): For every salient $E'$ there is *some* $X$ that is either $F'$ or $G'$ such $E'$ is in the relation $R$ to this $X$ and for every $Y$ that is either $F'$ or $G'$, there is a salient $E'$ and such that $E'$ is in the relation $R$ to this $Y$.

(39) The $E$ $R$ $F$ and $G$.

In Krifka's proposal, predicate-AC forms a complex predicate: *F and G* denotes a function that requires part of its argument to be $F'$ and part of its argument to be $G'$. Accordingly, he predicts that the relation $R$ will always be the predication relation itself.

Now consider the cases in (40). Start with (40a) and take a scenario where there are excatly three detectives, Peter, Bill and Mary all of which are paid to observe John. Peter is observing John in the morning and sees him sell cocain, then he (Peter) goes home and takes a nap. During that time, Bill and Mary enter the scene and observe John cheating on his wife. In this scenario, (40a) is true. Now extend the scenario and assume that each detective, right after his / her observations, reports them to the client. In this extended scenario, (40b) is true. Finally, turn to (40c) and assume that of all the historians writing about the topic (except Peter), a third claims that Henry IV died of syphilis, another third that he fell off a horse and the last third that he was murdered by his enemies. In this scenario, (40c) is true.

(40) a. The detectives saw John sell cocaine and cheat on his wife.
b. The detectives reported that John sold cocaine to his friends and cheated on his wife.
c. Agreed, there are various conflicting hypotheses about the death of Henry IV, but Peter went a little too far. The historians claim that Henry died of syphilis, fell of a horse and was murdered by is enemies, but noone ever dared to suggest that he committed suicide.

All of these examples make the same point: We obtain the weak truth-conditions I stated above w.r.t. the schema in (39): For every salient $E'$ there is *some* $X$ that is either $F'$ or $G'$ such $E'$ is in the relation $R$ to this $X$ and for every $Y$ that is either $F'$ or $G'$, there is a salient $E'$ and such that $E'$ is in the relation $R$ to this $Y$. However, $R$ is not the predication relation itself, but something more complex. Take (40a): The complex predicate denoted by *sell cocaine and cheat on his wife* in (40a) and (40b) applies to John, so the meaning for the sentence that Krifka predicts is that every salient detective saw John doing both, selling cocaine and cheating on his wife. As laid out above, this prediction is false. Rather, we find that the sentence is true if, for every salient detective, there is an $X$, such that $X$ is either the property of selling cocaine or cheating on his wife and that detective saw John do/ be $X$ and for every property $X$ that is either selling cocaine or cheating, there is a detective that saw John do / be $X$. Analogously for the other examples. As such cases can be found across the board and as I do not see how Krifka can account for them (ruling out syntactic possibilties) I conclude that Krifka's account is on the wrong track.

## 1.3 Parallels with plurals

My own proposal starts off at the same point as Krifka's: AC with individual denoting coordinates, such as *John and Peter*, denote the same kind of object as a standard plural DP.

However, rather than assuming that the occurrence of *and* in this context is the basic one and that the meaning of *and* in other contexts is derived from the meaning of its basic occurrence, I argue that *and* plays exactly the same semantic role in every context it occurs in: It forms a plurality from the extensions of the coordinates. As opposed to all other treatments that I am aware of (with the exception of Gawron and Kehler (2004)[9]), this claim is completely general. In other words, *John and Peter* denotes that plurality that consists of the denotations of *John* and *Peter*, *smoke and dance* denotes that plurality that consists of the denotations of *smoke* and *dance* and *John is a pervert and Mary is a crook* denotes that plurality that consists of the denotations of *John is a pervert* and *Mary is a crook*.

The claim that the denotations of plurals and AC form a semantic class – what I call a *plurality* – empirically corroborated by the observation that the two constructions display a number of significant parallels.

[9]Gawron and Kehler (2004) extend to notion of pluralities to all semantic domains, but they don't employ cumulative interpretation, as I do here.

First, Fodor (1970) notes that sentences with plurals exhibit what I henceforth call *homogeneity (effects)* (extending Löbner's 1987 terminology, cf. also Löbner (1987, 2000), Schwarzschild (1994), Gajewski (2005), Malamud (2006)), which means that they display a polar behavior w.r.t. negation. The sentence in (41a) expresses that all salient girls arrived. Its negation in (41b) and (41c), however, expresses that no salient girl arrived. For all in-between scenarios, the sentences in (41) seem neither true nor false.

(41) a. The girls arrived.
  b. The girls didn't arrive.
  c. It's not the case that the girls arrived.

I show that a similar behavior is witnessed across the board for all AC with unstressed *and* (cf. Winter (1995, 1998), Szabolcsi and Haddican (2004), Geurts (2005) for related observations). (42a) expresses that Brown is both tall and handsome, its negation in (42b), (42c) expresses that he is neither. In in-between scenarios, the sentences in (42) seem neither true nor false. I argue that the same phenomenon is found for sentential AC, (42) (from Križ and Schmitt (2012b)): If *and* is unstressed, (112a) conveys that the kitchen has windows and that the house is free of mould and (112b) that neither is the case. In an in-between scenario, the sentences are neither true nor false.[10]

(42) a. Brown is tall and handsome.
  b. Brown isn't tall and handsome. (Geurts 2005:(48a))
  c. It's not the case that Brown is tall and handsome.

(43) a. This house is much better than the other one. The kitchen has windows and the bathroom is free of mould.
  b. This house is much better than the other one. Here it's not the case that the kitchen is windowless and (that) the bathroom is infested with mould.

Second, a number of lexical items – which I call *plurality seekers*, following Schwarzschild (1996) – seem to have the same semantic impact irrespective of whether they combine with a plural or an AC. *both*, in each case, seems to force a distributive reading, Schwarzschild (1996), (44), *respectively* yields a one-on-one mapping between the atomic members of a plurality / the individual conjuncts according to some order, McCawley (1988), Gawron and Kehler (2004), (45), and *different* (under is DP-dependent reading, cf. Beck (2001)) can relate plural NPs to both standard plurals as well as to ACs, Carlson (1987), Moltmann (1992), Beck (2001).[11]

[10]Homogeneity is a very subtle phenomenon, both with AC and with plurals (cf. in particular Schwarzschild (1994)). There are a number of interfering factors, including imprecision and the role of context, and the diagnosis of homogeneity is complicated by the fact that discourse behavior does not provide a very reliable testing-ground. What I argue that there is an irreducible sense of polarity in the the plural examples – small as it may be – and that the same irreducible sense of polarity if found for AC.

[11]Carlson (1987) and Moltmann (1992) argue that in sentences such as (46b) the *different* relates the plural NP to different events. This cannot be a general analysis for all occurrences of *different* with ACs, however,

(44) a. *Both* the boys are blond.
b. John was *both* tired and hungry.

(45) a. John and Mary hit Pete and Susan, *respectively.*
b. John and Mary smoked and danced, *respectively.*

(46) a. The boys read *different* books.
b. *Different* people discovered America and invented bifocals.
(Carlson 1987:(18a))

Third, plurals and ACs behave alike when embedded under quantificational determiners. This phenomenon is more prominent in German and accordingly illustrated by means of German examples below. Consider the examples in (47) and focus in particular on the difference in the paraphrases: In the (47a), the determiner "distributes", so to speak, over the individuals that the plurality denoted by *the satanists* consists of, in (47b), it doesn't.

(47) a. Gestern wurden die meisten Tagebücher der Satanisten verboten
yesterday were the most diaries of-the satanists banned
'Yesterday, for each satanist, most of her diaries were banned.'
b. Gestern wurden die fünfzehn Tagebücher der Satanisten
yesterday safety-requirements were the fifteen diaries of-the
verboten.
satanists banned
'Yesterday, out of the total amount of diaries written by a satanist, fifteen were banned.'

I observe that those determiners that "distribute" in the case of plurals, also "distribute" over the individual conjuncts when embedding an AC, (48a), and that those determiners that don't "distribute" with plurals, don't distribute over the individual conjuncts, (48b).

(48) a. Gestern wurden die meisten satanistischen Tagebücher und
yesterday were the most satanistic diaries and
kommunistischen Streitschriften verboten
communists pamphlets banned
'Yesterday, most satanistic diaries and most communist pamphlets were banned.'
b. Gestern wurden fünfzehn satanistischen Tagebücher und kommunistischen
yesterday were fifiteen satanistic diaries and communists
Streitschriften verboten
pamphlets banned

as it does not extend to (i) from German.

(i) Satz (4a) ist aus unterschiedlichen Gründen falsch und ungrammatisch. Er ist falsch weil
sentence (4a) is out-of different reasons false and ungrammatical. He is false because
..., und er ist ungrammatisch weil ...
..., and it is ungrammatical because ...
'Sentence (4a) is false and ungrammatical for different reasons. It is false because ... and it is ungrammatical because ...

'Yesterday, fifteen books that were banned which were either satanistic diaries or communist pamphlets'

I take these observations to corroborate the claim that the denotations of plurals and AC form a semantic class. In the following, I give an informal outline of how this claim will be specified in this thesis.

## 1.4 Proposal

In a nutshell, these are the core claims of the proposals and its differences to existing analyses:

All AC and all standard plurals are plural expression. Plural expressions are syntactically complex, i.e. derived from singular expressions. The difference between plural and singular expressions is syntactically encoded and syntactically relevant: Plural expressions are subject to a different set of syntactic rules than singular expressions. Existing proposals (which mainly focus on plural DPs or *and*–coordinations with individual-denoting coordinates) usually take the syntactic distinction between plural and singular expressions to be relevant only for surface phenomena, such as morpho-syntactic plural agreement. Some proposals (in particular Winter (2001a)) assume that this difference also correlates with the application of different syntactic rules, but these rules exclusively concern type-shifting operations. My proposal here goes one step further: The syntactic difference between plural and singular expressions concerns essential syntactic operations, in particular, restrictions on movement. Syntactic rules differ on whether they are sensitive to the plural / singular distinction or not. The latter set of rules adheres to standard locality restrictions, the former set doesn't but rather exhibits its own set of locality restrictions.

Singular and plural expressions have their extensions in different domains. The ontology for singular expressions is our standard ontology, the ontology for plural expressions consists of sets derived from each such ontological layer which are not part of the standard functional ontology. Existing proposals of plural denotations (which, again, are mainly limited to pluralities of individuals) fall into two classes: Link (1983) argues that two structures are directly derived from the set of individuals, one corresponding to the next-highest function layer (containing the denotations of intransitive predicates of individuals, such as *man*, *sleep*), the other as part of the model structure itself. In Link's proposal, plurals have their denotations in the latter set, i.e. a set that isn't part of the functional ontology. At the same time, plural denotations are no more abstract than singular denotations, both are "primitives", namely, individuals. Authors basing their work on Bennett (1974), on the other hand, assume that only one structure is directly derived from the set of individuals – the next-highest functional layer – which contains the denotations of both intransitive predicates of individuals as well as of plurals. A plural denotation is thus a more abstract object than a singular denotation. The present view, in a sense, meanders between these two positions: It sides with Link (in a sense, at least) in assuming a "double-domain" stance, where, for any set if extensions S, we have two discrete sets S' and S", such that S' is a set of the next-highest functional level and S" the set of plural denotations. However, it sides with works such as Bennett's in considering plural denotations to be more abstract than singular denotations. As opposed to all existing theories, however, the present proposal assumes that there are no expressions that primitively denote properties of pluralities (of any kind). This might seem absurd first sight – after all, there are collective predicates that seem to express just that, see (49), repeated from above. However, I show that there is something wrong with our standard view of collective predicates: At least a subset displays homogeneity effects. (49) conveys that the entire group of boys didn't meet and that no subgroup of these boys met, either. From a standard perspective, this is completely unexpected.

(49) John and Peter met.

(50) The boys didn't meet.

Pluralities serve as the arguments of $n$- ary predicates pluralized by operators here called $n^*$. This pluralization operation is similar, but not equivalent to standard cumulation: Essentially, it has the effect that the values which the basic function yields for each atom of the plurality are added together, hence the value of such a pluralized function is a plurality. For $n$-ary relations, this means that we check for each atom of each plurality, whether it is in the relevant relation to an atom of the other pluralities and add the resulting values together, again obtaining a plurality as the overall value of the function. As a result, I correctly predict that once a sentence contains more than one plural expression – a standard plural or an AC – it will have the weak truth-conditions discussed above. I further predict homogeneity effects. This latter result is due to my slight alteration to the standard concept of cumulation: If a pluralized predicate applies to a plurality, it will yield a plurality of truth-values (which consists of the individual values the basic function yields of the atoms). Only in some cases – whenever all the atoms have the property in question or whenever none of the atoms has the property in question – can that plurality be reduced to a standard truth value, i.e. to *true* and *false*.

The proposal does not aim for an explanation for the other phenomena addressed so far. Plurality seekers can certainly tell us a lot about the correct treatment of plural expressions and their denotations, but I do not investigate their specific semantic impact (although I do, of course, address their distribution). Once we have an analysis for those elements that derives the correct results for standard plurals, the present proposal will allow to just extend this analysis to AC. Analogously so for the strange behavior of configurations where a quantificational determiner embeds a plural or an *and*–coordination. If we can solve this riddle for standard plurals, I would expect that the solution carries over to AC. I suspect (and give some reasons for this suspicion) that the solution must be sought in a more thorough investigation of the determiners themselves, which I cannot undertake at this point. Finally, I do not discuss the phenomenon of imprecision, as it mainly occurs with morphologically plural DPs.

The following gives a more elaborate, yet still informal sketch of the claims I just listed.

### 1.4.1 Plural syntax

Plural expressions are syntactically derived from singular expressions. The system includes two operators for that purpose: The operator $R$ is an (abstract) plural morpheme, the other one, DEF, corresponds to the definite determiner *the*. I treat *and* as syntactically vacuous (as in Jackendoff (1977), Winter (1995)), the phonological reflection of a particular syntactic configuration, namely that configuration where the two sister nodes are both plural expressions of the same semantic category. The resulting expression is again a plural expression. Accordingly, the strings in (51) are assigned the syntactic structures in bold-face.

(51) a. John and Bill
**[[R John] [R Bill]]**
b. smoke and dance
**[[R smoke] [R dance]]**
c. John is a pervert and Mary is a crook
**[[R [John is a pervert]] [R [Mary is a crook]]]**

The operator $\bar{R}$ derives singular expressions from plural expressions and can be identified with (abstract) singular morphology, Crucially, $\bar{R}$ must be affixed to all plural sentential expressions at matrix level (i.e. all matrix sentences are singular expressions). Sentential operators, such as negation, operate on the output of $\bar{R}$.

Plural expressions occur as syntactic arguments of predicates that are subsequently pluralized. Following Beck and Sauerland (2000), I assume that these predicates do not necessarily correspond to lexical elements, but can be derived syntactically. In (52), repeated from above, the relevant predicate would be a relation between individuals and properties, namely $\{\langle Y, X\rangle | X \text{ saw John } Y\}$.

(52) The detectives saw John sell cocaine and cheat on his wife.

However, as opposed to Beck and Sauerland (2000), I argue that the required predicates are not derived by standard syntactic movement, as the operation that derives them is blind to all standard syntactic constraints on movement. The sentence in (53a) for instance, is true, if no cat slept but all of the cats bit some dog and every dog was bitten by some cat. Accordingly, the predicate we require is of the form $\{\langle Y, X\rangle | X \text{ bit } Y \text{ or slept }\}$ (but see below for more discussion). Deriving this predicate *qua* standard syntactic movement would involve a violation of the Coordinate Structure Constraint. Analogously so for (53b), which is true, for instance, if no child was sleeping but some children danced, some smoked and all children either smoked or danced.

(53) a. The cats bit the dogs or slept.

b. The children were dancing and smoking or sleeping.

I propose a level of syntactic representation – let us call it plural syntax – on which operations are sensitive to the plural / singular distinction and which is ordered after the syntactic level where scope-relations are read off. The predicates that are subsequently pluralized are derived on this level. We find a syntactic operation just like movement, but not constrained by standard locality. This does not mean, however, that plural syntax is completely unconstrained. Rather, it exhibits a specific type of locality: We cannot derive a predicate by movement across an embedding plural expression. This is witnessed by data such as (54). In (54a), each coordinate – which is a plural expression, as it is affixed by R, embeds another plural expression, namely the DPs *the dogs* and *the birds*, respectively. In (54b), a plural DP embeds another plural expression, namely the *and*–coordination *the dogs* and *the birds.* If we were allowed to derive the predicate across the embedding plural expression, the result for (54b) would be a sentence (and here I rely on parts of the proposal that I have not introduced yet, see immediately below) which would be true only if every cat bit some dog and every dog was bitten by some cat and every cat bit some bird and every bird was bitten by some dog. This is not the case: For the sentence to be true it suffices that every cat bit some dog or some bird and every dog was bitten by some cat and every bird was bitten by some cat. The reasoning for (54a) is analogous.

(54) a. The cats bit the dogs and chased the birds.
b. The cats bit the dogs and birds.

Accordingly, I propose that the derivation at the level of plural syntax proceeds cyclically, where a cycle is essentially the material *c*-commanded by one of the plural operators, *R* or DEF. The operator *n is affixed to the derived predicate at the end of each cycle.

### 1.4.2 Plural semantics

Singular and plural expressions have denotations in different semantic domains. The domains for the extensions of singular expressions are the standard ones: The set of individuals, the set of sets of individuals (or rather, the set of characteristic functions of such sets of individuals) and so forth. In order to prevent confusion, let me call the set $S$ of all extensions of singular expressions of the semantic category $a$ $D_a$. I posit a family of isomorphisms $\rho$, such that $\rho_a$ is an isomorphism that maps the power set of $D_a$, excluding the empty set, to an appropriate set $S'$. I call this latter set $\mathcal{R}_a$. In other words, we derive two similar, but not identical sets on the basis of $D_a$: The set $\wp(D_a)$, which is corresponds to the next-highest functional layer – containing the objects that we call "properties" of objects of $D_a$ and $\mathcal{R}_a$. For illustration, assume that $D_a$ is a very small set, $\{X, Y, Z\}$. The set $\mathcal{R}_a$ is then a set isomorphic to $\{\{X\}, \{Y\}, \{Z\}, \{X, Y\}, \{Y, Z\}, \{X, Z\}, \{X, Y, Z\}\}$. All plural expressions have their extensions in such "derived" sets.

I illustrate the impact of the plural and singular operators introduced above w.r.t. this very small set $D_a$. Let $E$ be a singular expression with a denotation in our small set $D_a$ above, namely $X$. The effect of the plural operator $R$ from above on the extension of $E$ – i.e. the denotation of the plural expression [R E] – is that it yields that object in $\mathcal{R}_e$ that "corresponds" to $\{X\}$. The operator DEF, on the other hand, can be considered a "direct" implementation of $\rho$. Consider again our initial set $D_a$ and assume $X$, $Y$, $Z$ themselves are sets with elements that are members of the domain $D_b$ (i.e. $D_b$ is the next-lowest functional layer w.r.t. $D_a$). Then [DEF X] denotes that plurality in $\mathcal{R}_b$ that corresponds to $X$. Finally, the singular operator $\bar{R}$ takes an element $X'$ in $\mathcal{R}_a$ and maps it to that element $X$ in $D_a$ such that $\{X\}$ corresponds to X'. Accordingly, it is a partial function, limited to those elements $\mathcal{R}_a$ which correspond to singleton subsets of $D_a$. Concerning AC, a string *E and F* corresponds to the structure [[R(E) ] [ R(F)]]. Assume, as above, that the denotation of $E$ is $X$ and the denotation of $F$ is $Y$. Hence, we have two sister nodes, such that one node denotes the object in $\mathcal{R}_a$ corresponding to $\{X\}$ and the other node denotes the object in $\mathcal{R}_a$ corresponding to $\{Y\}$. Such a structure – and, accordingly, *AC* – will denote the "sum" of these two objects, which means that for the case at hand, the denotation will be that object in $\mathcal{R}_a$ that corresponds to $\{X, Y\}$. Roughly (and omitting semantic categorization), *John and Mary* will thus denote an object corresponding to $\{john', mary'\}$ (where $E'$ stands for "the denotation of E"), *smoke and dance* an object corresponding to $\{smoke', dance'\}$ and *John is a pervert and Mary is a crook* and object corresponding to $\{I, J\}$, where I, J are (possibly identical) truth-values, namely, the denotations of *John is a pervert* and *Mary is a crook*, respectively.

What *are* these objects in $\mathcal{R}$, i.e. these objects I call pluralities? In a way, I don't care, because they will never be interpreted directly: All matrix sentences with a plural value are affixed with the singular operator, accordingly, the will only have a truth-value *true* or *false* if their plural value is the element corresponding to $\{true\}$ or that corresponding to $\{false\}$. Assume that it is true that John is a pervert, but false that Mary is a crook. The plural value of the sentence is the object corresponding to $\{true, false\}$, as there is no singular value that this object can be mapped to by the singular operator $\bar{R}$, the sentence will be neither true nor false. As sentential operators apply above this singular morpheme, negation will always target the singular value of a sentence– if there is one.

(55) John is a pervert and Mary is a crook.

Further, there are no expressions that primitively denote properties of pluralities. This is where the $n^*$ operators come in, which pluralize predicates. What they do, essentially, is that they sum up the values that the basic function yields for each "singular" part of the plurality. By "singular" part I mean the elements of the set X that the plural denotation $X'$ corresponds to. Take the most simple cases in (56). Here, we pluralize the property $\{Z|$ John did $Z\}$, which means that we check for each "singular" part of the plurality corresponding to $\{drink', smoke'\}$ whether John did it and add the values together. If it is true that John drank and true that he smoked, we obtain the plural value corresponding to $\{true\}$ for which there is a singular counterpart, thus, the sentence is true. If it is false that John drank and false that he smoked, we obtain the plural value corresponding to $\{false\}$ for which there also is a singular counterpart, thus, the sentence is false. If it is true that John drank and false that he smoked, we obtain the plural value corresponding to $\{true, false\}$, for which there is no singular counterpart, thus, the sentence is neither true nor false. This, in essence, tracks the homogeneity effects observed above.

(56) John was drinking and smoking.

Now consider (57). Here, we pluralize the relation (paraphrased as) $\{\langle Z, Y\rangle | Y \text{ did } Z\}$. This means that we check for "singular" part $Y$ of the plurality corresponding to $\{john', peter'\}$ if there is a "singular" part $Z$ of the plurality corresponding to $\{dance', smoke'\}$ such that $Y$ did $Z$ and we check for each "singular" part $Z$ of the plurality corresponding to $\{dance', smoke'\}$ whether there is a singular part $Y$ of the plurality corresponding to $\{john', peter'\}$ such that $Y$ did $Z$ and we add up all the values. Accordingly, the sentence comes out as true if both John and Peter were dancing or smoking and at least one of them was dancing and at least one of them was smoking. It comes out as false if neither was smoking or dancing, in all other scenarios, it will be neither true nor false. This yields the weak construal of sentences with more than one plural expressions, as well as homogeneity.

(57) John and Peter were dancing and smoking.

In those cases, where plurals are embedded under plurals, i.e. where cyclic derivation becomes relevant, we proceed as follows: Recall that cyclic derivation is induced by the plural operators $R$ and DEF. Our pluralized function, in this case, will be that plurality that we obtain from summing up the results of applying the cylce-inducing operator – $R$ or DEF – to the singular function values. In order to prevent confusion, I just cite the most simple case here: The cylce induced by the plural operator DEF in (58) (i.e. the string *the cats* and *the dogs* will be that plurality corresponding to the sum formed the values resulting from applying DEF applied to the extension of *dogs* and DEF to the extension of *cats*. At the next cycle, we pluralize the predicate *bit* so that the resulting sentence comes out as true if every cat bit some dog or some bird and every dog was bitten by some cat and every bird was bitten by some cat. It comes out as false if no cat bit any dog or bird. In all other scenarios, it will be neither true nor false. This is the desired result.

(58) The cats bit the dogs and birds.

## 1.5 More general questions

Returning to the outset of the discussion, what I formulate here is a partial refutation of and an alternative to the traditional view of AC. What I do here, essentially, is to re-categorize AC. Traditionally, ACs fall into the class of universals, just as *every NP* asf. Here, they fall into a class of expressions by means of which we tend to express weaker meanings. There are, of course, a number of unresolved issues. connected to this claim

First, we require a better description of this latter class – i.e. the class of expressions by means of which we express weaker meanings. On the one hand, I do not think that it is limited to plural expressions – generic expressions probably fall into that class as well, as might other expressions lacking overt quantificational material (but cf. Gajewski (2005)). On the other hand, I doubt that it is only quantificational strength that is an issue here: Intuitively, it seems that using a quantificational expressions, also conveys that we are after accuracy, but a plural does not do so. However, a specification of this intuition would require a more thorough and also controlled investigation of three issues: Imprecision and team credit, the behavior of all plural expressions in discourse and, finally, the verification strategies employed for plural sentences (as opposed to sentences containing quantificational material).[12] Clearly, making this intuition more precise would also require a more thorough investigation of the material I innocently considered "quantificational" above. Maybe AC are not the only construction that requires a re-categorization. Similar claims (a brief synopsis of which is given at the end of this thesis) have been made for *or*–coordinations (cf. in particular Merin (1992), Zimmermann (2000), Geurts (2005), Barker (2010) a.o.), and possibly some further explorations of apparently quantificational determiners and adverbs would also be advisable.

Second, a better cross-linguistic picture is required: Which strategies can be employed to form plural expressions – and which can't? For instance, are all the strategies which typologists take to be expressing traditional conjunction, strategies for the formation of plural expressions? If not, how do the strategies for forming plural expressions differ, cross-linguistically, from those that don't form plural expressions?[13] This question, is, of course, connected to the first one. In several languages, *AC* are realized by strategies similar to those that language employs to express universal quantification over individuals or other primitives. If we subject *AC* in those languages to the same tests I employ for English and German, do they still behave like plurals? And, if so, what is the behavior of those other phrases where morphologically related material seems to express universal quantification?

I have no answer to any of these question, but I clearly consider them worth-while objects of future investigation.

[12] Clearly, my claims above should also be subjected to a more serious investigation, in particular, we would require tests with a more visible – and quantifiable – effect of how speakers interpret sentences containing *AC*. To my knowledge, no such tests have been devised for *and* so far. van Lambalgen and Stenning (2008) give a conjunctive condition on the classical selection task, but given the particular formulation of this condition (and the interferring factors they themselves address), the results are inconclusive w.r.t. my particular question here.

[13] One particular point of interest, given that it is cross-linguistically very wide-spread, is the strategy of juxtaposition. We find similar configurations at sub-sentential level in English and German (cf. Payne (1985)), (i) and, of course, on discourse level. Is there a common meaning component for all these cases and, if so, what is it?

(i) The cats bit Harro, Hasso, Hork.

(ii) The cat is asleep. The hamster is dead.

## 1.6 Structure of the thesis

**Chapter 2** focusses on standard plural expressions such as *the boys*. I introduce the existing conceptions of plural denotations, as well as the motivation for and implementation of predicate cumulation. I then highlight three further properties of standard plural expressions: First, I show that the predicates that undergo cumulation must not only be derived syntactically but also must be derived by syntactic operations blind to locality. Second, I discuss the phenomenon of homogeneity and show that it is at odds with our standard notion of cumulation. As a final issue, I address the behavior of plural expressions under quantificational determiners.

**Chapter 3** discusses AC with coordinates of any category. As a first step, I show that the standard intersective account of AC cannot be maintained. I then present Krifka's proposal in greater detail. Finally, I argue that AC display a behavior parallel to the behavior of plurals discussed in chapter 2 and show that Krifka's proposal cannot derive (all of) these parallels.

**Chapter 4** gives the main features of the proposal for the extensional part of the language. It introduces the generalized syntax and semantics for plural expressions.

**Chapter 5** addresses the relation of the proposal given in chapter 4 to two other phenomena: The first point– collectivity– seems to represent a great problem for my analysis at first, however, I show that the situation is by no means as clear as it might seem. The second point – *or*–coordinations – addresses the question of the impact that my proposal might have for the analysis of related constructions.

**Chapter 6** summarizes the main findings.

## 1.7 Technical background and notational conventions

The final point of this introductory sections is brief overview of the technical background and the notational conventions employed *throughout* this thesis – amendments or changes to these technical skeleton will be made along the way and will be explicitly marked as such.

For the most part, I implicitly use a syntactic framework informed both Chomsky (1981) and Heim and Kratzer (1998) and work based thereupon, at times, however, I will refer to "derivations" or "derivational steps" in reference to Chomsky (1995), Chomsky (2001). In syntactic terms, this meandering is certainly a bit sloppy, however, the plural syntax I give is fully specified. I leave open which existing syntactic system it should be combined with.

For the main part of this thesis, I consider only the extensional part of the language. This language, unless indicated otherwise, consists of logical forms (LFs), i.e. syntactic structures derived by the standard syntactic rules of the afore-mentioned syntactic systems.

As a point of departure, I start with completely standard assumptions: Linguistic expressions are semantically categorized, the semantic categories being the ones given in (59). Our basic vocabulary are the terminal nodes, which fall into two classes: Constants and variables. Complex expressions are formed *qua* the syntactic rules in (60).

(59) The set of types $T$ is the smallest set such that

  a. $e$ type
  b. $t$ is a type
  c. If $a$ is a type and $b$ is a type, then $\langle a, b\rangle$ is a type.

(60) a. If $\alpha$ is a constant or variable of type $a$, then $\alpha$ is an interpretable expression of type $a$.
  b. If $\alpha$ a non-branching node and its daughter is an interpretable expression of type $a$, then $\alpha$ an interpretable expression of type $a$.
  c. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta$ is an interpretable expression of type $a$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle$, then $\alpha$ is an interpretable expression of type $b$.
  d. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ an interpretable expression of type $b$, then $\alpha$ is interpretable expression of type $\langle a, b\rangle$.

Extensions of expressions are determined w.r.t. a model $\mathcal{M} = \langle A, \mathcal{F}\rangle$ and an assignment $g$. $A$ is a non-empty set of individuals, $\mathcal{F}$ is the interpretation function that maps any non-logical constant of type $a$ to a denotation in its denotation domain $D_a$, the ontology being in (61). $g$ is the assignment, which assigns to variables of type $a$ denotations in $D_a$. In other words, if $\alpha$ is constant of type $a$, then $[\![\alpha]\!]^{M,g} = \mathcal{F}(\alpha)$ and if $\alpha$ is variable of type $a$, then $[\![\alpha]\!]^{M,g} = g(\alpha)$. Functions ending in $t$ are characteristic functions of sets (of sets ...) of ($n$-tuples of) individuals. I sometimes equate functions with the sets they characterize, if no confusion is likely to arise.

(61) a. $D_e$ is the set of individuals $A$
  b. $D_t$ is the set of truth values, $\{1, 0\}$
  c. $D_{\langle a,b\rangle}$ is the set of all functions from $D_a$ to $D_b$.

Expressions of the language are assigned their extensions w.r.t. $\mathcal{M}, g$ on the basis of (62). In the text below, I suppress the superscript wherever possible. As the standard "logical words" *and* and *or* are subject of the discussion, I do not add their denotations here. Negation and quantificational determiners are introduced in chapters 2 and 4.

(62) a. If $\alpha$ is a constant of type $a$ then $[\![\alpha]\!]^{M,g} = \mathcal{F}(\alpha)$.
  b. If $\alpha$ is a variable of type $a$, then $[\![\alpha]\!]^{M,g} = g(\alpha)$.
  c. If $\alpha$ is a non-branching node with daughter $\beta$, where $\beta$ is an interpretable ex-

pression of type $a \in T$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g}$.

d. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle \in T$, then $[\![\alpha]\!]^{M,g} = [\![\gamma]\!]^{M,g}$ $([\![\beta]\!]^{M,g})$.

e. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ and interpretable expression of type $b \in T$, then $[\![\alpha]\!]^{M,g}$ is that function $f$ of type $\langle a, b\rangle$, such that for all objects $u$ of type $a$, $f(u) = [\![\alpha]\!]^{M,h}(\mathrm{x})$, where $x$ is the $n$-th variable of type $a$ and $h = g^{[x/u]} = (g \setminus \{x|g(x)\}) \cup \{\langle x, u\rangle\}$

Unless indicated otherwise, I use $x, y, z$ as variables over ranging individuals, $P, Q, R$ as variables over (n-ary) predicates of individuals, $\mathcal{P}$, $\mathcal{Q}$ as variables over quantifiers (objects of type $\langle\langle et\rangle t\rangle$), $p, q$ as variables over propositions. I use $u, v$ as individual constants, $U, V$ as (n-ary) predicate constants, $\mathcal{U}, \mathcal{V}$ as quantifier constants and $\pi, \upsilon$ as propositional constants. If the variable is to range over all semantic categories or if its domain is intentionally unspecified, I employ upper-case letters $X, Y, Z$, analogously for constants $\mathcal{X}, \mathcal{Y}, \mathcal{Z}$. Whenever I run out of variables, I use numerical superscripts, while numerical subscripts are usually used exclusively to represent the order of occurrence of variables. I will use English as a language of description, whenever confusion is likely to arise I indicate descriptions by ’.

I try to consistently employ the following conventions:

I write *singulars, plurals* when referring to expressions that are morpho-syntactically singular and plural, respectively, and *atoms / pluralities* when referring to semantic objects. Whenever I talk about singular DPs or plural DPs without any further specification, the DP is to be understood as embedding a count noun, rather than a mass noun or collective noun.

I use the terms *and*-coordinations and *or*-coordinations when talking about expressions, rather than conjunction (and disjunction), in order to avoid confusion. For the sake of brevity, I shorten the former to AC and the latter to OC.

As a final point, I only refer to a “reading” of a *string* $S$ to be ambiguous, whenever I do not want to commit to ambiguity, I will use “construal” of $S$ instead.

Concerning my use of data, examples from languages other than English (which will mainly be from German) are be glossed if morphological or syntactic properties of the construction could be relevant, otherwise I only give translations. Unless noted otherwise, judgements only concern the original example.

# 2 Plurals

This chapter focusses on the semantic and syntactic properties of plural sentences – i.e. sentences containing plural DPs. Under the latter I here subsume without any further discussion morphologically plural DPs, such as *the cats* as well as that ACs with conjuncts of type $e$, i.e. phrases such as *Jimmy, Johnny and Jack*. For all effects and purposes of the present chapter, these two structures behave alike. I return to the question of whether they should be distinguished in chapter 3.

The purpose of this chapter is two-fold. On the one hand, I work out the distinctive properties of plural sentences. These properties will be considered symptoms of plurality, which, at later stages of this thesis, will be used as diagnostics: Broadly speaking, if a sentence exhibits these properties, I will infer that it contains a plurality, whatever morphological or syntactic guise the latter may appear in. On the other hand, I introduce the basic features of the standard analysis of plural sentences, concentrating in particular on those aspects, that will be used, in one form or another, in my own proposal in chapter 4.

As a first step, I discuss existing proposals on the denotations of plural DPs – so-called pluralities. I briefly present the two main positions that have emerged in the past 40 years or so. Roughly, both assume that pluralites are complex objects – made up from "atoms", that is, individuals, but they differ in their perspective of how this complexity is encoded. Despite this difference, however, the two positions are hardly distinguishable empirically and nothing much hinges on which view we take at the present stage. Yet, as I explore the denotations of plural expressions more thoroughly in chapter 4, this initial overview will prove helpful for the subsequent discussion.

Once we have established which denotations existing theories assign to plural expressions, the next step is to investigate plural predication. There are two basic phenomena connected to plural predication, which seem to point into different directions concerning our investigation of plural denotation – collective predication and cumulative predication. Collective predication suggests that plural denotations are a discrete class of semantic objects that lives, in sense, independently of its individual parts. In particular, some expressions – such as *meet*, *parallel*, *team* – seem to denote irreducible properties of pluralities. Consider the sentence in (1a): *meet* here seems to be a property of the whole collection of cats, we cannot say what has to hold of each individual cat, in isolation, for the sentence to be true. Likewise, we are basically unable to say what the sentence in (1b) is supposed to express.

(1) a. The cats met.
    b. # Jimmy met.

In the present chapter, collective predication plays only a minor role – it will be mentioned from time to time, but no particular attention is given to it. What I am more interested in here is the second phenomenon, cumulative predication. Cumulative predication suggest that plural denotations "live off", so to speak, their individual parts. In particular, we find that properties such as *sleep* – which, intuitively, seem to denote properties of individuals – are inherited by the plurality itself from its individual parts: From the truth of the sentence in (2a), we can infer the truth of the sentences in (2a). More importantly (diagnostically) we find that this extends to $n$-ary relations between individuals: From the truth of (3a) we may infer the truth of (3b).

(2) a. Jimmy slept. Johnny slept. Jack slept.
  b. The cats slept.

(3) a. Jimmy bit Hasso. Johnny bit Harro. Jack bit Hork.
  b. The cats bit the dogs.

If cumulative inferences as in (3) and (2) are the primary empirical source for our analysis of plural predication – or plural predicates – on, the denotation of a plural predicate such as *sleep*, roughly, is that property that holds of all pluralities (or individuals) that are such that all its individual parts are asleep, whereas a plural predicate such as *bite* holds of a pair of pluralities (or individuals) that is such that every individual part of the first plurality in the pair was bitten by some individual part of the second plurality of the pair and every individual part of the second plurality in the pair bit some individual part of the first plurality in the pair. The fact that such a take on the denotations of plural predicates correctly derives the appropriate "weak" truth-conditions for sentences such as (3b) will be of immediate importance for the subsequent chapters.

Having sketched these basics, I turn to the question on cumulativity should be encoded, concerning both the underlying syntactic structure as well as the actual semantic operation itself.

Standardly, the step from the basic denotation of a predicate to its pluralized denotation is linguistically implemented by so-called cumulation operators, such that for each arity, there is one such operator, which, in most proposals is affixed to the predicate. I follow Beck and Sauerland (2000) in assuming that this predicate does not have to correspond to a lexical element. This means that the predicates in question can be syntactically derived. However, I contradict their claim that this derivation is constrained by those restrictions that we observe independently for covert movement or, in fact, any kind of syntactic movement. In other words, the formation of the predicates that are subsequently affixed with cumulation operators are not subject to locality constraints.

I then turn to the one syntactic configuration, that indeed seems to block formation of a a predicate of the afore-mentioned kind– those, where the relation have to be formed across the definite determiner and some quantificational determiners. At first sight, it seems that there is a neat syntactic distinction to be found here: Those determiners behave like syntactic islands that head DPs that display the same behavior as morphologically plural definite DPs in the sense that they may partake in cumulative construals of relations they occur as a syntactic argument of (cf. Scha (1981)). Unfortunately, the empirical situation proves to be more messy upon closer scrutiny and the correlation breaks down. In particular, it seems that all determiners may head DPs that can behave like plural expressions, and all determiners behave like syntactic islands in the sense specified above, nevertheless, we still find that quantificational determiners differ in their behavior when embedding a plural – whereas some determiners distribute, so to speak, over the individuals in the plural's denotation, others don't.

While these two points relate to plural syntax or essentially to the question of how to derive the predicates that are then affixed with the cumulation operator, the last major point concerns the semantic contribution of this operator. In its standard conception – which follows the path mapped out by cumulative inferences – cumulation is at odds with homogeneity, i.e. with the observation that plurals display a polar behavior under negation. If the plural predicate *sleep* holds only of all those pluralities that are such that all its individual parts are sleeping, then the sentence in (4a) should simply be false, and its negation in (4b) true, if only two out of the three cats were asleep. This doesn't seem to be the case. I go through some prominent explanations of this phenomenon and conclude that there is no utterly convincing one at the present stage.

(4) a. The cats slept.
b. The cats didn't sleep.

Returning to the tasks I formulated, this chapter shows that there two distinctive semantic features of plural sentences: First, if a plural sentence contains more than one plural expression, we obtain the characteristic "weak" truth-conditions. Second, we find homogeneity effects. It further shows that there are two distinctive syntactic features of plural sentences: First, the derivation of predicates for which we find the "cumulative" construal is not constrained by standard locality, second, it is constrained by constraints, one of which seems to apply in contexts where a subset of determiners – including the definite determiner and some quantificational ones – embeds a plural expressions. In the subsequent chapters, these properties are considered symptomatic of plural sentences.

Further, the chapter shows that there is a standard way to deal with the weak truth-conditions of plural sentences containing for than one plural expression, however, this treatment does not extend to homogeneity effects. Further, we have no syntax that would derive the particular syntactic properties witnessed here.

## 2.1 Denotations of singular and plural DPs

Intuitively, singular and plural DPs seem to differ in their meaning: When I use a singular DP such as *the boy* or *John* I talk about a single, minimal individual that has the property of being a boy or that is John – an *atom* – but when I use a plural DP, such as *the boys* or *John and Bill* I talk about a *collection* of minimal individuals that have the property of being a boy or a *collection* that contains John and Bill– a *plurality*.[1] An atom is a primitive in the model, a plurality is something more complex as it has identifiable "parts".

### 2.1.1 The single and the double domain approach

All existing accounts of plurality maintain that a plural denotes a more complex object than a singular. However, they differ in whether they assume that this complexity is expressed by a our standard ontology or not – I here call the former perspective the *single domain approach* and the latter the *double domain approach*.

Consider again the standard ontology, as introduced above, which we can conceive of as follows (replacing functions with the sets they characterize): Given a non-empty set of individuals $A$, all semantic domains formed on the basis of $A$ are Boolean algebras, the set-theoretic complexity of which is directly reflected in the functional hierarchy encoded by the logical types of expressions (see above). From $A$, we derive the complete Boolean algebra $\wp(A)$, which corresponds to the set of extensions of expressions of type $\langle et \rangle$– the latter denote characteristic functions corresponding to the elements in $\wp(A)$. $\wp(A)$ in turn forms the input for the next level $\wp(\wp(A))$ corresponding to the set of extensions of type $\langle\langle et\rangle t\rangle$ etc. set of order $n$ is derived on the basis of a set of order $n-1$.[2] Extensions of type $\langle et \rangle$ correspond to sets of individuals, $S \subseteq A$ (i.e. the set of their extensions is $\wp(A)$), extensions of type $\langle\langle et\rangle t\rangle$ to subsets of $\wp(A)$ (and the set of such extensions is the set $\wp(\wp(A))$. (Analogously for $n-ary$ the extensions of expressions of type $\langle e\langle et\rangle\rangle$ correspond to subsets of $A \times A$ and extensions of expressions of type $\langle\langle et\rangle\langle et\rangle t\rangle$ correspond to subsets of $\wp(A) \times \wp(A)$ etc.) Broadly speaking, the single domain approach assumes that, given a non-empty set of individuals $A$, there is exactly one Boolean algebra $B(A)$ derived, while the double domain approach assumes that two such structures, $B_1(A)$ and $B_2(A)$ are derived: One structure corresponds to the next

[1] I brush over a proper definition of "atom" at this point. For AC of proper names, the atoms are simply the objects picked out by the proper names, Accordingly, *John* will denote an atom and *John and Peter* will not (I exclude special cases, where proper names don't seem to pick out an atom. Imagine a scenario, where John just exploded, his upper half lying on the lawn and the lower half on the stairs. It is possible to utter *Oh look, John's over there. And over here, too*). For standard plurals such *the boys*, the atoms of the plurality can be defined *qua* the property P' denoted by the predicate. An atom, relative to P' is the smallest object of which P' holds. This definition, however, only holds if a predicate P is *quantized*, which, following Krifka (1992, 1998), is the case iff for all $x$ in $P$'s extension, no proper part of $x$ is also in P. It does not extend to non-quantized predicates such as mass nouns, but also some count nouns such as *line* (cf. Rothstein (2010)). I mainly ignore this issue here, briefly returning to it in chapter 5.

[2] The set of truth-values, derived on the basis of $A$, is the set $\wp(\{\emptyset\}) = \{\emptyset, \{\emptyset\}\}$). Note that there is no equivalent set-theoretic rendering of objects ending in $e$: obviously, there is a set $S$ of extensions of type $\langle a, e\rangle$ from which we can derive the Boolean algebra $B(S)$, but $S$ itself is not a Boolean algebra, as it is not a power set of (a power set ...) of $A$. However, it can possibly shown that such sets are isomorphic to sets of expressions of the Boolean type (cf. Kaplan (1975) for related discussion).

highest ontological layer, so to speak, while the other one is the structure of the set our primitives itself, provided by the model.

The former position is taken by Bennett (1974), Van der Does (1992, 1993) and Winter (2001a) a.o.. Singulars denote primitives in the model, i.e. object of type $e$ (or quantifiers, i.e. objects of type $\langle\langle et\rangle t\rangle$, the set of all properties an individual has, cf. Partee (1986) for more discussion). Plurals, on the other hand, denote sets of individuals and therefore, just as the extensions of intransitive predicates elements of $\wp(A)$ (while their actual extensions will be found in a subset of $\wp(A)$, namely, $\wp(A) \setminus \{\emptyset\}$, see below). Their semantic category, Accordingly, is $\langle et\rangle$. (I do not discuss here how these meanings are derived for concrete cases, such as *John and Mary* or *the boys*, as proposals differ in this respect.[3])

[3]One implementation (the one most closely resembling Link's proposal), employs two shifts, (15) in the text below and (i), where (i) a partial function from sets of individuals to individuals (or a total function from singleton sets of individuals to individuals). (Both shifts are embedded in Quine's axiomatic set-theory, (Quine 1980:parts 1,3) and also employed, as part of the model structure, in Schwarzschild (1996)). (15) is employed by both Van der Does (1992, 1993) and Winter (2001a) for partially independent reasons, (i) isn't.

(i) Partee's 1986 *iota* $\langle et\rangle \Longrightarrow e$ $\lambda P_{\langle et\rangle}.\iota x P(x)$

We could now take *and* for $D_{\langle et\rangle}$ to be ambiguous between union and intersection, the first applying whenever the conjuncts are pluralities, the second whenever they are not but rather one-place predicates of individuals. This must be a syntactic distinction, but this distinction is independently required, as I lay out below. If the conjuncts are singulars, as in (iii), each be shifted *qua* (15).

Concerning standard DPs, we could simple assume that the definite determiner is generally the identity function on predicates, adding an existence presupposition. In order to avoid excessive use of pluralities (but cf. Van der Does (1992)) we could employ (i) in case the result is a singleton. Whenever it isn't, occurrence of the definite determiner would furthermore have to change the syntactic category, as we need to distinguish pluralities and non-pluralities, both of which are members of $D_{\langle et\rangle}$.

(ii) $\lambda P_{\langle et\rangle}.\lambda x_e : P \neq \emptyset.P(x)$

Winter (2001a) argues for a different proposal concerning AC (I leave out his account of standard DPs), proposing that *and* is uniformly intersective. This yields the right result for (iiia), but not for (iiib).

(iii) a. John and Mary are blond.
b. John and Mary met.

To derive the correct DP-meaning for (iiib), he assumes that the extensions of proper names (elements of $D_{\langle\langle et\rangle t\rangle}$), may undergo *collectivity lifting* (COLL), which first derives for each of these sets the set of its minimal elements by means of the operation MIN, (iva) (i.e. for the set $\{P_{\langle et\rangle}|P(john) = 1\}$, the set of its minimal elements is $\{\{j'\}\}$, cf. also Hoeksema (1983)) and then existentially quantifies over the result of MIN by means of E, (ivb). (i.e. we go from $\{P_{\langle et\rangle}|P(john) = 1\}$ via $\{\{j'\}\}$ to $\{Q_{\langle\langle et\rangle t\rangle}|\exists x[x \in \{\{john\}\} \wedge Q(x)\}$) (collective predicates are of type $\langle\langle et\rangle t\rangle$), see below). (v) gives the chunks of the derivation where the two operators apply successively to a the coordinate structure *John and Mary* and the result combines with a collective predicate.

(iv) a. $\textsc{min}_{\langle\langle\langle et\rangle t\rangle,\langle\langle et\rangle t\rangle\rangle} = \lambda\mathcal{Q}_{\langle\langle et\rangle t\rangle}.\lambda A_{\langle et\rangle}.\mathcal{Q}(A) \wedge \forall B[B \in \mathcal{Q} \wedge B \subseteq A \Rightarrow B = A]$.
b. $\textsc{e}_{\langle\langle\langle et\rangle t\rangle\langle\langle et\rangle t\rangle,t} = \lambda\mathcal{Q}_{\langle\langle et\rangle t\rangle}.\lambda\mathcal{P}_{\langle\langle et\rangle t\rangle}.\exists X_{\langle et\rangle}[\mathcal{Q}(X) \wedge \mathcal{P}(X)]$

(v) John and Mary met LF: [ [E[MIN [John and Mary]]] met ]
a. $[\![\text{John and Mary}]\!]^{M,g} = \lambda P_{\langle et\rangle}.P(j') \wedge P(m')$
b. $[\![\textsc{min}\ [\text{John and Mary}]]\!]^{M,g} = \lambda A_{\langle et\rangle}.A(j') \wedge A(m') \wedge \forall B[B \in \{P_{\langle et\rangle}|P(j') \wedge P(m')\} \wedge B \subseteq A \Rightarrow B = A]. = \{\{j', m'\}\}$
c. $[\![\ \textsc{e}\ [\textsc{min}\ [\text{John and Mary}]]]\!]^{M,g} = \lambda\mathcal{P}_{\langle\langle et\rangle t\rangle}.\exists X_{\langle et\rangle}[X \in \{\{j', m'\}\} \wedge \mathcal{P}(X)]$

As, according to the single-domain approach, the difference between singular and plural denotations is encoded in the grammar, so is the difference between predicates that seem to denote properties of atoms – so-called distributive predicates, such as *sleep*, which are of standard type $\langle et \rangle$– and *collective* predicates, such as *meet*, which are functions of type $\langle\langle et \rangle t \rangle$. Collective predicates seem to exclusively denote properties of pluralities, (5). When co-occuring with a singular, we are unable to say what the resulting sentence means, i.e.. when it would be considered true, (5a).

(5) a. # Sue met.
b. The boys met.

The double domain approach is put forth by Link (1983) (cf. also Schwarzschild (1996), and also Landman (1989a)), who assumes that we derive two Boolean algebras on the basis of $A$: the domain $D_{\langle et \rangle}$, which corresponds to the set $\wp(A)$ and the structure $\langle A, \oplus, \leq \rangle$ which is isomorphic to $\wp(A) \setminus \{\emptyset\}$. The second structure is not part of our ontology derived on the set of primitives $A$, but rather part of the model structure itself. In other words, we enrich the set of primitives of our model: A is made up of a set of atomic individuals and a set of pluralities. Both singulars and plurals have their denotations in $D_e$, i.e. A.

Link maintains that language does *not* consistently distinguish between the denotations of singulars and plurals: After all, we do not only find distributive and collective predicates, but also so-called *mixed* predicates that seem to be able to express both properties of atoms and pluralities: *weigh 200 kilograms* can occur with both singulars and plurals and, in (6b) can relate to the total weight of all boys together, or to the individual weight of each boy.

(6) a. Sue weighs 200 kilograms.
b. The boys weigh 200 kilograms.

Link thus claims that there is no difference in terms of abstraction between the denotations of singulars and of plurals and that both simply denote individuals.[4] Yet, there seems to be an intrinsic ordering on $A$ which becomes visible when considering the extensions of *distributive* predicates, which, after all, are subsets of $A$. In particular, the following so-called *cumulative* inferences hold.

(7) a. John slept. Mary slept. $\Rightarrow$ John and Mary slept.
b. The boys slept. The girls slept. $\Rightarrow$ The children slept.

---

d. $[\![$ E [MIN [John and Mary]] met $]\!]^{M,g} = 1$ iff $\exists X_{\langle et \rangle}[X \in \{\{j', m'\}\} \wedge \text{met}(X)]$

[4]More precisely, Link argues that both denote concrete objects, no sets. This latter argument is refuted by Landman (1989a), who concludes that a double-domain approach does not have to have mereological rendering, as in Link (1983), but may also have a set-theoretic rendering as in Landman (1989a), Schwarzschild (1996) and also Scha (1981). Note, however, that I only present half of Link's 1983 proposal here, omitting his discussion of mass nouns, which is essential for his claims. Chapter 5 contains a very brief discussion of the missing part.

(7a) shows that if $[\![\text{sleep}]\!]^{M,g}$ has $[\![\text{John}]\!]^{M,g}$ in its extension and if it has $[\![\text{Mary}]\!]^{M,g}$ in its extension, it will have $[\![\text{John and Mary}]\!]^{M,g}$ in its extension. More generally, we may infer that for any two atoms $u$, $v \in A$, the plurality made up of $u$ and $v$ is also a member of $A$. (7b) shows that the cumulative inference also holds between two plural sentences and another plural sentence, the claim is more general: for any two pluralities $u$, $v \in A$, the plurality made up of $u$ and $v$ is also a member of $A$. As cumulative inferences seem to exist across the board (but see section 2.6 below) we can also show that every plurality has parts and, by the same reasoning, that all pluralities are made up of atoms, as illustrated in (8) for a very small model, with John, Bill being all the boys and Mary and Sue being all the girls. By the same reasoning, we can show that every plurality is uniquely determined by its atomic elements, and that any set of atoms $A$ uniquely determines a plurality. Finally, we find that the extensions of singular DPs –which I already referred to as atoms, are indeed atomic, i.e. they have themselves as their only part: The minimal sentence from which we infer that John slept is *John slept* ( cf. Link (1983, 1991) and chapter 5 for discussion).

(8)
a. The boys slept. The girls slept. ⇒ The children slept.
b. John slept. Bill slept. ⇒ The boys slept.
c. Mary slept. Sue slept. ⇒ The girls slept.
d. John slept. Bill slept. Mary slept. Sue slept. ⇒ The children slept.

Accordingly, $A$ is a set of individuals, closed under the (associative, commutative and idempotent operation) mereological join $\sqcup_i$ and partially ordered by the (reflexive, transitive and anti-symmetric) part-of-relation $\leq_i$, (9) (cf. Heim (1994)).

(9)
a. For any $u, v \in A$, $u \leq_i v \leftrightarrow u \sqcup_i v = v$.
b. For any $u, v \in A$, $u \sqcup v$ is the the unique $w \in A$, such that
$\forall x[x \leq_i u \vee x \leq_i v \rightarrow x \leq_i w]$ and
$\forall y[\forall x[x \leq_i u \vee x \leq_i v \rightarrow x \leq_i y] \rightarrow w \leq_i y]$

$\langle A, \sqcup_i, \leq_i \rangle$ is a complete join atomic semi-lattice, as for any $u, v \in A$, $u \sqcup v \in A$. The bottom elements are the atoms, the set $AT \subseteq A, AT = \{x | \forall y, y \leq_i x \rightarrow x = y\}$ . The set of pluralities is a proper subset of $A$, namely $A \setminus AT$, henceforth written as $A$*.

The new model is the structure $\mathcal{M} = \langle \langle A, \sqcup_i, \leq_i \rangle, \mathcal{F} \rangle$. The following two assumptions are added: *and*, when occurring with conjuncts of type $e$ denotes the operation $\sqcup$, (10). Accordingly, the conjunction in (10) picks out that member of $A$ which is the mereological sum of the atom pick out by $[\![\text{Sue}]\!]^{M,g}$ and the atom picked out by $[\![\text{Mary}]\!]^{M,g}$), If the conjuncts themselves denote pluralities *and* will form the mereological sum of these pluralities. Note that this structure is ontologically *flat* in that $A$ does not contain any more complex objects, accordingly all of the DPs in (11) simply denote individuals.(The same position is taken in Schwarzschild (1996) within a set-theoretic framework. Landman (1989a), on the other hand, also working within a set-theoretic framework, introduces such more complex objects.) I will be sloppy (but at least I will be sloppy quite explicitly): Link translates natural language sentences into a formal language, so that *and* corresponds to the expression $\oplus$ in that formal language ($\oplus$ is interpreted as $\sqcup$). At the moment, this intermediate level is of no importance. However, I will in many cases use $\oplus$ to stand for the *semantic* counterpart of *and*. I do so because this notation will make some of the parallels to my own proposal in chapter 4 more easily visible.

(10) $[\![\text{Sue and Mary}]\!]^{M,g} = [\![\text{Sue}]\!]^{M,g} \sqcup [\![\text{Mary}]\!]^{M,g} = \mathcal{F}(\text{Sue}) \oplus \mathcal{F}(\text{Mary}) = \mathcal{F}(\text{Sue} \oplus \text{Mary})$

(11) a. Sue and Mary
b. The boys and the girls
c. The boys and Sue

Concerning plural predication, as in (12) (which is more thoroughly discussed in section 2.2 below), Link argues that the cumulative inferences for distributive predicates discussed above suggest that predicate extensions can be closed under $\oplus$, which tracks the structure of A, (13). I here call *P the *cumulated* extension of the predicate (see section 2.2 below for more discussion).

(12) Sue and Mary are sleeping.

(13) a. For any $P \subseteq A$, *P is the smallest set $S \subseteq A$, such that $P \subseteq S$ and for all $x, y \in P$, $x \oplus y \in S$.
b. $[\![\text{sleep}]\!]^{M,g} = \{a, b, c\}$ $^*[\![\text{sleep}]\!]^{M,g} = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

(13) also derives the denotations of plural DPs *qua* a very general definition of the definite determiner as a function that picks out the supremum of set denote by the NP, which is equivalent to the formulation in (14).

(14) $[\![\text{the}]\!]^{M,g}\langle\langle et\rangle e\rangle = \lambda P_{\langle et\rangle} : \exists x_e \wedge \forall y[P(y) \rightarrow y \leq_i x.\iota[P(x) \wedge \forall y[P(y) \rightarrow y \leq_i x]]]$
a. $[\![\text{boy}]\!]^{M,g} = \{a, b\}$, $^*[\![\text{boys}]\!]^{M,g} = \{a, b, a \oplus b\}$, $[\![\text{the boys}]\!]^{M,g} = a \oplus b$
b. $[\![\text{girl}]\!]^{M,g} = \{c\}$, $[\![\text{the girl}]\!]^{M,g} = c$

### 2.1.2 Interim Summary

The two approaches are not as different in their application as analytical tools as it might seem at first sight.[5]

[5] At least no facts that I aim to discuss here. A potential argument against the single domain approach is that it introduces some version of the double domain approach through the back door. In particular, as plurals and standard intransitive predicates of individuals all have their extensions in the same domain $D_{\langle et\rangle}$, they must derive the different distribution – both in terms of overt syntax, but also concerning covert operations – by purely syntactic means which go beyond the semantic categorization (cf. Van der Does (1992) and in particular Winter (2001a)). A potential argument against the double-domain approach, given in Schmitt (2012), is that it is less suited than the single-domain approach to account for the hitherto unnoticed fact that collective predicates license *negative polarity items* (NPIs). In particular, Ladusaw (1979) argues that NPIs are licensed only in *downward-entailing* (DE) contexts, where DE-ness is defined

Van der Does (1992, 1993) argues that Link's structure for $A$ can be mimicked within the single-domain approach *qua* type-shifting rules. As a first step, the single-domain approach must reproduce the indistinguishability of singular and plural denotations in the context of mixed predicates. Van der Does employs Partee's 1986 *ident*-lift, (15), a total function from $D_e$ to $D_{\langle et\rangle}$ that maps every individual $u$ to the property of being identical with $u$ (cf. Winter (2001a) for a technically slightly different operation to the same effect).[6] Within the single-domain approach, a mixed predicate will thus be a function of basic type $\langle\langle et\rangle t\rangle$, (15), just like a collective predicate, but singular denotations may be shifted to plural type. (15) will also derive the fact that plurals and singulars can be coordinated, (17), Van der Does (1992).

(15) $e \Longrightarrow \langle et\rangle$
$\lambda x_e.\lambda y_e.x = y$

(16) $[\![\text{weigh 200 kilograms}]\!]^{M,g} = \lambda P_{\langle et\rangle}.$ w' 200 kg' $(P)$

---

as in (ia). Entailment is a relation between expressions, which is based on a set-theoretic relation between the extensions of expressions, (ib). Since entailment is defined *qua* set-theoretical relations, it is the Boolean structure of the domain of the functions that we appeal to.

(i) a. $X \rightarrow Y \longleftrightarrow [\![\text{X}]\!]^M \subseteq [\![\text{Y}]\!]^M$ for any model $M$.
b. DE-ness
An expression $F$ of type $\langle\sigma,\tau\rangle$ is DE iff for all expressions $X$, $Y$ of type $\sigma$ such that $X \rightarrow Y$, $F(Y) \rightarrow F(X)$ i.e.
a function $F$ of type $\langle\sigma,\tau\rangle$ is DE iff it is a downward monotone function, i.e. iff for all $X$, $Y$ of type $\sigma$, such that $X \subseteq Y$, $f(Y) \subseteq f(X)$.

The fact that we find NPIs with standard quantifiers, as in (ii) from German (with the NPI the NPI in *auch nur irgendein* (roughly: even a single)) suggests that DE-ness is property relevant for the ontological layers of the functional hierarchy. Now we also find that some collective predicates license NPIs in their plural argument, (iii). This is predicted by the single-domain approach, which views collective predicates as the same type of object as a quantified (a set of sets of individuals), but not by the double-domain approach, which conceives of them of predicates. Nevertheless, these data are only weakly distinctive between the approaches, as DE-ness could be defined disjunctively.

(ii) Niemand hat auch nur irgendeine Frau belästigt.
nobody has PRT PRT even-a-single woman molested
'Nobody molested any woman.'

(iii) a. # Die Buben, die auch nur irgendeine Ahnung von Computerspielen haben, sind in der
The boys RP PRT PRT any clue of computer-games have are in the
Überzahl.
majority
'# Those boys, that have any clue about computer games, are the majority.'
b. Die Buben, die auch nur irgendeine Ahnung von Computerspielen haben, sind in der
The boys RP PRT PRT any clue of computer-games have are in the
Unterzahl.
minority
'Those boys, that have any clue about computer games, are the minority.'

[6]Van der Does (1992) takes Quine's association of singletons with their only members (and vice versa) as basic, Schwarzschild (1996) uses this more concretely as part of the structure of $A$ itself. In a single-domain approach, we have to be careful, however, not to overstate the application of this identification: Identifying a singleton with its only member (i.e. the reverse direction of the shift above) should (probably) only be possible for a subset of items of $D_{\langle et\rangle}$, namely, those which correspond to the denotations of plurals.

(17) Mary and the boys died.

Based on the same rationale, we can now capture the cumulative inferences for distributive predicates in the single-domain approach. If there is a general shift from $D_e$ to $D_{\langle et \rangle}$, then there must be a general shift from $D_{\langle et \rangle}$ to $D_{\langle\langle et \rangle t \rangle}$. (19) is the shift proposed by Van der Does (1992), which preserves the inference in (18), assuming that $[\![\text{John and Mary}]\!]^{M,g} = \{j', m'\}$.

(18) John slept. Mary slept. $\Rightarrow$ John and Mary slept.

(19) a. $\langle et \rangle \longrightarrow \langle\langle et \rangle t \rangle$
$\lambda P_{\langle et \rangle}.\lambda Q_{\langle et \rangle}.Q \subseteq P \wedge X \neq \emptyset$
b. $[\![\text{sleep}]\!]^{M,g} = \{a, b, c\}$ $[\![\text{sleep}]\!]^{M,g} = \{Q | Q \subseteq \{a, b, c\}\}$

Yet, the general availability of type-shifting strategies such as (15) voids the explanation that the single domain approaches seem to offer for the badness of sentences in (20), which they seemed to account for in terms of incompatibility of semantic category: Collective predicates are of type $\langle\langle et \rangle t \rangle$, the denotations of singulars are of type $e$. If, however, (15) or comparable type-shifting operations apply to $[\![\text{Sue}]\!]^{M,g}$ in (20), they yield a subject of the right type in order for the predicate to combine with it. Accordingly, the single-domain approach must recur to other explanations of why (20) is ruled out. They either do so by positing a syntactic incompatibility (cf. Van der Does (1992), Winter (2001a))[7] or by appealing to conceptual reasons (as in Winter (1996), based on Dowty (1986)), so that (20) is not ill-formed but rather incompatible with our world knowledge (similar, possibly, to *The stone died last night!*).[8]

(20) # Sue met.

(21) $\lambda x_e : x \in AT.\text{meet'}(x)$

In the double-domain approach, plurals denote elements of $D_e$, hence the incompatibility of collective predicates with singulars as in (22) cannot be explained in terms of semantic category, anyway, but must rather proceed via a domain restriction as in (21), which means that all collective predicates end up as partial functions.

In effect, both theories can somehow account for all the prominent empirical facts. Accordingly, while one might prefer one theory over the other on very general grounds – such as elegance, generality or even metaphysical considerations – no particular set of data compels us to chose one approach over the other. My own proposal in chapter 4 will contain components of both, in chapters 2 and 3, I employ a double-domain approach as it is more convenient.

[7]In light of data such as *The team is currently meeting on the field*, this syntactic incompatibility cannot recur to the morpho-syntactic singular on the DP, but must relate to a more abstract feature.

[8]The plausibility of the latter analogy depends on how we take $\theta$-roles to be encoded linguistically, cf. in particular Reinhart (2006), Haiden (2005).

## 2.2 Plural predication

When does a plural predicate hold of its argument?[9] In standard predication, a predicate $P$ holds of an entity $a$ iff $a$ has the property denoted by $P$. I.e. for (22a) to be true, John has to have the property of having black hair. In plural predication, this straightforward attribution of the property in question to the argument is also possible – in (22b), the plural individual *as such* can have the property *meet*. But now consider (23a): the color of the hair is something that we evaluate when we consider atomic individuals, i.e. having black hair, intuitively, is a property of individuals.[10] So when does *have black hair* hold of a plural individual? In other words, when is the sentence true? Likewise for (23b): impregnation, intuitively, is a relation between atomic individuals, (22c). When does it hold of a pair of plural individuals?

(22) a. John has black hair.
b. The boys met in the zoo.
c. The male panda impregnated the female panda.

(23) a. The boys have black hair.
b. The males panda impregnated the female pandas.

(24) a. John and Peter hate Mary and Sue.
b. The boys hit the girls. (These brutes!)
c. The boys introduced the nuns to the monks.
d. The boys hit the girls. Bill, being the most timid, hit Karen. The others were more brutal: John hit Sue and Mary, and Peter, this choleric lunatic, hit Mary and Karen.

(23a) is true iff all the boys that I am talking about have black hair. (23b) on the other hand, has very weak truth-conditions (cf. Langendoen (1978), Scha (1981), Krifka (1986), Beck and Sauerland (2000), Beck (2000a)): It is true iff every male panda under consideration impregnated *some* female panda under consideration, and every female panda was impregnated by some male panda. (24) give some more examples to the same effect: (24a) is true, for instance, in a scenario where John hates Mary, but has no opinion about Sue and where Peter hates Sue but loves Mary. (24b) is true if, for instance, John hit Sue and Mary, Peter hit Mary and Karen and Bill hit Karen, assuming that John, Peter and Bill are the only boys around and Sue, Mary and Karen the only girls. Finally, (24c) is true if John introduced

[9]For the complicating factor of imprecision, which I ignore here, see chapter 3.

[10]How do we know that a predicate such as *sleep* denotes a property of an atom? I have to rely here on our intuitions (as will become clear in section 5.2 below, I cannot recur to Schwarzschild (1994) at this point). *sleep* or *be blond* are properties that can be instantiated by atoms: I can say, albeit I will sound like an idiot, *hey, there is some sleeping going on* or *god, there is some blondness in this room* if John and noone else is sleeping or if John and noone else is blond. This that such predicates *can* denote properties of atoms. That they must do so becomes evident when they occur with a plural, we have the feeling that in order to determine whether the sentence is true, we have always to check the properties of each atom. Note that the occurrence of *together* might also be a discriminating factor, however, its use as a test is complicated by the possibility that it might also have a "participate in the same event" -construal, Lasersohn (1990, 1995).

sister Annunciata to fratre Celest , Peter introduced sister Mary to fratre Thomas and Bill introduced introduced sister Beata to fratre Archangelo (and there are no other boys, nuns or monks around). Note that these weak trut-condtions are not due to imprecision: (24d) shows that we can make these weak truth-conditions explicit in discourse, which, as I mentioned in the introduction, we cannot with clear-cut cases of imprecision.[11]

Both meanings are schematized in (25). The following discusses how they can be derived.[12]

[11] Another piece of evidence that the actual meaning of the sentence must involve these weak truth-conditions is obtained by considering the distribution of NPIs in German: While structures with distributive intranstive predicates allow for NPIs in their plural argument, (ia), structures which involve relations between plural DPs, such as (ib) don't.

(i) a. Die Buben, die auch nur irgendein Interesse an Frauen haben, sind pervers.
the boys RP PRT PRT any interest in women have hate each-other.
'Those boys that have even the slightest interest in women are perverse.
b. # Die Buben, die auch nur irgendeine Ahnung von Recht und Gesetz haben, hassen die Polizisten.
the boys RP PRT PRT any clue about law and order have hate the policemen.
'Those boys that have even the slightest interest in law and order hate the policemen'

[12] An alternative strategy to the one discussed below is one where we do not make the predicate's extension fit the denotation of its argument, but where we rather make the argument's extension fit the predicate (cf. in particular Van der Does (1993) for discussion). Broadly speaking, the latter view (as based on Bennett (1974)) assumes that plural DPs are ambiguous between pluralities and universal quantifiers, i.e. that a plural DP such as *the boys* can also denote a universal quantifier, $\lambda P.B' \subseteq P$ (which corresponds semantically, but not syntactically, to the type-lifting strategy for distributive predicates in the single-domain approach.) In the following, I list some arguments against this position.

First, it does not derive the weak readings for transitive structures: (i), as opposed to (23b), does not have a weak construal. However, this argument is weaker than it might seem: As we find scopeless construals for double-quantifier structures, which have been analyzed as involving branching quantification (cf. Barwise (1979), Westerstahl (1987), Sher (1990)) (23b) might be just be such a case (and (i) could possibly be ruled out for different reasons).

(i) Every male panda impregnated every female panda.

Second, sentences like (iia), Dowty (1986) have a construal where the boys met in the bar and had a beer each, i.e. the first conjunct requires a plurality as a subject and the second one a quantifier. Possibly, this could be solved assuming that the universal meaning for plural DPs is derived by an prefix, which is then stranded in the second conjunct, however, the same problem also occurs in different syntactic configurations such as (iib), where stranding is no obvious option.

(ii) a. The boys met at the bar and had a beer.
b. The boys gathered naked in front of the town hall.

The third problem are intermediate readings for collective and mixed predicates, which I address in the text below– those cannot be derived by standard universal quantification over atoms. Fourth, there is no evidence that a universal quantifier is actually present in plural sentences. (iiia) seems to involve a scope ambiguity (but see section 2.3 below), but (iiic), as opposed to (iiib), lacks an inverse -scope reading. Further, English exceptive *but* (discussed in von Fintel (1993)) is licensed by standard universals but not by plural DPs, (iv) (for German, cf. Križ and Schmitt (2012a)). Finally, universal quantifiers license the *q*- bound reading of German *anders* (different), but plurals don't, Beck (2000b).

(iii) a. The boys ate a pizza ...
b. At least one man saw every boy / all of the boys.
c. At least one man saw the boys.

(25) a. If $a$ is a plural and $O$ an intransitive distributive predicate, then
$[\![\text{a O}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow O'(x)$

b. If $a, b$ are plurals and $O$ is an transitive distributive predicate, then
$[\![\text{a O b}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow \exists y[(y \leq b' \wedge y \in AT) \wedge O'(y)(x)]] \wedge \forall y[(y \leq b' \wedge y \in AT) \rightarrow \exists x[(x \leq a' \wedge x \in AT) \wedge O'(y)(x)]]$

### 2.2.1 Cumulative inferences and cumulated predicate extensions

Link's original observation, which I already addressed above, is that cumulative inferences are available for all plural sentences with intransitive distributive predicates of individuals: We can infer the truth of a plural sentence *a is A* from the truth of any two sentences *b is A* and *c is A*, as long as $[\![\text{b}]\!] \oplus [\![\text{c}]\!] = [\![\text{a}]\!]$, (26). In other words, properties of *parts* of the plurality seem to be inherited by plurality itself. I henceforth refer to this phenomenon as *cumulativity*.[13]

(26) a. John has black hair. Bill has black hair. ⇒ John and Bill have have black hair.

b. The boys have black hair. The girls have black hair. ⇒ The children have have black hair.

In order to be clear about what I mean by a property being "inherited", I henceforth distinguish between *basic* and *cumulated* extensions. As noted above, predicates seem to vary of whether they –intuitively – denote properties of atoms or pluralities or both. *Having black hair* is a property of atoms, *heavy* is a property of both atoms and pluralities and *meet* is a property of pluralities. The objects that these properties primitively hold of are henceforth said to be in the basic extension of the predicate. Given that we have identified three classes of predicates, we find three types of basic extensions, which I assume here to be lexically

(iv) Every boy / All the boys / # The boys but John joined the race.

Interestingly, floated *each*, which has sometimes been identified with the universal prefix, Dowty and Brodie (1984) is rather bad with purely distributive predicates, (va), also, it does not necessarily quantify over atoms, (vb), (vc).

(v) a. ?The boys each slept.

b. *The "adopt-a-highway" program was very successful this year.*
The volunteers and the professionals each collected exactly 1000 tons of garbage.

c. A nasty fight broke out because the pimps and the clients had each gathered in the VIP-room.

[13]The phenomenon, termed *cumulative reference* Quine (1960), is used by both Link (1983), Landman (1989a) in examples using mass nouns, (ia) and plural predicates, (ib), (ic). However, as pointed out in Schwarzschild (1996), the term "cumulative reference" might be misleading and thus should be replaced with simple *cumulativity*: At least the *NP pop stars* in (ib) / (ic) does not actually *refer*.

(i) a. If $a$ is water and $b$ is water then the sum of $a$ and $b$ is water. (Link 1983:(10a))

b. If David is a pop star and Tina is a pop star then David and Tina are pop stars. (Landman 1989a:(45))

c. If David and Chris are pop stars and Jerry and Tina are pop stars, then David, Chris, Jerry and Tina are pop stars. (Landman 1989a:(1))

specified (but cf. Link (1983) for more discussion).

(27) a. The basic extension of a *collective predicate* $O$ is a set $S \subseteq (A \setminus AT)$ (a partial function $\lambda x_e : x \in A \setminus AT.A'(x).O'(x)$)

b. The basic extension of a *mixed predicate* $O$ is a set $S \subseteq A$ (a total function $\lambda x_e.O'(x)$)

c. The basic extension of a *distributive predicate* $O$ is a set $S \subseteq AT$ (a partial function $\lambda x_e : x \in AT.O'(x)$).

We can now restate what the inferences above show us about predicate extensions (again, I follow Link (1983)): If a distributive predicate $O$ has $u$ and $v$ in its extension, then its plural correlate will have $u \oplus v$ in its extension. More generally, for any distributive predicate $O$, the extension of its plural correlate is the extension of $O$ closed under $\oplus$ – the so-called cumulated extension (see also section 2.1 above). In order to avoid direct reference for morpho-syntactic number, I henceforth write $O+$ instead of "O's plural correlate", I write ⟦O⟧ for the basic extension of $O$ (which I sometimes simply replace by $P$ or $Q$) and, following standard notation, *⟦O⟧ (or, again, *P, *Q) for its extension closed under sum. * is defined in (28) (for both sets and functions). For the moment, I take $+$ to be the syntactic correlate of *, (29). (Here and throughout I leave open whether + should be directly associated with plural morphology.) Both (28) and (29) are not restricted to distributive predicates (see section 2.5 below).

(28) a. For any $P \subseteq A$, *P is the smallest set $S \subseteq A$, such that $P \subseteq S$ and for all $x, y \in P$, $x \oplus y \in S$.

b. For any $P \in D_{\langle et \rangle}$, *P is the smallest function $f \in D_{\langle et \rangle}$, such that for all $x$, if $P(x) = 1$ then $f(x) = 1$ and for all $y, z$, if $P(y) = 1$ and $P(z) = 1$ then $f(x \oplus y) = 1$.

(29) a. If $\alpha$ is branching node with daughters $+$, $\beta$, where $\beta$ is interpretable expression of type $\langle et \rangle$, then $\alpha$ is an interpretable expression of type $\langle et \rangle$.

b. If If $\alpha$ is branching node with daughters $+$, $\beta$, where $\beta$ is interpretable expression of type $\langle et \rangle$, then $[\![\alpha]\!]^{M,g} = = \lambda x_e.[\![\beta]\!]^{M,g}$ (x) $= 1 \vee \exists y, z[y \oplus z = x \wedge$ *$[\![\beta]\!]^{M,g}$(y) $=1 \wedge$ *$[\![\beta]\!]^{M,g}$(z) $=1]$

(29) predicts that the sentence in (30) is true the plural individual denoted by *the children* is in the basic extension of *sleep*, or if the basic extension of that verb contains individuals the sum of which will yields the denotation of *the children*. Since we assumed that *sleep* only has atoms in its extension, we can infer that is true if and only if the basic extension of *be asleep* contains all the atomic individuals the union of which yields the denotation of *the children* – which is exactly what aimed to derive, i.e. (25a).

### 2.2.2 Relations

Cumulative inferences can also be witnessed for $n$-transitive distributive predicates of individuals, (cf. Scha (1981), Krifka (1986), Sternefeld (1998)), (30).[14] Here, a property of tuples of atoms seems to be inherited by a tuple of pluralities.

(30) a. John hates Mary. Peter hates Sue. ⇒ John and Peter hate Mary and Sue.
b. The nuns hit the girls. The priests hit the boys. ⇒ The nuns and the priests / The members of the clergy hit the girls and the boys / the children.
c. John and gave Peter *War and Peace*. Sue gave Mary *Anna Karenina*. ⇒ John and Sue gave Peter and Mary *War and Peace* and *Anna Karenina* / Tolstoi's two most famous books.

Crucially, truth of the conclusion in (30a) can be inferred not only from the truth of the premisses in (30a) – it can also be inferred from truth the premisses in (31a), irrespective of whether the premisses in (30a) are true. Analogously so for (30b) / (31b) and (30c) / (31c).

(31) a. Peter hates Mary. John hates Sue. John and Peter hate Mary and Sue.
b. Two of the nuns hit the girls. The rest of the nuns and the priests hit the boys. ⇒ The nuns and the priests / The members of the clergy hit the girls and the boys / the children.
c. John and gave Mary *War and Peace*. Sue gave Peter *Anna Karenina*. ⇒ John and Sue gave Peter and Mary *War and Peace* and *Anna Karenina* / Tolstoi's two most famous books.

If we derive the meaning of plural predicates on the basis of cumulative inferences, then what this tells us is that properties of tuples of atoms are inherited by tuples of pluralities. Hence, the cumulated extensions of expressions corresponding to $n$-place predicates of individuals, can be stated as follows. I start with properties P of pairs of individuals, **P is the cumulated version of P, as defined in (32). I then extend this to properties of $n$-tuples of individuals, the cumulated version of which I call $*^n$P, again following standard notion and which is defined in (33) (for ** cf. Scha (1981), Krifka (1986), Sternefeld (1998) and for $*^n$ cf. in particular Sternefeld (1998)). Note that in (33) I write $\times_n$ for $n \leq 1$ to indicate $n-1$ occurrences of $\times$ (the resulting set is the Cartesian product of the set $A$ derived after $n-1$ applications of $\times$). I write $x_n$, $n \leq 1$ to indicate that x is the $n$-th argument coordinate of a tuple / $n$-th argument of the function. Further, I shorten complex types of functions with $n$-many arguments of type $e$ to $\langle e_1 \langle \ldots \langle e_n, t\rangle\rangle\rangle$.

(32) a. For any $P \subseteq A \times A$, **P is the smallest set $S \subseteq A \times A$, such that $P \subseteq S$ and for all $x^1, x^2, y^1, y^2$, if $\langle x^1, x^2\rangle \in P$ and $\langle y^1, y^2\rangle \in P$, then $\langle x^1 \oplus y^1, x^2 \oplus y^2\rangle \in S$.
b. For any $P \in D_{\langle e\langle et\rangle\rangle}$, **P is the smallest function $f \in D_{\langle e\langle et\rangle\rangle}$, such that for

[14] It is not common to use the term "distibutive" for these case, here it is employed to indicate that these predicates denote properties of tuples of atoms.

all $z^1, z^2$, if $P(z^1)(z^2) = 1$ then $f(z^1)(z^2) = 1$ and for all $x^1, x^2, y^1, y^2$, if $P(x^1)(x^2) = 1$ and $P(y^1)(y^2) = 1$ then $f(x^1 \oplus y^1)(x^2 \oplus x^2) = 1$.

(33) a. For any $P \subseteq A \times_n A$, $*^n$P is the smallest set $S \subseteq A \times_n A$, such that $P \subseteq S$ and for all $x^1, \ldots, x^n, y^1, \ldots, y^n$, if $\langle x_1^1, \ldots, x_n^n\rangle \in P$ and $\langle y^1, \ldots, y^n\rangle \in P$, then $\langle x^1 \oplus y^1, \ldots x^n \oplus y^n\rangle \in S$.

b. For any $P \in D_{\langle e1\langle \ldots \langle en,t\rangle\rangle\rangle}$. $*^n$P is the smallest function $f \in D_{\langle e1\langle \ldots \langle en,t\rangle\rangle\rangle}$, such that for all $z^1, \ldots, z^n$, if $P(z_1^1)\ldots(z_n^n) = 1$ then $f(z_1^1)\ldots(z_n^n) = 1$ and for all $x^1, \ldots, x^n, y^1, \ldots, y^n$, if $P(x_1^1)\ldots(x_n^n) = 1$ and $P(y_1^1)\ldots(y_n^n) = 1$ then $f(x^1 \oplus y^1), \ldots, (x^n \oplus x^n) = 1$.

Put sloppily, what this states is that cumulated extensions of $n-$place predicate $O$ contains all $n-$tuples $\langle x_1^1, \ldots, x_n^n\rangle$ such that for each tuple there is a set of partitions (or rather, covers, allowing overlap) $\{PRT_1 \ldots PRT_n\}$, such that for every $S_i, 1 \leq i \leq n$, $S_i \in PRT_i\{y|y \leq x_i^i \wedge y \in AT\}$ there is a an $n - tuple$ $\langle\bigoplus(S_1 : S_1 \in PRT_1\{y|y \leq x_1^1 \wedge y \in AT\}), \ldots, \bigoplus(S_n : S_n \in PRT_n\{y|y \leq x_n^n \wedge y \in AT\})$, which is a member of the basic extension of O, if the $i$-th coordinate is replaced by $\bigoplus(S_i)$.( $\bigoplus(B)$ is short for "the mereological sum of all elements of B"). Put even more sloppily, the cumulated extension of $O$ will contain all those tuples that are such that we can cut up each coordinate so that the resulting chunks (which might be the initial chunk) are in the relation expressed by $O$ with the other coordinates or some chunk of each coordinate. For a distributive predicate such as *hate*, this boils down to a cumulated extension that will contain all ordered pairs $\langle x, y\rangle$, such that every member of x is hated by some member of y and every member of y hates some member of x. Accordingly, the meaning of sentences with $n$- transitive predicates with plural arguments is exactly the one in (25b) above (cf. Langendoen (1978), Scha (1981), Krifka (1986), Sternefeld (1998), Beck and Sauerland (2000), Beck (2000a) a.o).

Note that for each $i$, $1 \leq i$, we require an extra-syntactic operator to introduce $*^i$ – while $n$-def gives a general format for $*^i$ for each $i$, the syntax must be specific enough to pick the right one, which, of course, is determined by the arity of the function denoted by its sister node.[15] We must therefore add $+_n$ to the language, for each $n \geq 1$, (34).

(34) a. If $\alpha$ is branching node with daughters $+_n$, $\beta$, where $\beta$ is interpretable expression of type $\langle e_1\langle \ldots \langle e_n, t\rangle\rangle\rangle$, then $\alpha$ is an interpretable expression of type $\langle e_1\langle \ldots \langle e_n, t\rangle\rangle\rangle$.

b. If If $\alpha$ is branching node with daughters $+_n$, $\beta$, where $\beta$ is interpretable expression of type $\langle e_1\langle \ldots \langle e_n, t\rangle\rangle\rangle$, then $[\![\alpha]\!]^{M,g} = \lambda x_1^1. \ldots \lambda x_n^n [\![\beta]\!]^{M,g}$ $(x_1^1), \ldots, (x_n^n) =$

15 $*^n$ cannot be derived by single application of *, nor by applying * $n$ times in the structure (cf. Van der Does (1993), Sternefeld (1998) for discussion), as illustrated in (iiib) and (ib), respectively, both of which yield the wrong meaning (in fact, (iiib) should not be interpretable.

(i) a. [[[John and Peter] [+ [hate [Sue and Mary]]]]] $= 1$ iff $\forall x, y[(x \leq j \oplus p \wedge x \in AT) \rightarrow H'(m' \oplus s')]$

b. [[[John and Peter] [ + [ λ1 [[Sue and Mary] [+λ2 [ $t_1$ hate$t_2$ ]]]]]] $= 1$ iff $\forall x, y[(x \leq j \oplus p \wedge x \in AT)(y \leq m \oplus s \wedge y \in AT) \rightarrow H'(y)(x)]$

$1 \vee \exists y_1^1, \ldots, y_n^n, z_1^1, \ldots, z_n^n[y_1^1 \oplus z_1^1 = x_1^1, \ldots, y_n^n \oplus z_n^n = x_n^n \wedge$
${}^n[\![\beta]\!]^{M,g}\ (y_1^1), \ldots, (y_n^n) \wedge {}^{*n}[\![\beta]\!]^{M,g}\ (z_1^1), \ldots, (z_n^n)$

### 2.2.3 Interim summary

This section showed how cumulative inferences lead to the assumption of cumulated predicate extensions, and that if plural predicates are assigned such cumulated extensions, we derive the correct meanings, repeated in (35) and supplemented by (35c) for plural sentences. Extensions of plural predicates can be derived on the basis of cumulative inferences. The extensions we arrive at yield the right predictions for the meanings of plural predicates, repeated in (35) and supplemented by (35c)

(35) a. If $a$ is a plural and $O$ an intransitive distributive predicate, then
$[\![\text{a O}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow O'(x)$

b. If $a, b$ are plurals and $O$ is an transitive distributive predicate, then
$[\![\text{a O b}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow \exists y[(y \leq b' \wedge y \in AT) \wedge O'(y)(x)]] \wedge \forall y[(y \leq b' \wedge y \in AT) \rightarrow \exists x[(x \leq a' \wedge x \in AT) \wedge O'(y)(x)]]$

c. If $a^1, \ldots a^n$ are plurals and $O$ is an $n$-transitive distributive predicate, then
$[\![\ \text{O}\ a_1^1, \ldots a_n^n\ ]\!] = \forall x^1[(x^1 \leq a_1^{1'} \wedge x^1 \in AT) \rightarrow \exists x^2 \ldots x^n[(x^2 \leq a_2^{2'}, \ldots, x^n \leq a_n^{n'} \wedge x^2, \ldots x^n \in AT) \wedge O'(x^1) \ldots (x^n)]] \wedge \ldots \wedge \forall x^n[(x^n \leq a_n^{n'} \wedge x^n \in AT) \rightarrow \exists x^1 \ldots x^{n-1}[(x^1 \leq a_1^{1'}, \ldots, x^{n-1} \leq a_{n-1}^{n-1'} \wedge x^1, \ldots x^{1-n} \in AT) \wedge O'(x^1) \ldots (x^n)]]$

In the following, I discuss four issues which relate to syntactic as well as semantic questions raised by cumulation. I refer to them by the headers *projection*, *homogeneity*, *quantifiers* and *generality*.

The first two points concern syntactic questions: *Projection* refers to observation that cumulative relations are syntactically unbounded in terms of standard locality constraints. I follow Beck and Sauerland (2000) in arguing that cumulation cannot be limited to lexical heads but must apply to derived predicates. However, I argue – against them – that the the derivation of these predicates is not constrained by standard syntactic locality. *Quantifiers* takes up on this latter point and shows that albeit standard syntactic locality constraints do not apply, the definite determiner and some quantificational determiners do in fact seem to block the derivation of such predicates across them.

The last major point, *homogeneity* is connected to a semantic question, namely, to the observation that that plural sentences with distributive predicates seem defined only if all or none of the atoms have the property in question. This observation is not straightforwardly compatible with our conception of cumulation and existing proposal that tackle the problem are not completely satisfactory. A final, less crucial issue, *generality* is whether cumulative inferences are completely general, i.e. found for all predicates. I discuss some data that suggest they are not.

My discussion of these points addresses them in an order that is different from the one just outline: I start with the syntactic question, then turn to the semantic problem of homogeneity and address quantifiers after that, as the latter point will partially built on data involving homogeneity.

## 2.3 Projection

While Krifka (1986) (cf. also Scha (1981) and Champollion (2010b)) argues that cumulation is a lexical property (and that, in fact, the extensions of all lexical predicates are cumulated), Beck and Sauerland (2000) submit that the extensions of syntactically derived predicates are (also) subject to cumulation, which means that $+^n$ can be inserted into the syntactic structure.

### 2.3.1 Lexical cumulation does not suffice

If Krifka's position were correct, only properties denoted by lexical heads should be able to be interpreted cumulatively – which means that only sentences where the relation is expressed by a lexical head should have the weak, i.e. cumulative, construal. Beck and Sauerland (2000) argue that this prediction is false. Consider (36a) (based on examples in Schein (1986, 1993)), which contains an existentially quantified direct object. Apart from the reading where there is a single picture, the sentence has a reading where pictures vary with actor-producer-pairs: (36a) is true in the scenario given. Accordingly, the relation that we are considering and the extension of which needs to cumulated is the one in (36b). (36b) is not the extension of any of the lexical elements, i.e. of any terminal in (36a).

(36) SCENARIO: *actor John showed producer Eichinger a picture of a naked man, actor Bill showed producer Spelling a picture of Tory in questionable setting, actor Peter showed Weinstein a picture of himself in g-string.*

a. The actors showed the producers a naughty picture. (This is how they hoped to catch their attention.)

b. $\lambda x_e.\lambda y_e.\exists z_e[picture'(z) \wedge show'(x)(z)(y)]$

An analogous case can be made on behalf of (37a) and (38a), which do not involve indefinites. Both are true in the respective scenarios, which means that the relations that need to be cumulated are (37b) and (38b), respectively. Again, there is no lexical element in these sentence, of which these could be the extensions.

(37) SCENARIO: *John wants to marry Mary, Bill wants to marry Jane and Peter wants to marry Sue.*

a. The boys want to marry the girls.

b. $\lambda x_e.\lambda y_e.want'(marry'(x)(y))(y)$

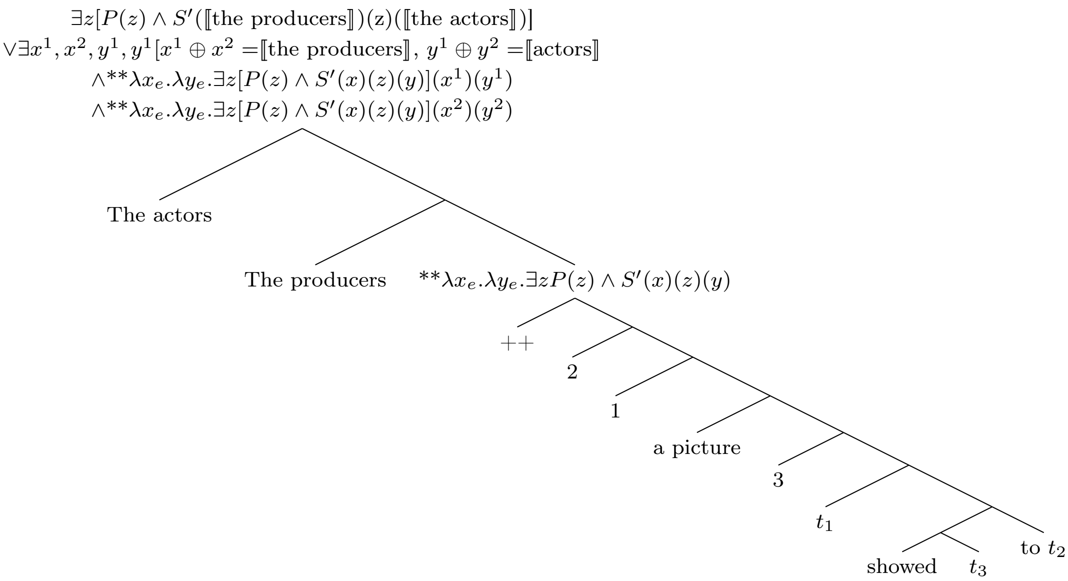
(38) SCENARIO: *John wants Sue to marry Jane (and not Mary, who he despises)) Peter wants Sue to marry Mary.*

a. *John and Peter want Sue to marry Jane and Mary (respectively).*

b. $\lambda x_e.\lambda y_e.want'(marry'(x)(s'))(y)$

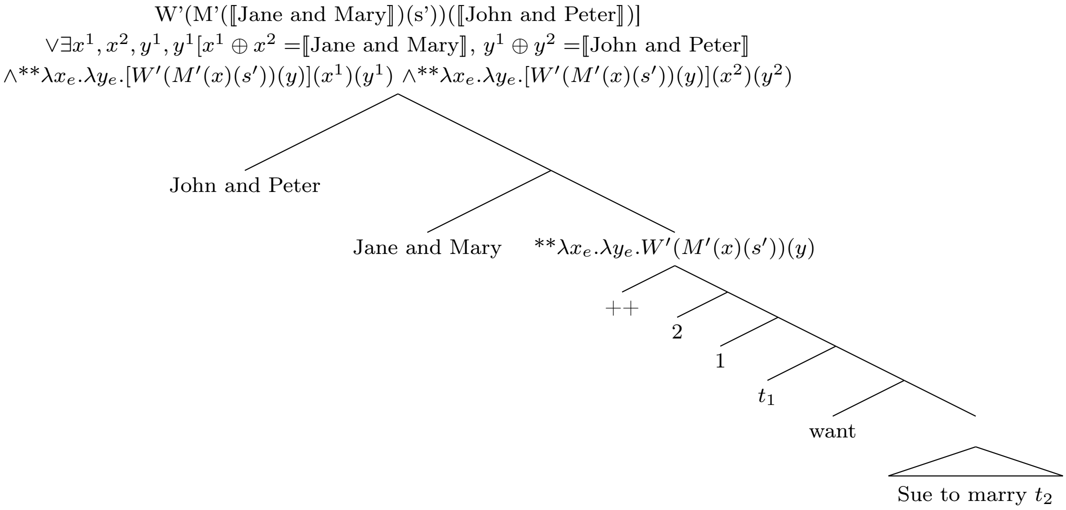
How do we derive these relations? Beck and Sauerland (2000) argue that they are created by standard covert syntactic movement. In fact, the movement that we are considering here is not really that standard, as it involves *tucking-in* (described by Richards (1997) for overt movement). This type of movement, which violates strict cyclicity, is such that if an element $\beta$ moves *after* and element $\alpha$, it moves *in between* the target of $\alpha$ and the index created by movement of $\alpha$ (i.e. it *tucks in*). For the sake of readability, I here introduce another countercyclic measure, namely, that the structurally highest element moves first; as there is no problem in reversing this order, nothing hinges on this point.[16] (39) and (40) give the syntactic derivations and the denotations of some nodes within the structure for (36a) and (38a).

(39)




[16] If we reverse the order, we end up with an LF-correlate of Baker's 1985 *mirror principle*.

(40)




### 2.3.2 Derived predicates are not derived by standard syntactic movement

Crucially, since Beck and Sauerland (2000) argue that the relations in question are derived by covert movement, cumulative – i.e. weak– construals should not be found for relations the derivation of which would violate constraints on syntactic movement. We therefore do not expect to find cumulative relations across islands or, as covert movement is further constrained by *clause-boundness* (cf. Reinhart (1997), Szabolcsi (1997)), across clause boundaries. Beck and Sauerland (2000) argue that this is exactly what we find, but I do not think this conclusion is correct.[17] Below, I give some examples which show that the formation of the relations in question is not at all constrained syntactically.

[17]Beck and Sauerland's 2000 strongest case (their (53)) for their point that the derivation of the predicate is constrained by standard is restrictions on covert movement relates to English double object constructions: Those do not allow for covert movement of the second object over the first, Bruening (2001), (i). Accordingly, Beck and Sauerland (2000) expect a weak construal, where there are two girls, two boys, and each girl gave some cookie to one (or more) of the boys and each boy was given a cookie by one (or more) of the girls (iia), but no construal for (iib) where there are two girls, two cookies and each girl gave some boy one of the cookies and each cookie was given by one of the girls to some boy. This prediction is correct.

(i) I gave a boy every cookie. *a cookie > every boy, # every boy > a cookie*

(ii) a. The two girls gave the two boys a cookie.
b. The two girls gave a boy the two cookies.

However, I do not think that this shows that standard constraints on movement are at work. I think that the problem with double objects constructions is not that they block the the formation of cumulative relations between the two plurals, but rather with the fact that this first object needs to get a specific reading whenever the other arguments – or at least one of them– is a plural. This is shown by (iiia) and (iiib). In both cases, *a friend* has a specific reading, we are talking about a single friend of both John and Peter, but the relation $\{\langle y, x\rangle|$ x gave this specific mutual friend y $\}$ in (iiia) and $\{\langle z, y, x\rangle|$ x gave this specific mutual friend y on z $\}$ in (iiib) still allows for a cumulative reading. ((iiia), but not (iiib) could be a case of lexical cumulativity.) (iiib), for instance, is true if John have this specific friend HIV on one of the warm nights and Peter gave that same friend Hepatitis on the other warm night.

(iii) a. John and Peter gave a friend Hepatitis and HIV.
b. John and Peter gave a friend the two diseases (he suffers from now) on the two warm nights last August.

In order to get the right perspective on the data, it is important to bear the following in mind. First, examples tend to get worse the further away from each other– in terms of both linear order and hierarchical structure – the arguments occur. As this is a graded, rather than an absolute distinction, it cannot be taken as evidence for syntactic restrictions. Second, there is an intervening factor (which also, I think, plays a role in those examples which Beck and Sauerland (2000) claim lack a weak construal) having to do with when we use a plural. More precisely, if we say something like *the boys hit the girls* we don't really care (or assume that the hearer won't care) which boy hit which girl. If we did, we would have rather listed the relevant pairs. I.e. we have to be careful to use contexts where this indifference as to what the pairs really look like is plausible. Third, in all cases where it hard to find such contexts, I follow Beck and Sauerland (2000) and use the adverb *respectively*, which makes plural sentences more specific, as it links members of one plurality to members of another plurality *qua* some order (which may, but does not have to be, induced by the linear order of conjuncts (cf. Dalrymple and Kehler (1995), Munn (1993), Gawron and Kehler (2004)).[18] I do not think that *respectively* itself is responsible for the availability of the weak construal as such, but rather parasitic on it, as in all cases under consideration, we could replace *respectively* by more specific context which would facilitate the weak construal.[19]

The first set of examples from German and English are sentences which allow for weak construals, but where the derivation of the required relation by overt (or, in fact any type of) movement would involve a serious island-violation. The (a)-cases give the examples, the (b)-cases show the required relation and (c)-cases illustrated that covert movement of a quantifier from the position in question in an analogous structure is impossible. Consider first (41), where the objects of the relation are embedded in a coordinate structure. The sentence allows for a weak construal: If we find out that every thug beat some girls and every girl was beaten by some thug, I will have said something true. However, deriving the required relation by syntactic movement, would involve a violation of the *coordinate structure constraint*, Ross (1967), Williams (1978), in particular, movement of both (non-identical) coordinates out of the coordinate structure. (42), the weak construal of which is self-explanatory, would also involve a CSC violation, in this case, we would have to move a part of the first coordinate out

[18] As the afore-mentioned authors show that *respectively* can occur with standard plurals as in (i) and not only with AC, McCawley's 1988 speculation that the sentences are derived from underlying sentential AC (a version of which is also found in McKinney-Bock and Vergnaud (2010)) can be ruled out. The examples I discuss in chapter 3 cannot involve underlying sentential AC, either, given that here, too, we find standard plurals, (ic).

(i) a. The two first amendments are said to refer to the first two commandments, respectively. (adapted from (Munn 1993:(17c)))
b. The French Henris of the sixteenth century were killed in an Accident, assassinated by a friend, and stabbed in the back, respectively.
c. The first two prime numbers are even and odd, respectively.

[19] Gawron and Kehler (2004) claim that the specific weak construal found for sentences containing *respectively* is either due to a covert operator RESP of which *respectively* is the (optional) phonological realization. In the absence of RESP, weak construals don't exist in their system. Link (1984) maintains a similar position, by introducing a special meaning for *and* for these cases.

of the coordinate structure. The fact that we can topicalize the coordinate structures in (43) shows that the problem cannot be solved by assuming and underlying sentential coordination.

(41) a. *Es gab ein großes Gezeter.* Also haben die Rowdys (entweder) die Buben aus der ersten Klasse oder die Buben aus der zweiten Klasse geschlagen. *Wenn sie die Mädchen verprügelt hätten, dann wäre es nicht so laut geworden.*
'There was a lot of commotion. Therefore, the thugs either beat the boys from first grade or the boys from second grade. If they had beaten the girls, there wouldn't have been so much noise.'

b. $\lambda x.\lambda y.\lambda z.$ z beat' x or' y

c. Jeder Mann hat entweder höchstens ein Mädchen oder höchstens einen Bub geschlagen.
'Every man beat either at most one girl or at most one boy.'
*every > at most one*, # *at most one > every*

(42) a. Meine Wahrsagerin sagte, dass Hans und Karl entweder Susi und Maria schwängern oder ein Bluttat begehen werden. *In jedem Fall werden sie sich unehrenhaft verhalten.*
'My fortune teller said that Hans and Karl will either impregnate Susi and Maria or commit a murder. In any case, they will behave ignobly.'

b. $\lambda x.\lambda y.$ y impregnates' x or' commits' a' murder'.

c. Jeder Mann hat entweder höchstens ein Mädchen geschwängert oder gemordet.
'Every man impregnated most one girl or committed a murder.'
*every > at most one*, # *at most one > every*

(43) a. Die Mädchen aus der ersten Klasse oder die Buben aus der zweiten Klasse
the girls from the first grade or the boys from the second grade
haben die Rowdys gerade geschlagen.
have the thugs just beaten

b. Susi und Maria schwängern oder eine Affäre miteinader beginnen werden
Susi and Maria impregnate or an affair with-each-other start will
Hans und Karl nächstes Jahr
Hans and Karl next year

(44) also allows for weak construals. The relevant relation can be derived syntactically only by movement out of an adjunct island.[20]

(44) SCENARIO *One of the two murderers killed Gertie with the chainsaw, the other one killed Petra with the kitchen knife.*

[20] I would not put my money on (i) (which I owe to Manuel Križ)) due to potential monotonicity of *because*.

(i) a. *John is in love with Mary and Peter is in love with Susi*
John and Peter fell in love because Mary and Sue played the piano so well.

b. $\lambda x.\lambda y.x$ fell' in love' because' $y$ played' the piano' well'.

a. Die Mörder haben Gertie und Petra unter Verwendung der Motorsäge
The murderers have Gertie and Petra under usage of-the chainsaw
und des Küchenmessers umgebracht.
and the kitchen-knife killed killed.
'The murderers killed Gertie and Petra by using the chainsaw and the kitchen-knife.'

b. $\lambda x.\lambda y.\lambda z.z$ killed' $y$ by' using' $x$

c. Jeder Mörder hat die Straftaten unter Verwendung höchstens eines Messers begangen.
'Every murdered committed the deeds by using at most one knife.'
*every > at most one*, *# at most one > every*

(45) and (46) allow for weak construals, too, here, the relation would have to derived by movement out of a wh-island.

(45) *wh-island + clause-boundedness*

a. *I had a horrible day. First I was called to the president's office, then to the vice president's office.* They wanted to know who hired John and Peter (respectively). *I assume that the president really hates John and the vice president has some strange interest in Peter.*

b. $\lambda x.\lambda y.y$ wanted to know who hired $x$.

c. Every official wanted to know who hired some clerk.
*every official > some clerk*, *# some clerk > every official*

(46) SCENARIO: *The boys were completely drunk and their perception was blurred. Accordingly, John knows when Sue arrived, other than that, he didn't notice anything that happened at the party. Peter only knows, when Mary arrived. And Bill knows when Jill arrived.*

a. Immerhin wissen die Buben, wann die Mädchen angekommen sind.
'At least the boys know when the girls had arrived.'

b. $\lambda x.\lambda y.y$ knows' when' $x$ arrived'.

Finally, we find cases where syntactic derivation of the relation would violate clause-boundness, i.e. where the relation would be formed across a clause-boundary, (47), (48).[21]

(47) a. Yesterday, Peter and Mary told me that Sue and Ellen (respectively) were pregnant. *It turns out that Peter was wrong and Mary was right. Ellen is really is going to have a baby, but Sue has just gotten fat.*

[21] Analogously for (i), which involves an additional indefinite.

(i) Yesterday, Peter and Mary told me that Sue and Ellen (respectively) had married a crook. *Peter told me that Sue had married Bastard Billy and Mary told me that Ellen had married Peeping Paul. Imagine my shock at these news!*

b. $\lambda x.\lambda y.y$ told' me' that' $x$ was pregnant'.

c. Yesterday, every doctor told me that some woman was/ is pregnant.
*every doctor > some woman, # every doctor > some woman*

(48) a. John and Mary claim that Peter adores Hitler and Stalin (respectively). *In fact, if John is right, that's even worse than if Mary's right.*

b. $\lambda x.\lambda y.y$ claims' that' Peter' adores' $x$.

### 2.3.3 Interim summary

What I tried to show here is that while Beck and Sauerland (2000) are right in arguing that cumulation is not lexical property, their claim that cumulation only targets predicates that are derived by covert movement is not correct. Rather, there appear to be no such restrictions, as we find cumulative – that is, weak – readings for sentences where the relation in question could only be formed by movement out of a clause-boundary or even movement out of an island.

## 2.4 Homogeneity

Consider again the schematized truth-conditions for plural sentences with distributive n-place predicates, as derived on the basis of cumulated predicate extensions, (49).

(49) a. If $a$ is a plural and $O$ an intransitive distributive predicate, then
$[\![\text{a O}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow O'(x)$

b. If $a, b$ are plurals and $O$ is an transitive distributive predicate, then
$[\![\text{a O b}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow \exists y[(y \leq b' \wedge y \in AT) \wedge O'(y)(x)]] \wedge \forall y[(y \leq b' \wedge y \in AT) \rightarrow \exists x[(x \leq a' \wedge x \in AT) \wedge O'(y)(x)]]$

c. If $a^1, \ldots a^n$ are plurals and $O$ is an $n$-transitive distributive predicate, then
$[\![ \text{ O } a^1_1, \ldots a^n_n ]\!] = \forall x^1[(x^1 \leq a^{1'}_1 \wedge x^1 \in AT) \rightarrow \exists x^2 \ldots x^n[(x^2 \leq a^{2'}_2, \ldots, x^n \leq a^{n'}_n \wedge x^2, \ldots x^n \in AT) \wedge O'(x^1) \ldots (x^n)]] \wedge \ldots \wedge \forall x^n[(x^n \leq a^{n'}_n \wedge x^n \in AT) \rightarrow \exists x^1 \ldots x^{n-1}[(x^1 \leq a^{1'}_1, \ldots, x^{n-1} \leq a^{n-1'}_{n-1} \wedge x^1, \ldots x^{1-n} \in AT) \wedge O'(x^1) \ldots (x^n)]]$

As noted by Fodor (1970), the behavior of plural sentences under negation is not what we would expect given (49). In particular, a negated plural sentence *not (a is O)* plural sentence, where $O$ is intransitive, seems to express (rendered here as $\approx$) that no atom of $[\![\text{a}]\!]$ is in $[\![\text{O}]\!]$, (50a), (50b) rather than what we would expect, namely, that not all atoms of $[\![\text{a}]\!]$ are in $[\![\text{O}]\!]$. I assume here that *not*, in all the cases under consideration, is sentential negation, i.e. $[\![\text{not}]\!]^{M,g} = \lambda p_t.\neg p$.

(50) a. The boys didn't sleep. $\approx$ None of the boys slept.

b. It's not the case that the boys slept. $\approx$ None of the boys slept.

c. $\neg(\forall x[(x \leq [\![\text{the boys}]\!] \wedge x \in AT) \rightarrow S'(x)$

The same extends to the negation of plural sentences with $n$-transitive relations of pluralities, as witnessed by (51) (cf. Schwarzschild (1994)).

(51) a. The boys didn't hit the girls. $\approx$ None of the girls hit any of the boys.

b. It's not the case that the boys hit the girls. $\approx$ None of the girls hit any of the boys.

c. $\neg(\forall x[(x \leq a' \wedge x \in AT) \rightarrow \exists y[(y \leq b' \wedge y \in AT) \wedge O'(y)(x)]] \wedge \forall y[(y \leq b' \wedge y \in AT) \rightarrow \exists x[(x \leq a' \wedge x \in AT) \wedge O'(y)(x))$

Now, consider scenarios. We have established (or can easily do so), that (52a) is true in a scenario where both John and Peter are blond and (52b) is false in that scenario. On the other hand, (52b) is true in a scenario where neither of them is blond, while (52a) is false in that scenario. Now what about a scenario where John is blond and Peter is a redhead? In this case, we have the feeling that neither (52a) nor (52b) is true and that neither (52a) nor (52b) is false. In other words, plural sentences seem to exhibit a truth-value gaps.

(52) a. John and Peter are blond.

b. John and Peter aren't blond.

Similarly for (54): Take a scenario where John hit Sue and Peter hit Mary and no other hitting took place. (53a) is true in this scenario and (53b) is false. Now consider a scenario where John didn't anybody and Peter didn' t hit anybody. In this case, (53b) is true and (53a) false. Finally, consider a case where John hit Sue and Peter didn't it anybody. Here, both (53a) and (53b) seem neither true nor false.

(53) a. John and Peter hit Sue and Mary.

b. John and Peter didn't hit Sue and Mary.

On the basis of these observations, Löbner (1987) argues that plural sentences involve a *homogeneity* presupposition. Considering only the intransitive cases, plural sentences *a are O* are assumed to carry the presupposition (PS) in (54). Accordingly, we obtain (55a) for (52a) and (55b) for (52b). Note that in the case where John is blond, but Peter is a redhead, the PS of both (52a) and (52b) are not met.

(54) $[\![\text{a are O}]\!]^{M,g}$ is *presupposes* that $\forall x[(x \leq [\![\text{a}]\!] \wedge x \in AT) \rightarrow [\![\text{O}]\!]^{M,g}\text{a} = 1] \vee \forall x[(x \leq [\![\text{a}]\!] \wedge x \in AT) \rightarrow [\![\text{O}]\!]^{M,g}\text{a} = 0]$ and *true* iff $\forall x[(x \leq [\![\text{a}]\!] \wedge x \in AT) \rightarrow [\![\text{O}]\!]^{M,g}\text{a} = 1]$

(55) a. $[\![\text{John and Peter are blond}]\!]^{M,g}$ is *presupposes* that $\forall x[(x \leq j' \oplus p \wedge x \in AT) \rightarrow B'(x) = 1] \vee \forall x[(x \leq j' \oplus p' \wedge x \in AT) \rightarrow B'(x) = 0]$ and *true* iff $\forall x[(x \leq j' \oplus b' \wedge x \in AT) \rightarrow B'(x) = 1]$

b. $[\![\text{not( [John and Peter are blond]}]\!]^{M,g}$ is *presupposes* iff $\forall x[(x \leq j' \oplus p \wedge x \in AT) \rightarrow B'(x) = 1] \vee \forall x[(x \leq j' \oplus p' \wedge x \in AT) \rightarrow B'(x) = 0]$ and *true* iff $\neg(\forall x[(x \leq j' \oplus b' \wedge x \in AT) \rightarrow B'(x) = 1])$

In the following, I briefly address how this PS has been argued to arise and whether it can be extended to plural sentences with transitive predicates.

Before I do so, however, I point out that there are plural sentences where homogeneity does not arise – namely, sentences containing floated *all*, *both* or, in case the plural is an AC, stressed *and* under negation (cf. Schwarzschild (1994)). I do not discuss here why this is the case (cf. in particular Schwarzschild (1994) for a proposal), nor whether these cases are really simply the negations of our standard plural-sentence meaning, (49) without the homogeneity PS – as indicated by status of the material in the brackets this might not be the case.[22] The only thing that matters for my purposes is to take these facts into account, as they will resurface in another context in chapter 3.

(56) a. The boys aren't all blond. ≈ Not all of the boys are blond ?(but some are)
b. John and Peter aren't both blond ≈ John isn't blond or Peter isn't blond (? or neither is blond)
c. Well, it's not the case that John AND Peter are blond (. . . John/ Peter is a redhead) ≈ John isn't blond or Peter isn't blond (? or neither is blond)

### 2.4.1 Schwarzschild (1994)

Schwarzschild (1994) derives Löbner's 1987 homogeneity PS for distributive predicates as a side effect of cumulated predicate extensions embedded in (his rendering) of Cooper's 1983 system of positive and negative intensions. I here give a more primitive version, where we do not consider intensions – functions from worlds to extensions – but simply extensions. The basic idea is that all expressions $F$ of type $a \in TC$ are assigned a pair of extensions, the first member of which is the *positive extension* $[\![F]\!]^{M,g}{}_{+}$ , the second member of which is the *negative extension* $[\![F]\!]^{M,g}{}_{-}$. $[\![F]\!]^{M,g}{}_{+}$ contains all objects $u$ that meet the PS of $A$ and have the property denoted by $A$, $[\![F]\!]^{M,g}{}_{-}$ contains all the objects that meet the presupposition of $F$ and do *not* have the property denoted by $F$, as illustrated in (57).

(57) a. $[\![\text{meet}]\!]^{M,g}{}_{+} = \{x_e | x \text{ is a plurality and x met }\}$
b. $[\![\text{meet}]\!]^{M,g}{}_{-} = \{x_e | x \text{ is a plurality and x didn't meet }\}$

The following gives the relevant definitions for functional application, (58), truth w.r.t. a model, (59), PS failure, (60) and sentence negation, (61). A PS can then defined as in (59). Accordingly, F presupposes $p$ iff $p$ is true in all models $M$ where $[\![F]\!]^{M,g}{}_{+} \neq [\![F]\!]^{M,g}{}_{-}$.

(58) For any expression a of type $e$, F of type $\langle et\rangle$, where $[\![a]\!]^{M,g}$ is in the domain of $[\![F]\!]^{M,g}$, $[\![F(c)]\!]^{M,g}{}_{+} = 1$ iff $c \in [\![F]\!]^{M,g}{}_{+}$, $[\![F(c)]\!]^{M,g}{}_{-} = 1$ iff $c \in [\![F]\!]^{M,g}{}_{+}$.

(59) A sentence $S$ is true w.r.t. a model $\mathcal{M}$ iff $[\![S]\!]^{M,g}: + = 1$ and false otherwise.

[22]We could also add *each*, but, as I pointed out above, its co-occurrence with distributive predicates is rather bad. Further, note that, of course, the presence / absence of stress on *all* / *both* might play a role concerning the status of the material in brackets, but I think the judgements below can be maintained even if these items are unstressed.

(60) A sentence $S$ is an instance of PS failure w.r.t. $M$ iff $[\![S]\!]^{M,g}: + = [\![S]\!]^{M,g}: -$

(61) $[\![\text{not-S}]\!]^{M,g}{}_+ = 1$ iff $[\![S]\!]^{M,g}{}_+ = 0$ and $[\![\text{not-S}]\!]^{M,g}{}_- = 1$ iff $[\![S]\!]^{M,g}{}_- = 0$

Consider first three simple examples: (62a) and (62b) are both true and do not involve a PS-failure, (62c) is false and involves a PS-failure.

(62) a. John smoked
$[\![\text{smoke}]\!]^{M,g}{}_+ = \{j', m'\}$ $[\![\text{smoke}]\!]^{M,g}{}_- = AT \setminus \{j'm'\}$
$[\![\text{John smoked}]\!]^{M,g}{}_+ = 1$, $[\![\text{John smoked}]\!]^{M,g}{}_- = 0$ $\langle 1, 0\rangle$
b. John and Mary met
$[\![\text{meet}]\!]^{M,g}{}_+ = \{j' \oplus m'\}$ $[\![\text{meet}]\!]^{M,g}{}_- = A \setminus AT \setminus \{j' \oplus m'\}$
$[\![\text{John and Mary met}]\!]^{M,g}{}_+ = 1$, $[\![\text{John and Mary met}]\!]^{M,g}{}_- = 0$ $\langle 1, 0\rangle$
c. John met.
$[\![\text{John met}]\!]^{M,g}{}_+ = 0$, $[\![\text{John met}]\!]^{M,g}{}_- = 0$ $\langle 0, 0\rangle$

Crucially, cumulated positive and negative extensions are formed on the basis of basic positive and negative extensions, as in (63), for any F of type $\langle et\rangle$.

(63) a. $*[\![F]\!]^{M,g}{}_+ =$ the smallest set $S \subseteq A$, such that $[\![F]\!]^{M,g}{}_+ \subseteq S$ and for all $x, y \in [\![F]\!]^{M,g}{}_+$, $x \oplus y \in S$.
b. $*[\![F]\!]^{M,g}{}_- =$ the smallest set $S \subseteq A$, such that $[\![F]\!]^{M,g}{}_- \subseteq S$ and for all $x, y \in [\![F]\!]^{M,g}{}_-$, $x \oplus y \in S$.

This yields the correct results, including homogeneity, as shown in (64) and (65), relative to a very small model. The sentence in (64) comes out as true in (64a), as false in (64b) and as false and an instance of PS failure in case one of the two doesn't have blond hair. The negated sentences in (65) comes out as false in (65a), as true in (65b) and as true and an instance of PS failure in (65c). The only worry that might arise is the asymmetry of the non-negated and the negated sentence is scenarios where one of the two boys isn't blond – while the former is false and a PS-failure, the latter is true and a PS-failure (an instance of *PS-denial* for both Cooper (1983) and Schwarzschild (1994)). Schwarzschild (1994) presents some arguments for this asymmetry, but I am not so sure about their status (see my discussion in the subsequent paragraph and Križ and Schmitt (2012a)).

(64) John and Peter are blond.
a. $[\![\text{blond}]\!]^{M,g}{}_+ = \{j', p'\}$, $[\![\text{blond}]\!]^{M,g}{}_- = \emptyset$
$[\![\text{blond}]\!]^{M,g}{}_+ = \{j', p', j' \oplus p'\}$ $[\![\text{blond}]\!]^{M,g}{}_- = \emptyset$
$[\![\text{John and Peter are blond}]\!]^{M,g}{}_+ = 1$, $[\![\text{John and Peter are blond}]\!]^{M,g}{}_- = 0$ $\langle 1, 0\rangle$
b. $[\![\text{blond}]\!]^{M,g}{}_+ = \emptyset$ , $[\![\text{blond}]\!]^{M,g}{}_- = \{j', p'\}$
$[\![\text{blond}]\!]^{M,g}{}_+ = \emptyset$ $[\![\text{blond}]\!]^{M,g}{}_- = \{j', p', j' \oplus p'\}$
$[\![\text{John and Peter are blond}]\!]^{M,g}{}_+ = 0$, $[\![\text{John and Peter are blond}]\!]^{M,g}{}_- = 1$ $\langle 0, 1\rangle$
c. $[\![\text{blond}]\!]^{M,g}{}_+ = \{j\}$ , $[\![\text{blond}]\!]^{M,g}{}_- = \{p'\}$

$[\![\text{blond}]\!]^{M,g}{}_{+} = \{j\}$ $[\![\text{blond}]\!]^{M,g}{}_{-} = \{p'\}$
$[\![\text{John and Peter are blond}]\!]^{M,g}{}_{+} = 0$, $[\![\text{John and Peter are blond}]\!]^{M,g}{}_{-} = 0$ $\langle 0, 0\rangle$

(65) John and Peter aren't blond.

a. $[\![\text{blond}]\!]^{M,g}{}_{+} = \{j', p'\}$, $[\![\text{b}]\!]^{M,g}{}_{blond} = \emptyset$
$[\![\text{blond}]\!]^{M,g}{}_{+} = \{j', p', j' \oplus p'\}$ $[\![\text{blond}]\!]^{M,g}{}_{-} = \emptyset$
$[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{+} = 0$, $[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{-} = 1$ $\langle 0, 1\rangle$

b. $[\![\text{blond}]\!]^{M,g}{}_{+} = \emptyset$ , $[\![\text{blond}]\!]^{M,g}{}_{-} = \{j', p'\}$
$[\![\text{blond}]\!]^{M,g}{}_{+} = \emptyset$ $[\![\text{blond}]\!]^{M,g}{}_{-} = \{j', p', j' \oplus p'\}$
$[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{+} = 1$, $[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{-} = 0$ $\langle 1, 0\rangle$

c. $[\![\text{blond}]\!]^{M,g}{}_{+} = \{j\}$ , $[\![\text{blond}]\!]^{M,g}{}_{-} = \{p'\}$
$[\![\text{blond}]\!]^{M,g}{}_{+} = \{j\}$ $[\![\text{blond}]\!]^{M,g}{}_{-} = \{p'\}$
$[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{+} = 1$, $[\![\text{not [J and P are blond]}]\!]^{M,g}{}_{-} = 1$ $\langle 1, 1\rangle$

The problem with this system, as pointed out in (Gajewski 2005:145ff) is that it does derives counterintuitive results for sentences involving binary (or $n$-ary) relations between plurals. I only consider the most simple case, binary relations. As pointed out above, the sentences in (66) seem to have very weak truth conditions: (66a) is true, for instance, if every boy hit only one of the girls and if every girl was hit by a boy. Likewise, (66b) is true in a scenario, where John hit Mary, but not Sue, and Peter hit Sue, but Mary.

(66) a. The boys hit the girls.
b. John and Peter hit Mary and Sue.

Negating these sentences, on the other hand, yields strong meanings: (67a) is true only iff none of the boys hit any girls, and (67b) iff neither John nor Peter hit Mary or Sue.

(67) a. The boys didn't hit the girls.
b. John and Peter didn't hit Mary and Sue.

Assume again (following Schwarzschild (1994)) that cumulated positive and negative extensions are formed on the basis of basic positive and negative extensions, as in (68), for any F of type $\langle e\langle et\rangle\rangle$ (the formulation is different from Schwarzschild's, but is equivalent effect).

(68) a. $*[\![\text{F}]\!]^{M,g}{}_{+}$ = the smallest set $S \subseteq A \times A$, such that $[\![\text{F}]\!]^{M,g}{}_{+} \subseteq S$ and for all $x^1, x^2, y^1, y^2$, if $\langle x^1, x^2\rangle \in [\![\text{F}]\!]^{M,g}{}_{+}$ and $\langle y^1, y^2\rangle \in [\![\text{F}]\!]^{M,g}{}_{+}$ , then $\langle x^1 \oplus y^1, x^2 \oplus y^2\rangle \in S$.
b. $*[\![\text{F}]\!]^{M,g}{}_{-}$ = the smallest set $S \subseteq A \times A$, such that $[\![\text{F}]\!]^{M,g}{}_{-} \subseteq S$ and for all $x^1, x^2, y^1, y^2$, if $\langle x^1, x^2\rangle \in [\![\text{F}]\!]^{M,g}{}_{-}$ and $\langle y^1, y^2\rangle \in [\![\text{F}]\!]^{M,g}{}_{-}$ , then $\langle x^1 \oplus y^1, x^2 \oplus y^2\rangle \in S$.

The problem that now arises is the following: In the scenario given above, where (66b) should come out as true, it comes out as true *and an instance of PS-failure*, since $[\![(66b)]\!]^{M,g}{}_{+} = [\![(66b)]\!]^{M,g}{}_{-}$ – which doesn't seem correct, (69a). What is more, if we slightly change the scenario, so that Peter hit both Mary and Sue, while John still only hits Mary, the sentence will all of a sudden be true and not involve a presupposition failure, (69b). As correctly pointed out by (Gajewski 2005:148), this seems counterintuitive. A further change in scenario, to one where John hit Mary, but not Sue and Peter hit none of the two, will render the sentence false, (69c) – while I think that this should be a presupposition failure.

(69) a. $[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>,<p',s'>\}$, $[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<p',m'>,<j',s'>\}$
$[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>,<p',s'>,<j'\oplus p',m'\oplus s'>\}$,
$[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<p',m'>,<j',s'>,<j'\oplus p',m'\oplus s'>\}$
$[\![\text{J and P hit M and S}]\!]^{M,g}{}_{+}=1$, $[\![\text{J and P hit M and S}]\!]^{M,g}{}_{-}=1$, $\langle 1,1\rangle$

b. $[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>,<p',s'>,<p',m'>\}$, $[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<j',s'>\}$
$[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>,<p',s'>,<p',m'><j'\oplus p',m'\oplus s'>\}$,
$[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<j',s'>,\}$
$[\![\text{J and P hit M and S}]\!]^{M,g}{}_{+}=1$, $[\![\text{J and P hit M and S}]\!]^{M,g}{}_{-}=0$, $\langle 1,0\rangle$

c. $[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>\}$, $[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<j',s'>,<p',s'>,<p',m'>\}$
$[\![\text{hit}]\!]^{M,g}{}_{+}\ \{<j',m'>\}$,
$[\![\text{hit}]\!]^{M,g}{}_{-}\ \{<j',s'>,<p',s'>,<p',m'><j'\oplus p',m'\oplus s'>\}$
$[\![\text{J and P hit M and S}]\!]^{M,g}{}_{+}=0$, $[\![\text{J and P hit M and S}]\!]^{M,g}{}_{-}=1$, $\langle 0,1\rangle$

The predictions for the negated sentence in (67a) are obvious and just as counterintutive: in (69a), where it should simply be false, it comes out as false and an instance of PS-failure, which also doesn't seem to be correct: we simply want (67a) to be false. The prediction for (69b) seems correct: it comes out as false and so it should. But again, the fact that the slight change in scenario should make all the difference here (from a PS failure to case where the PS is met) seems very strange. Finally, in (69c), where we should find a PS-failure, it comes out as true. In sum, while it seems promising, as an account of homogeneity, Schwarzschild's 1994 proposal cannot be extended to sentences with transitive relations between plurals.

### 2.4.2 The status of homogeneity

One last point I want to address is the status of homogeneity or homogeneity effects. I intentionally limited the discussion so far to examples involving ACs, rather than standard plurals, in order to avoid having to address a class of phenomena which interfere even with our basic description of the data – that class of phenomena discussed by various authors under different headings and which, for the sake of simplicity, I here term *imprecision*, as we did in Križ and Schmitt (2012a). The point at issue is the observation that plural sentences can be considered true even if there are exceptions. Although the phenomenon can be found for all types of predicates (but cf. Dowty (1986), Taub (1989), Brisson (1998) for more discussion) and also for all $n$-transitive predicates (with $n \leq 1$), I limit myself here to the discussion of intransitive distributive predicates. Accordingly, the phenomenon can be restated as follows: A plural sentence *e are F* can be true (i.e. considered to be true) even if not all atomic parts of $e$ have the property denoted by $F$. Consider the minimal pair in (70) and (71), from (Malamud 2012:(7),(2)), based (Krifka 1996:(10)).[23] The plural sentences in (70b) behave according to our predictions: they both convey that *all* of the windows are open. However, the plural sentences in (71a) and (71a) don't – here, (71a) and (71b) both convey that *some* of the windows are open.

(70) Situation: *Mary has a large house with over a dozen windows in different rooms. She is about to have the window frames painted, and is preparing the house for the arrival of painters. Her friend Max says, "I think you still have a ton of work to do, right?" Mary replies:*

a. actually, I'm done – the windows are open!

b. actually, I'm done – the windows aren't closed (anymore)!

(71) Situation: *Mary has a large house with over a dozen windows in different rooms. She locks up and leaves to go on a road trip with her friend Max, forgetting to close just a few of the many windows in various rooms. A few minutes into the ride, Max says, "There is a thunderstorm coming. Is the house going to be OK?" Mary replies:*

a. Oh my – we have to go back, the windows are open.

b. Oh my – we have to go back, the windows aren't closed.

In Križ and Schmitt (2012a) we argue that imprecision is an inherent, i.e. semantic property of plural sentences, not reducible to *pragmatic slack*, a phenomenon discussed in both Lasersohn (1999) and Lauer (2011) and considered by us and below from Lauer's perspective. This means that (71a) is actually *true* (rather than false, but felicitous) in a scenario where only some, but not all of the windows are open.[24]

[23] Krifka's 1996 discussion is again based on Yoon (1996) who calls what I call "imprecision" above "partial predication" and claims that it is a lexical property of predicates, found only for members of what Cruse (1986) calls *C-complementaries*. Krifka (1996) and others have since refuted the claim that imprecision is a lexical property (the examples discussed above are similar to those used by Krifka to support his critique). It could be argued that members of $C$-complementaries are still particularly prone to imprecision, possibly this could be related to observations about their lexical meaning made in (Gajewski 2005:108). (Gajewski 2005:108f) also criticizes Krifka's 1996 implicature-based take on imprecision (and does so correctly, I think), I do not go through Krifka analysis and the points against it here.

[24] Brisson (1998) assumes (in effect, not technically) that we restrict the extension of the plural DP to the salient individuals (cf. Heusinger (1997), Schlenker (2004)) for related discussion). More precisely, she assumes, following Schwarzschild (1996), that the distributivity operator (or *) on VP has an extra domain restriction, a pragmatic cover $Cov$, (ia) (adapted from Schwarzschild (1996)), which, however, may be "ill-fitting". This means that for the plural argument's extension $S$ and the cover $Cov$, where, it does not have to hold that for every $u \in Cov$, $u \leq S$. Given the distributivity operator in (ib) it thus might happen that subsets of the plural arguments extension $S$ are irrelevant for the truth-conditions of the sentence –i.e. imprecise construals (or, in Brisson's sense) readings, arise because members of the plurality become irrelevant for the evaluation of the sentence. The problem with this view (cf. Malamud (2012) for a similar point) is that imprecision will thus always require some members of the plurality to me more salient than others – and this prediction seems incorrect (unless salience is conceived of in the sense that $x$ is more

Irrespective of our explanation of imprecision, the simple observation that if plural sentences can be true even if the predicate does not yield true for every atom, and if negated plural sentences can be true if the predicate does not yield false for every atom – what is the phenomenon I have been talking about above, i.e. what is homogeneity?[25] As a first point, we must note that there is still something left of the original phenomenon: Sentences where we introduce each atom of the plurality explicitly, i.e. where the plurality is the denotation of an AC, do not (easily, at least) allow for imprecision, (72). Here, we witnessed homogeneity effects and we have to account for them (albeit that account might be trivial from a perspective such as Malamud's 2012 in combination with standard Gricean reasoning, based on Grice (1975)).

(72) SITUATION: *Mary and Max have left the house and their 5 children in the care of a babysitter. After a day on the road, Mary receives a call from the babysitter, telling her that 2 of the 5 children are sick. She goes pale. Max asks: "Do we have to turn around?" Mary replies:*

a. Yes – the children are sick.

b. # Yes– John, Bert, Sue, Katy and Helen are sick.

---

salient than $y$ just in case the property under discussion holds of $x$– which would introduce circularity.)

(i) a. For any cover $Cov \subseteq A$, plurality $S \in A$, $Cov$ is a cover for $S$ iff $S \leq \bigoplus Y : Y \in Cov$
b. DIST $= \lambda P_{\langle et \rangle}.\lambda Cov_{\langle et \rangle}.\lambda x_e.\forall y[y \leq x \wedge y \in Cov \rightarrow P(y)]$

Malamud (2012), on the other hand, assumes that plural sentences are underspecified and imprecision is, in fact, due to competing readings of the sentence. Simplifying greatly, the basic, once we are met with a plural sentence such as (ii), we consider all alternatives of the form *e are open*, where $[\![e]\!] \leq [\![\text{the windows}]\!]$. Let us distinguish three alternatives: First, the sentence S1 that expresses that no windows are open. Assume that it is true in the world $w_1$, i.e. $[\![S1]\!] = \{w_1\}$. Second, the sentence that expresses that some windows are open. Assume that it is true in the worlds $w_2, w_3$, i.e. $[\![S2]\!] = \{w_2, w_3\}$. Third, the sentence where all windows are open, which is true in the world $\{w_3\}$. We then pick that alternative which is most relevant for the *question under discussion* (QUD) (cf. Roberts (1996)) which in turn is considered as a decision problem (in the sense of Merin (1999), Rooij (2003)), so that the most relevant alternative(s) is/ are the one(s) that excludes most non-optimal actions.The most relevant alternative is that which rules out the largest number as non-optimal for the decision problem, i.e. the QUD. As each world has exactly one action that is optimal in it, the most relevant alternative is that essentially that which rules out most worlds. Assume that the QUD whether Mary can relax. This is the optimal action in $w_3$, but not in $w_2, w_1$. Accordingly, the reading corresponding to *all of the windows are open* is the most relevant one. Now assume that the QUD is whether Mary has to turn back. This is the optimal action in $w_2, w_3$, but not in $w_1$. Accordingly, the most relevant reading here is that corresponding to *some of the windows are open.* The same process is assumed to happen in case of negated sentences, *above* negation.

(ii) The windows are open

I do not discuss this proposal here, because of a number of problems pointed out to me by Manuel Križ (pc). One of them is the inability of the proposal to account for imprecision with collective predicates (see chapter 5), which, in my treatment of collective predicates in chapter 5, reduces to a problem to give a proper account for structures with more than one plural expression (but cf. (Malamud 2012:43f)). I omit this discussion here.

[25] In the example discussed in Malamud (2012), the universal /universal negative case comes out as special, as in these cases, we can eliminate all worlds (taken as equivalence classes) but one. However, there could be cases where some intermediate construal yields has the same effect.

More importantly, what I originally gave as the meaning of the sentences (both the negated, as well as the non-negated forms), still seems to represent a special case – the unmarked construal, if one wishes. This is witnessed by the following observation, made in Križ and Schmitt (2012a), namely, that while there being exceptions doesn't seem to prevent the sentence from being true, exceptions can be explicit in discourse only be means of special formal devices, in particular, adverbs like *of course, admittedly, as you know* . . . . This is illustrated in (73). (73a) seems true in the scenario given, and it can be followed up by making the exceptions explicit, if introduced by *of course*, (73b). Without *of course*, the follow-up seems bad and has a contradictory sound to it. The same pattern can be witnessed for the negated sentence in (74): (74a) is fine, and exceptions can be mentioned as in (74b), with the adverb *of course*, but not without the adverb, as in (74c).[26]

(73) SCNEARIO: *3 of my 5 children are obese, 2 have normal weight and body-size.*

a. I'm desperate. My children are really fat.
b. I'm desperate. My children are really fat. Of course, Joey and Billy, being just 4 years old, aren't, but the others are monsters.
c. I'm desperate. My children are really fat. # Joey and Billy, being just 4 years old, aren't, but the others are monsters.

(74) SCNEARIO: *4 of my 5 have normal weight and body-size, 1 is obsese.*

a. Well, I'm not a bad mother. My children aren't fat.
b. Well, I'm not a bad mother. My children aren't fat. Of course, Max, having a mental disorder, is obsese. The others are completely normal.

---

[26]Brisson (1998) gives examples similar to the (c) cases below and considers them fine, with contrasts with our judgements in Križ and Schmitt (2012a). Another claim made in Brisson (1998), which we consider misguided is the one that the "strict" construal, where the predicate holds of all atoms – is an implicature. The basis for her argument is that (i), is fine According to her, which it should not be if the strict construal were entailed. She takes (ia) to be implicature reinforcement. Sentences such as (ii), on the other hand, are taken to involve implicature cancellation.

(i) a. The boys –in fact, all of them – are sleeping in the attic.
b. The boys – all of them – are sleeping in the attic.
c. Every boy – every single one – will be sleeping in the attic..

(ii) The boys are sleeping in the attic, but not all of them are,

I find this line of argumentation questionable. Apart from the fact that I consider (ii) almost contradictory, the problem exact derivation the implicature eludes me, and my intuition that (ib) is much better than (ia) and seems to be a strategy that has nothing to to with implicature reinforcement, given that we find the same pattern in (ic), the formal patterns by means of which the implicature is taken to be cancelled or reinforced are the exact opposite of what we find elsewhere. An utterance of (iiia) is commonly assumed to trigger the implicature in (iiib). *In fact* is a typical means to introduce cancellation, (iiib1) and *but* is a typical means to introduce reinforcement, (iiib2) – and not vice versa (but see section 5.2 below).

(iii) a. Some people in this course hate me . . .
b. $\rightsquigarrow \neg\forall x$[ course-attendant(x)$\rightarrow$ hates-me $(x)$]
1) . . . *in fact* / # *but*, all of them do. $\Longrightarrow$ (*cancellation*)
2) . . . *but* / # *in fact* not all of them do. $\Longrightarrow$ (*reinforcement*)

c. Well, I'm not a bad mother. My children aren't fat. # Max, having a mental disorder, is obsese. The others are completely normal.

These facts also seem to have a bearing on discourse and this is why it is hard to draw any evidence for homogeneity from discourse. In a scneario such as (73), is the fact that only the *well-answer* seems appropriate an indication that homogeneity has been violated or is it due to the same reasons (whatever they are) that the obligatory status of *of course* and similar adverbs is due to?[27]

(75) MOTHER: I'm desperate. My children are really fat.
FRIEND OF MOTHER:
a. ??No they aren't. Joey and Billy are normal.
b. ?/ ?? Yes they are. I am sorry. (vs. Yes, they are, you irresponsible bitch!)
c. Well, Joey and Billy aren't.

### 2.4.3 Interim summary

In the preceding paragraphs, I gave a brief discussion of the phenomenon known as *homogeneity* in plural predication, which refers to the observations that plural sentences seem to impose a restriction that either the property in question holds of all members of the plurality or of none. Homogeneity is unexpected within the theory of cumulation I sketched above, and analyses which combine cumulation with a particular theory of presupposition, such Schwarzschild's 1994, fail to derive homogeneity effects for sentence with $n$-transitive predicates of pluralities, $n > 1$. I also raised the question of the *status* of homogeneity, given that plural sentences can be imprecise. Although the discussion remained superficial, I indicated that the discourse behavior of exceptions shows that the universal and the universal negative case must remain special in a sense – or, in other words, that we have to capture homogeneity effects somehow. However, it is really unclear *what* exactly it is that we need to capture, i.e. what, if any, level of linguistic representation the special status of the universal / universal negative case, i.e. homogeneity, should be ascribed to. The proposal I give below has an idealizing take on the phenomenon, ignoring, for the most part, the complications arising due to imprecision.

[27] I think the same extends even to cases such as (70). Note further that *well* itself is an unreliable test, as shown in (i).

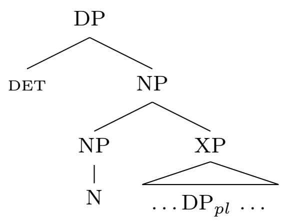
(i) *A*: Noone likes me.
a. *B*: That's false. John likes you and Mary does, too.
b. *B*: Well, John likes you and Mary does, too.

## 2.5 Quantifiers

In the following, I return to the syntactic aspects of cumulation. I present one syntactic configuration, that indeed seems to block the syntactic formation of a predicate that is subsequently affixed with the cumulation operator, namely that configuration, where the relation would be need to be formed across the definite determiner and (some) quantificational determiners. Albeit it seems that at first sight there is a neat syntactic distinction, in the sense that all those determiners behave like syntactic islands, so speak, which head DPs that can behave like plural expressions, with plural denotations, the empirical situation is more messy and (unfortunately) does not allow for such a straightforward correlation.

Up to this point, I only considered simple plurals or simple AC with DP-coordinates. Here, I briefly address examples where a plural is embedded in a DP, as schematized in (76), where DET ranges over the singular and the plural definite determiner (see section 2.1 above) and all quantificational determiners, the standard meanings of which (following Barwise and Cooper (1981), Westerstahl (1985), Keenan and Stavi (1986), Partee (1989)) are given in (77) below. I employ German data, given that German allows for a more clear-cut distinction between determiners (cf. Heycock and Zamparelli (2005)) as regards the behavior of the determiner whenever it embeds a plural (or, as we will see later on, an AC).[28] Accordingly, (77) gives the lexical entries for both German and English quantificational determiners. Further, I use set notation and first order representation (wherever possible) interchangeably.[29]

(76)




(77)
a. $[\![\text{ jed- / every }]\!]^{M,g}{}_{\langle et\rangle\langle et\rangle t} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.[P \subseteq Q]$
b. $[\![\text{ alle / alle }]\!]^{M,g}{}_{\langle et\rangle\langle et\rangle t} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.[P \subseteq Q]$
c. $[\![\text{ein /some}_{sg}\text{ (a) }]\!]_{\langle et\rangle\langle et\rangle t} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.[P \cap Q \neq \emptyset]$
d. $[\![\text{einige /some}_{pl}\text{ (a) }]\!]_{\langle et\rangle\langle et\rangle t} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.[P \cap Q \neq \emptyset]$
e. $[\![\text{die meisten /most}]\!]_{\langle\langle et\rangle\langle et\rangle t\rangle} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.|P \cap Q| > |P \cap \bar{Q}|$
f. $[\![\text{viele /many}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \cap Q > n$, for some large $n$
g. $[\![\text{wenige /few}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \cap Q > n$, for some small $n$
h. $[\![\text{fünf / five}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \cap Q = 5$
i. $[\![\text{mehr als fünf /more than five}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \cap Q > 5$
j. $[\![\text{weniger als fünf / less than five}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \cap Q < 5$

[28] The cases that differ are the singular definite determiner and the singular existential and singular negative existential. Cf. in particular (Heycock and Zamparelli 2005:fn.9) for the discussion of possible exceptions to the German pattern I address here.

[29] I only give Partee's 1989 entry for cardinal *many / few* and not the one for proportional *many / few*. Cf. Solt (2009) for the discussion (with a negative answer) of whether there should be two lexical entries.

The problem I raise here has two aspects to it, which I call the *internal* and the *external* problem.

The *internal* problem relates to the behavior of the determiner w.r.t. the embedded plural. I show that matrix DETS can apparently be categorized according to the following schema: Either the determiner *distributes* or it doesn't. This means that for one set of determiners, the DP in (78a) seems to be equivalent to that in (78b), while for another set it doesn't.

(78) a. DET diary / diaries of *the girls / Maria, Susi and Karla*
b. DET diary / diaries of Maria and DET diary / diaries of Maria and DET diary / diaries of Karla

At first, this appears to correspond to a syntactic difference between determiners: While determiners that distribute could be viewed as allowing QR of the plural to a position above the DP and subsequent cumulation of the derived predicate, determiners that don't distribute could be seen as instances of barriers for such movement (given the discussion in section 2.3, the only barriers observed so far). However, this view cannot be correct: It falsely predicts the entailment in (79) whenever there is another plural in the sentence. This entailment is not found. Rather, what we observe a cumulative construal: The first sentence in (79) states that the boys, *among them* read DET *diary / diaries of Maria, Susi and Karla.*

(79) The boys read DET diary / diaries of Maria, Susi and Karla $\rightarrow$
$\forall x[x \leq_{AT} B' \rightarrow x$ read the every diary of Maria or every diary of Susi or every diary of Karla.

This latter observation relates to what I call the *external* problem. In particular, it seems that, irrespective of their behavior in terms of the internal problem, all determiners block movement from within them. Why should they? In chapter 4 I show that if a plural expression embeds a plural expression, the embedding plural expression acts as an intervener for syntactic movement. Hence, could we say that DPs headed by quantificational determiners count as plural expression? Below, I give some evidence that they should, however, as their behavior differs from that of definite plural DPs in some crucial respects, I don't really know what to do with this evidence.

### 2.5.1 The internal problem

Consider the sentences in (80) (uttered by a nosy person), where a plural is embedded in a DP headed by a singular a plural definite determiner. Assuming that Maria, Susi and Karla are the only girls around, (80a) is true and defined iff there is a single diary, written by the girls collectively and I read it. (80b) on the other hand, is true and defined, iff there is a maximal collection of diaries made up of every diary written by Susi, every diary written by Maria and every diary written by Karla (I assume that the unmarked case is that diaries written by people individually, not collectively) and I read every diary in this collection.

(80) a. Ich habe das Tagebuch der Mädchen / von Maria, Susi und Karla gelesen.
‘I read the diary of the girls / of Maria, Susi and Karla read.
b. I habe die Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘I read the diaries of the girls / of Maria, Susi and Karla.’

If we change the sentences slightly by inserting a plural in the subject position, as in (81), we obtain the following: (81a) is true and defined iff there is a single diary, written collectively by the girls, and each boy read it. (81b), on the other hand, has a cumulative construal: It is true and defined iff there is a collection of diaries made up of every diary of each of the girls, and the boys *among them* read these diaries. Likewise for (81c): It is true and defined iff there is a collection of written documents made up of every diary of each of the girls and every poem written by each of the teachers and the boys, *among them* read these documents.

(81) a. Die Buben haben das Tagebuch der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read the diary of the girls / of Maria, Susi and Karla read.
b. I habe die Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘I read the diaries of the girls / of Maria, Susi and Karla.’
c. Die Buben haben die Tagebücher der Mädchen und die Gedichte der Lehrer gelesen.
‘The boys read the diaries of the the girls and the poems of the teachers.’

Given the meaning of the definite determiner discussed above, these results can easily be derived – adding the stipulation (already mentioned in section 2.1 above) that morphosyntactically singular NPs are not cumulated (i.e. do not have + attached to them), while morphosyntactically plural NPs are cumulated (i.e. have + attached to them). Analyzing the complex NP as involving a silent relative clause, we derive (82a) for the singular NP extension and (82b) for the plural NP extension. If the definite determiner has the meaning given in section 2.1 and picks the maximal element from each set, we obtain the right result.

(82) a. Tagebuch von Maria, Susi und Karla ≈ diary that was written by Susi, Maria and Karla
$\{x \in AT | \forall y[y \leq_{AT} x \rightarrow \exists z[z \leq_{AT} m' \oplus s' \oplus k' \wedge W'(y)(z)] \wedge \forall z[z \leq_{AT} m' \oplus s' \oplus k' \rightarrow \exists y[y \leq_{AT} x \wedge W'(y)(z)]]\}$
b. Tagebücher von Maria, Susi und Karla ≈ diaries that were written by Susi, Maria and Karla
$\{x \in A | \forall y[y \leq_{AT} x \rightarrow \exists z[z \leq_{AT} m' \oplus s' \oplus k' \wedge W'(y)(z)] \wedge \forall z[z \leq_{AT} m' \oplus s' \oplus k' \rightarrow \exists y[(y \leq_{AT} x \wedge W'(y)(z)]]\}$

Now consider the DPs in (83), where a plural is embedded by a DP headed by a quantificational determiner. (83a) is true iff I red every diary of Maria, every diary of Susi and every diary of Karla, similarly for (83b). (83c) is true iff I read some diary of Maria, some diary of Susi and some diary of Karla. It doesn't seem true if I read some diary of Maria, some of Susi and none of Karla. (83d), finally, is true iff I read most diaries of Maria, most diaries of Susi and most diaries of Karla. It doesn't seem to be true if I read each of the girls has written 5 diaries and I read 4 diaries of Susi, 4 diaries of Karla and 1 diary of Maria.[30] In other words, the determiners in (83) *distribute*.

(83) a. Ich habe jedes Tagebuch der Mädchen / von Maria, Susi und Karla gelesen.
'I read every diary of the girls / of Maria, Susi and Karla.
= I read every diary of Maria and I read diary of Susi and I read every diary of Karla.

b. I habe alle Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
'I read all diaries of the girls / of Maria, Susi and Karla.'
= I read all diaries of Maria and I read all diaries of Susi and I read all diaries of Karla.

c. Ich habe einige Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
'I read some diaries of the girls / of Maria, Susi and Karla.'
= I read some diaries of Maria and I read some diaries of Susi and I read some diaries of Karla.

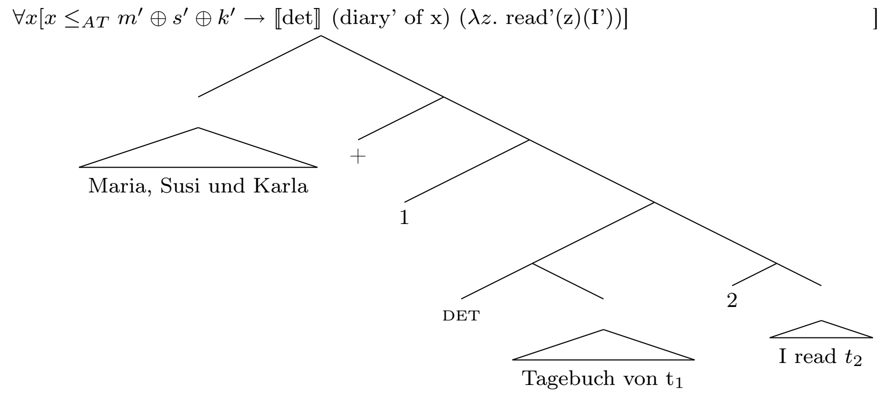
d. Ich habe die meisten Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
'I read most diaries of the girls / of Maria, Susi and Karla.' = I read most diaries of Maria and I read most diaries of Susi and I read most diaries of Karla.

If we assume that the syntactic operation that derives the predicates that subsequently undergo cumulation is completely unrestricted – as I argued in section 2.3 above– then these data are apparently easy to account for: Let DET in (84) range over the determiners employed in (83). Then (84), when interpreted, yields the right meaning.

[30] For the conjoined cases, it seems to be that the construal I take to be absent is available if a slight prosodic break is inserted between the head noun and the PP / genitive (ia). Interestingly, the cases I discuss in chapter 3 are the same: If I insert a slight prosodic break in the position indicated in (ib) I don't have to see any pigs in order for the sentence to be true. Similarly for *die meisten / most*. Somehow, this slight prosodic break is only possible if the "group" is somehow salient.

(i) a. Ich habe einige Tagebücher der von | Maria, Susi und Karla gelesen
b. Ich habe einige | Kühe und Schweine gesehen.
'I saw some | cows and pigs.'

(84)




Now consider the sentences in (85). For (85a) to be true in German (apparently, English behaves differently, cf. Heycock and Zamparelli (2005)) there must be a single diary written by all the girls. If I read a diary written exclusively by Maria, one exclusively written by Susi and one written exclusively by Karla, but no other diary, the sentence isn't true. For (85b) to be true, I have to have read many diaries of Maria, Susi or Karla in total, but I don't have to have read many by each of them. Finally, for (85c) to be true, I must have read exactly 5 diaries of Maria, Susi or Karla. (85c) isn't true if I read five diaries of Maria, five diaries of Susi and five diaries of Karla. In other words, in these cases, the determiner *does not distribute.*

(85) a. I habe ein Tagebuch der Mädchen / von Maria, Susi und Karla gelesen.
'I read a diaries of the girls / of Maria, Susi and Karla.'
b. Ich habe viele Tagebücher der Mädchen von Maria, Susi und Karla gelesen.
'I read many diaries of the girls / of Maria, Susi and Karla.'
c. Ich habe genau fünf Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
'I read exactly five diaries of the girls / of Maria, Susi and Karla.'

We could account for this in (admittedly random) syntactic terms, assuming that the determiners in (85), as opposed to the ones in (83) introduce islands for that type of movement that forms plural predicates.[31] While this wouldn't explain the data in (85), we could, at least, describe the difference between distributing and non-distributing determiners.

### 2.5.2 The external problem

But this cannot be correct. No matter whether a determiner distributes or not, it will not (consistently) allow for the formation of a plural predicate across it. This is witnessed by the truth-conditions of the following sentences. (86a) is true iff the boys, *among them* read the collection of diaries made up of every diary written by Maria, every diary written by Susi and every diary written by Karla, likewise for (86b). Importantly, it does not have to be

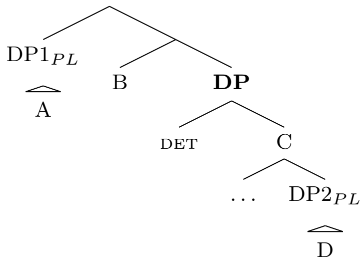
[31]This restriction is not reflected in standard QR, as all determiners discussed here allow for inverse scope w.r.t. quantifiers embedded in them– no matter whether it is embedded as a genitive or as a PP.

the case that each boy read every diary by one of the girls: Assume that Maria, Susi and Karla each wrote 2 diaries, and that there are 3 boys, John, Peter and Bill. The sentence is true, for instance, if John read $d_{m1}, d_{s1}$, Bill read $d_{s2}, d_{k1}$ and Peter read $d_{m2}, d_{k2}$. (86c) is true iff the boys *among them* read the collection of diaries made up of some diary written by Maria, some diary written by Susi and some diary written by Karla. Finally, (86d) is true iff the boys, *among them* read the collection of diaries made up of most diaries written by Maria, most diaries written by Susi and most diaries written by Karla. Again, how exactly the diaries are distributed amongst the boys reading them does not matter. Finally, (86e) is true iff there are exactly five diaries written by Maria, Susi or Karla that were read by the boys *among* them.

(86) a. Die Buben haben jedes Tagebuch der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read every diary of the girls / of Maria, Susi and Karla read.
b. Die Buben haben alle Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘The boys read all diaries of the girls / of Maria, Susi and Karla.’
c. Die Buben haben einige Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read some diaries of the girls / of Maria, Susi and Karla.’
d. Die Buben haben die meisten Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘The boys read most diaries of the girls / of Maria, Susi and Karla.’
e. Die Buben haben genau fünf Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read exactly five diaries of the girls / of Maria, Susi and Karla.’

Accordingly, end up with the following situation: We find determiners that distribute and those that don’t distribute. I called this the *internal* problem. As the name already suggests, the *internal* problems makes reference to interaction of the determiner w.r.t. plurals embedded in the DP headed by the respective determiner. In addition to this, we find what I here call the *external* problem, illustrated by data such as (86). That problem refers to the observation that apparently all determiners block the formation of predicates which subsequently form the input to cumulation across them. In other words, for any value for DET in the tree in (87), we cannot form a direct relation between plural DP1 and plural DP2 that would include the determiner, i.e. we cannot form the relation $\lambda x.\lambda y.yB[det[Cx]]$.

(87)




Why should this be the case? The intuition that I follow up in subsequent chapters is that the only syntactic configuration that blocks the formation of predicates that are subsequently cumulated are those where one (or more) of the plural arguments are embedded in another plural expression. Since all determiners block the formation of plural predicates, we should conclude that all determiners head DPs that count as plural expressions. This certainly is a problem from the traditional stance of determiner meanings (see the meanings I gave above), but that wouldn't really bother me. What bothers me is that albeit I can show that albeit quantificational determiners – or expressions usually considered to be quantificational determiners – indeed behave like plural expressions in some respects, they do not do so consistently. Accordingly, even though I will later on indeed pursue the hypothesis that plural expressions act as syntactic islands, I do not really know what to do about quantificational determiners – hence the *external problem* is, indeed, a problem.

In the following, I first present evidence that all DPs headed by quantificational determiners can behave like standard definite plural DPs in some respects. I then show that there is no straightforward way of how to capture this behavior, in particular as the parallel to definite plural DPs does not concern all aspects of their behavior.

### DPs headed by quantificatinal determiners behave like definite plural DPs . . .

Scha (1981) observes that DPs headed by numeral determiners may partake in cumulative construals of relations between individuals (henceforth referred to as the "cumulative construal" of quantifiers).(88a) can express that John, Bill and Peter, among them, ate 93 sausages, (88b) that three boys, among them, ate 93 sausages. In both cases, the alleged quantifiers are scopeless w.r.t. each other[32]

[32]The phenomenon is distinct from collectivity, as examples such as (i) allow for a much wider distribution w.r.t. space and time (see section 5.1 below).

(i) In the past six months, 8 criminals assaulted 25 people. There were 10 assaults in Hamburg, 5 in Bonn, 9 in Kaiserslautern and one in Frankfurt '

Note that the quantifiers do not have to be scopeless w.r.t. all other elements in the sentence (cf. Schein (1986, 1993)). Consider (ii) (which emerged from discussion with Manuel Križ). The scopeless reading for all quantifiers is one where two girls, among them, caused every guest to hear a story and the totality of stories told is six. It also has a reading, however, where *two* is scopeless w.r.t. *every* and *six*, but where *every* outscopes *six*: Two girls, among them, caused every guest to hear six (possibly different) stories). In (iii), which is less problematic than (ii), *two* and *every* are scopeless w.r.t. each other: the two girls, among them, used every knife for a killing, but *every* outscopes *at least one*: for each knife, a different person can be killed by it.

(88) a. John, Bill, and Peter ate 93 sausages. Disgusting.
b. Three boys ate 93 sausages. Disgusting.

Landman (2004) argues that Scha's 1981 claims can be extended to modified numerals and Schein (1986, 1993) shows that even DPs headed *every* seems to have such a construal.

I submit that – at least in German – the phenomenon is even more general. Apart from DPs headed by numerals and modified numerals, we find it for DPs headed by cardinal determiners, (89a), by *die meisten* (most), and for the plural and the singular universal, (89d) and (89e). (89a) can express that Hans, Maria and Karl, among them, shot many / few birds, (89b) that, among them, they shot most birds, (89d) that, among them, they shot all birds, and (89e) that, among them, they shot every bird.

(89) a. Hans, Maria und Karl haben viele / wenige Vögel in diesem Wald
Hans, Maria and Karl have many / few birds in this forest
abgeschossen.
shot.
'Hans, Maria and Karl shot many /few birds in the forest.'
b. Hans, Maria und Karl haben die meisten Vögel in diesem Wald abgeschossen.
Hans, Maria and Karl have the most birds in this forest shot.
'Hans, Maria and Karl shot most birds in the forest.'
c. Hans, Maria und Karl haben einige Vögel in diesem Wald abgeschossen.
Hans, Maria and Karl have some in this forest shot.
'Hans, Maria and Karl shot some birds in the forest.'
d. Hans, Maria und Karl haben alle Vögel in diesem Wald abgeschossen.
Hans, Maria and Karl have all birds in this forest shot.
'Hans, Maria and Karl shot all birds in the forest.'
e. Hans, Maria und Karl haben jeden Vogel in diesem Wald abgeschossen.
Hans, Maria and Karl have every bird in this forest shot.
'Hans, Maria and Karl have every bird in the forest.'

(90) makes the same point as (88), except that it is parallel to (88b) above and thus illustrates the phenomenon of scopelessness more clearly: (90a) can express that two hunters, among them, shot many / few birds, (90b) that, among them, they shot most birds, (90c) that, among them, they shot all birds, and (90d) that, among them, they shot every bird and (90e) that some hunters, among them, shot every bird. (As the existential and the universal are scopeless w.r.t. each other, (90e) illustrates that the plural existential can indeed have a cumulative construal.)

(ii) Two girls told every guest six stories.

(iii) Zwei Verrückte haben mit jedem Messer in diesem Haus mindestens eine Person umgebrACht.
'Two lunatics killed at least one person with every knife in the house.'

(90) a. Zwei widerliche Jäger haben viele / wenige Vögel in diesem Wald
two disgusting hunters have many / few birds in this forest
abgeschossen.
shot.
‘ Two disgusting hunters shot many /few birds in the forest.’

b. Zwei widerliche Jäger haben die meisten Vögel in diesem Wald
two disgusting hunters have the most birds in this forest
abgeschossen.
shot.
‘Two disgusting hunters shot most birds in the forest.’

c. Zwei widerliche Jäger haben alle Vögel in diesem Wald abgeschossen.
two disgusting hunters have all birds in this forest shot.
‘Two disgusting hunters shot all birds in the forest.’

d. Zwei widerliche Jäger haben jeden Vogel in diesem Wald abgeschossen.
two disgusting hunters have every bird in this forest shot.
Two disgusting hunters shot every bird in the forest.’

e. Einige widerliche Jäger haben jeden Vogel in diesem Wald abgeschossen.
some disgusting hunters have every bird in this forest shot.
Some disgusting hunters shot every bird in the forest.’

The phenomenon is not tied to the eventive character of the predicate in (90). (91a), for instance, has a cumulative reading, where Hans and Maria, among them, know every important artwork /most important artworks of the 20th century, (91b) can be true if half of the hypotheses follow from Axiom 1 and the other from Axiom 2. (91c) makes the same point. Further, the VP containing the quantifier cannot simply be analyzed as collective, as illustrated by (92) (which should be self-explanatory).

(91) a. Hans und Maria kennen jedes / die meisten bedeutende(n) Kunstwerkwerk des 20. Jahrhunderts. Hans kennt alle Werke vor dem Minimalismus und Maria alle danach, das ist schon beeindruckend.
‘Hans and know every / most important artwork of the 20th century. Hans knows every pre-minimalist artwork and Mary every post-minimalist one.’

b. Aus diesen zwei Axiomen folgt jede Hypothese in diesem System. ‘Every hypothesis in this system follows from these two axioms.’

c. Kriminell, geistig minderbemittelt – diese zwei Eigenschaften beschreiben jeden FPÖ-Politiker. Ersteres gilt ganz klar für die Führungsetage, letzteres für die Provinzpolitiker.
‘Criminal, utterly stupid – these two attributes characterize every FPÖ-politician. The former clearly applies to the leaders of the party, the latter to those in the rural provinces.’

(92) ‘Hansi, Karli und Buberl sind ja sexuell sehr aktiv. Sie haben alle blonden Kinder / jedes blonde Kind / die meisten blonden in diesem Dorf gezeugt.
‘Hansi, Karl and Buberl are sexually very active, as you know. They fathered all

blond children / every blond child / most blond children in this village.'

Kratzer (2000), in her discussion *every*, notes that cumulative readings of quantifiers other than numerals seem to be restricted to configurations where the quantifier does not occur as an agent (which can, but does not have to be a syntactic subject).[33] However, I don't think that this suggests a deep difference between numerals and other quantifiers. Importantly, judgements are graded, rather than absolute, in two respects. On the one hand, it seems to play a role what type of an agent we are considering.[34] Employing Haiden's 2005 and Reinhart's 2006 terminology, quantifiers that occur as pure [+ C(AUSER)] agents can more easily get a cumulative reading than agents that are also [+ M(ENTALLY INVOLVED)] (it also seems that the more mental involvement, the harder it is to obtain a cumulative reading). Further, if a quantifier occurs in an agent position, judgements are graded concerning the quantifier chosen: numerals modified by *exactly* and non-modified numerals seems to be the ones that most get a cumulative reading most easily, while for numerals modified by *more than / less than*, cardinals, the plural universal and *at most* it is harder to obtain and probably the hardest for the singular universal. However, that doesn't mean a cumulative reading is not attested for these cases. Imagine we are in the engine room of a rather large boat, being shown around by the captain of the ship. I believe all of the sentences can have a cumulative reading (for the (a) scenarios, it further helps to imagine the captain as exasperated by the uneconomical construction of the ship).[35]

---

[33]Schein (1986, 1993), Kratzer (2000) give an event-based accounts of the data involving a cumulative reading of *every*. Kratzer's 2000 rendering for (i) is the one in (ii), where $E$ is a sum of events ("sum" here being understood in the Linkean sense), $X$, $Y$ pluralities of individuals. As opposed to the rendering above, (ii) involves true universal quantification and would therefore derive the plural / quantifier asymmetry w.r.t. homogeneity, which I address below. However, it is made implausible by the observations right below – not all agents are always excluded (a similar point is made in Champollion (2010a), but I think the example he employs (his (12)) is ill-chosen, as, at least in German, it seems to lack a cumulative reading), it is further excluded by the fact that the verbs in question do not have to be eventive, as also illustrated above.

(i) Two hunters shot every bird.

(ii) $\exists E \exists X[2^*H'(X) \wedge {}^{**}\text{AGENT}(X,E) \wedge$
$\forall y[B'(y) \rightarrow \exists e[e \leq E \wedge \text{ shot (y)(e)} \wedge \exists Y[{}^*B'(Y) \wedge {}^{**}\text{shot(Y)(X)}]]]]$

[34]Solt's 2007 arguments against the cumulative reading of *few / many NP* all consider the latter when occurring as an agent.

[35]Analogously for the sentences in (i), which allow for a cumulative reading (and happen to be true). However, here it is really unclear whether the subject is an agent at all. (Concerning the historical situation, half of the Viennese men had fallen for Alma and the other half for Mathilde and the two groups did not overlap.)

(i) a. Zu Beginn des zwanzigsten Jahrhunderts waren die meisten Männer in Wien zwei scheußlichen Weibern verfallen – Alma Mahler-Werfel und Mathilde Schönberg.
'At the beginning of the 20th century, most men in Vienna had fallen for two appalling women – Alma Mahler-Werfel und Mathilde Schönberg.'

b. Zu Beginn des zwanzigsten Jahrhunderts war jeder Männer in Wien zwei scheußlichen Weibern verfallen – Alma Mahler-Werfel und Mathilde Schönberg.
'At the beginning of the 20th century, every man in Vienna had fallen for two appalling women – Alma Mahler-Werfel und Mathilde Schönberg.'

(93) a. Mehr als fünf Motoren treiben diese paar Maschinen an.
more than five engines power these few machines PRT

b. Mehr als fünf Motoren treiben viele Maschinen an.
more than five engines power many machines PRT

c. Mehr als fünf Motoren treiben genau zwei Maschinen an.
more than five engines power exactly two machines PRT

(94) a. Viele Motoren treiben die Maschinen an.
many engines power the machines PRT

b. Viele Motoren treiben viele Maschinen an.
many engines power many machines PRT

c. Viele Motoren treiben genau zwei Maschinen an.
many engines power exactly two machines PRT

(95) a. Die meisten Motoren treiben diese paar Maschinen an.
the most engines power these few machines PRT

b. ?/??Die meisten Motoren treiben wenige Maschinen an.
the most engines power few machines PRT

c. ?Die meisten Motoren treiben genau zwei Maschinen an.
the most engines power exactly two machines PRT

(96) a. Alle Motoren treiben diese paar Maschinen an.
all engines power these few machines PRT

b. Alle Motoren treiben alle Maschinen an.
all engines power all machines PRT

c. Alle Motoren treiben genau zwei Maschinen an.
all engines power exactly two machines PRT

(97) a. ?Jeder Motor in diesem Raum treibt diese paar Maschinen an.
every engine in this room powers these few machines PRT

b. ??/#Jeder Motor in diesem Raum treibt ganz wenige Maschinen an.
every engine in this room powers very few machines PRT

c. ?/??Jeder Motor in diesem Raum treibt genau zwei Maschinen an.
every engine in this room powers exactly two machines PRT

In sum, I provided evidence that DPs headed by quantificational determiners behave like standard definite plural DPs – they partake in cumulative construals of relations. So can we analyze them in analogy to definite plural DPs? And, if so, how exactly should we proceed?

#### ... but what does this tell us about the analysis of DPs headed by quantificational determiners?

Scha's 1981 original examples with numerals are incompatible with the view of quantificational determiners given above and have been taken by many to suggest that numerals and modified numerals require an alternative construal as predicates of plural individuals (or modifiers of cumulated NP-extensions) Hoeksema (1983), Link (1987), Partee (1989) , Krifka

(1999), Landman (2004), but cf. Solt (2009)), as shown in (98a), (98b) and (98c). For independent reasons, analogous assumptions have been made for cardinals, (98d), (98e) (and, by Solt (2009, 2011b), based on Hackl (2000, 2009) also for *most*).

(98) a. $[\![$ fünf$]\!] = \lambda x.|x| = 5$
b. $[\![$mehr als fünf$]\!] = \lambda x.|x| > 5$
c. $[\![$weniger als fünf$]\!] = \lambda x.|x| < 5$
d. $[\![$viele$]\!] = \lambda x.|x| > n$ for some large $n$
e. $[\![$wenige$]\!] = \lambda x.|x| < n$ for some small $n$

This yields NP-structures as in (99), which is are then subjected to existential closure (cf. Krifka (1999),Landman (2004) for variants).[36]

(99) $[_{NP}$ five $[_{NP}$ N ]]

This assumption, it seems, helps us to derive the cumulative construal for DPs headed by numerals (I still say "headed" even though numerals might not be $D^0$s anymore). (100a) now has the representation in (100b), which seems correct.

(100) a. Three boys ate 93 sausages. Disgusting.
b. $[\exists x_e[|x| = 3 \wedge x \in *B]$ $[$ $[\exists y[|y| = 93 \wedge y \in *S]$ : $[$ ++ $[$ 1 $[$ 2 $[$ ate' $(t_1)(t_2)]]]]]]]$

For numerals and cardinals, this analysis can apparently be directly extended to the cases with embedded plurals. (101) has a cumulative construal. If the numeral with the lexical entry in (98a) now modifies the plural NP-extension repeated from above in (103b), we seem to obtain the right result: The syntactic structure for the sentence is (102) and the meaning of this structure is that five boys, among them, read a collection of 5 diaries, such that each diary was written by Karla, Maria or Susi and that Karla, Maria and Susi each wrote at least one diary in that collection.

(101) Die Buben haben fünf Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.

[36] This can be a silent existential determiner in the Spec of DP, Partee's 1986 *A*-shift, an existential closure operator in the periphery of the sentence (or beyond sentence level, cf.Heim (1982), Kamp and Reyle (1993)), or the structure could involve a choice function in the Spec of DP, (i), which is existentially bound by some higher operator (cf. Reinhart (1997), Winter (2001a)). For problems with the latter view and a possible solution (which, nevertheless, would render the cumulative construals observed above impossible) cf. in particular Winter (2001a).

(i) Let $A$ be a non-empty set of individuals. Then f: $\wp A \rightarrow A$ is a choice function (CH($f$)) iff for every $B \subseteq A$: if B is not empty, $f(B) \in B$. (after (Winter 2001a:82))

Scha (1981), Van der Does (1992, 1993), obtain the same result *qua* the shift $C_a$ in the single domain approach.

(ii) $C_a := \lambda D_{\langle\langle et\rangle\langle\langle et\rangle t\rangle\rangle}.\lambda A_{\langle et\rangle}.\lambda \mathcal{B}_{\langle\langle et\rangle t\rangle}.\exists X_{\langle et\rangle}[D(A)(X) \wedge \mathcal{B}(X)]$
(after (Van der Does 1993:518ff))

' The boys read five diaries of the girls / of Maria, Susi and Karla.'

(102) [[the boys ] [fünf Tagebücher der Mädchen / von Maria, Susi und Karla ] [++ [ 1 [ 2 [gelesen $(t_1)(t_2)$ ]]]]]

(103) a. Tagebuch von Maria, Susi und Karla ≈ diary that was written by Susi, Maria and Karla
$\{x \in AT | \forall y[y \leq_{AT} x \rightarrow \exists z[z \leq_{AT} m' \oplus s' \oplus k' \wedge W'(y)(z)] \wedge \forall z[z \leq_{AT} m' \oplus s' \oplus k' \rightarrow \exists y[y \leq_{AT} x \wedge W'(y)(z)]]\}$

b. Tagebücher von Maria, Susi und Karla ≈ diaries that were written by Susi, Maria and Karla
$\{x \in A | \forall y[y \leq_{AT} x \rightarrow \exists z[z \leq_{AT} m' \oplus s' \oplus k' \wedge W'(y)(z)] \wedge \forall z[z \leq_{AT} m' \oplus s' \oplus k' \rightarrow \exists y[(y \leq_{AT} x \wedge W'(y)(z)]]\}$

As I showed that all the quantificational determiners can head DPs for which we find cumulative construals when heading simple DPs, shouldn't we just generalize this procedure and assume that every determiner has an alternative construal as a predicate of a plural individual – in analogy to numerals and cardinals, (104)?

(104) $[\![\text{det}]\!] = \lambda x.P(x)$

In the following, I list some reason why we cannot do so – and why, possibly, the solution just sketched is ill-fated on a more general level.

First, there is the internal problem – when embedding a plural, some determiners distribute and others don't.[37] Generalizing the determiners-as-predicates-of-pluralities view would predict that all determiners don't distribute. This is desired for numerals and cardinals but not desired for the German correlates of *every, all* and *most* (for the plural existential, see below). In fact, the singular and plural universal might not represent a big problem: Assuming that its determiner-as-predicate analysis is very much like that of the definite determiner, as in (105), we obtain the effect that the determiner seems to distribute automatically (what we couldn't maintain anymore is the direct correlation of cumulation and morpho-syntactic number: The restrictor of the singular universal is a singular NP, yet would have to have the cumulated extension in (103b)).[38] However, I see no sensible extension to *most.* It seems

[37] It is hard to classify the determiners that project and those that don't in more general terms. Cardinals and numerals are a subset, of course, of symmetric determiners, (i), and, as opposed to other determiners, have been argued to introduce a degree argument (cf. Hackl (2000, 2009)) and can occur in post-determiner position, but other than that, there is no phenomenon that groups them together to the exclusion of other determiners. We have seen that cumulative construal are far more wide-spread than originally thought, but also other phenomena, such as exceptional scope taking (cf. Ruys (1992), Reinhart (1997), Winter (2001a)), the possibility to head DPs that can bind plural pronouns (cf. Kamp and Reyle (1993), Reinhart (1997) and Winter (2001a), but Brasoveanu (2010) for criticism) or the class of determiners that may head DPs that can-occur with the complement set of what Winter (2001a), based on Dowty's 1986 categorization, calls *all-type* collective predicates, will not single out this particular set of determiners.

[38] I do not discuss the problem here that the universal can be generated from the empty set, i.e. that a sentence such as (i) is true if there are no poems written by either of these individuals – and that it isn't true if there are poems written by Maria but no poems written by Sarah, and I didn't read all of Maria's poems.

that we would require an NP-extension as in (106) and I have no idea how to derive it.

(105) $[\![\text{jeder}]\!]_{\langle et\rangle,\langle et\rangle} = \lambda P_{\langle et\rangle}.\lambda x.P(x) \wedge \forall y[P(y) \rightarrow y \leq x]$

(106) $\exists x[(x \in {}^*\text{diary'} \wedge \forall y[y \leq_{AT} m' \oplus s' \oplus k' \rightarrow [\![\text{DET}]\!]\ \text{diary' written by y} \leq x] \wedge \forall z[z \leq_{AT} x \rightarrow \exists y[y \leq_{AT} m' \oplus s' \oplus k') \wedge \text{wrote(z)(y)}]]) \wedge \forall y^1[y^1 \leq_{AT} x \rightarrow \exists z^1[z^1 \leq_{AT} [\![\text{the boys}]\!] \wedge \text{read'}(y^1)(z^1)]] \wedge \forall z^1[z^1 \leq_{AT} [\![\text{the boys}]\!] \rightarrow \exists y^1[(y^1 \leq_{AT} x \wedge \text{read'}(y^1)(z^1)]]]$

Second, there is the problem that concerns any determiners-as-predicates analysis of numerals with subsequent existential closure. It has become to be known as *van Benthem's problem* Benthem (1986), and addresses the fact that proposals assuming a modifier or predicative analysis of determiners always predict an *at least* reading for numerals and cardinals, which might be problematic even for non-modified numerals (cf. Breheny (2008)) but has the disastrous result for cardinality expressions which, in the determiner view, correspond to downward-monotone functions, i.e. *few* or *less than five*. Various solutions have been proposed for this problem (cf. in particular Swart (2001), Landman (2004), Solt (2009)) and I don't dwell on it here, addressing the more particular problems that arise in a determiners-as-predicates analysis of the data discussed above.

Third, and crucially, we have a serious problem with negation. It is not only a problem for the determiners-as-predicates view but, more generally, arises because we assumed that our NP-extensions looks like (103b) above.

Consider first the existential. In effect, it seems as though we already have our solution for both the singular and the plural existential, without needing to say more. As the determiners-as-predicates view involves existential closure of the complex predicate, it does not matter whether we assume that *ein* / *einige* are actually semantically empty morphemes and existential closure happens independently, or whether they are standard existential determiners, ranging over the NP extensions in (103a) and (103b) respectively. The singular existential does not distribute: (107a) is true if there is a diary written by the girls collectively, and each boy read it or if, for each boy, there is a diary written by the girls collectively and he read it. This fact is easily explained if we assume that the NP-restrictor of the singular existential is (103a) and accordingly only contains atoms, as each atom must have a part written by Maria, a part written by Susi and a part written by Karla, and as atoms only have themselves as parts, the existential must pick a diary that was written by the girls collectively (there are simply no other objects in the NP-extension). For the plural, we assume that the restrictor of the existential is (103b), which will yield the desired results: The objects in the NP-extension can be atoms and pluralities, they will all be such that a part is written by Maria, a part is written by Susi and a part is written by Karla. Hence, assuming that each of the girls wrote two diaries (and there was no collective diary-writing) so that $d_{m1}, d_{m2}, d_{s1}, d_{s2}, d_{k1}, d_{k2}$ are all our atomic diaries written by girls in M1, the restrictor of the plural existential in (107b) will be the set in (108)– which seems to be just right.

(i) I read every poem written by Maria and Sarah.

(107) a. Die Buben haben ein Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read a/some diary of the girls / of Maria, Susi and Karla.’

b. Die Buben haben einige Tagebücher der Mädchen / von Maria, Susi und Karla gelesen.
‘ The boys read some diaries of the girls / of Maria, Susi and Karla.’

(108) $\{d_{m1} \oplus d_{m2} \oplus d_{s1} \oplus d_{s2} \oplus d_{k1} \oplus d_{k2}, d_{m1} \oplus d_{m2} \oplus d_{s1} \oplus d_{s2} \oplus d_{k1}, d_{m1} \oplus d_{m2} \oplus d_{s1} \oplus d_{s2} \oplus d_{k2}, d_{m1} \oplus d_{m2} \oplus d_{s1} \oplus d_{k1} \oplus d_{k2}, d_{m1} \oplus d_{m2} \oplus d_{s2} \oplus d_{k1} \oplus d_{k2}, \ldots, d_{m1} \oplus d_{s1} \oplus d_{k1}, d_{m1} \oplus d_{s1} \oplus d_{k2}, d_{m1} \oplus d_{s2} \oplus d_{k2}, d_{m2} \oplus d_{s1} \oplus d_{k2}, d_{m2} \oplus d_{s2} \oplus d_{k2}, d_{m2} \oplus d_{s1} \oplus d_{k1}, d_{m2} \oplus d_{s2} \oplus d_{k1}\}$

Now consider the negative existential in (110). The sentences with the singular negative existential in (109) expresses that there is no diary written by the three girls together that I / the boys read. (109a) can be true, for instance, if I read a diary by Maria, but nothing else. The sentences with the plural negative existential in (110), however, expresses that there isn’t any diary by Maria *or* Susi *or* Karla that I or any of the boys read. It is not true if I or the boys, respectively, read a diary by Karla and nothing else.

(109) a. Ich habe kein Tagebuch von Maria, Susi und Karla gelesen.
I read no diary of Maria, Susi und Karla.

b. Die Buben haben kein Tagebuch von Maria, Susi und Karla gelesen.
‘The boys read no diary of Maria, Susi und Karla.’

(110) a. Ich habe keine Tagebücher von Maria, Susi und Karla gelesen.
I read no diaries of Maria, Susi und Karla.

b. Die Buben haben keine Tagebücher von Maria, Susi und Karla gelesen.
‘The boys read no diaries of Maria, Susi und Karla.’

Penka (2011) argues that the negative existential in German (and English) must be decomposed into an existential expression *ein N* in the scope of a silent sentential negation, (111).[39]

(111) a. Ich habe keinen Mann gesehen.
I have no man seen

b. [ $\neg_{\langle t,t\rangle}$ [ [ein Mann] [1 [ich habe $t_1$ gesehen ]]]]

Amongst other observations, Penka cites split-scope readings as in (113) (modelled after her 89:(8)) as evidence for her claim, where material intervenes scopally between the negation and the existential. ($w$ is a variable over possible worlds, $Acc_w$ is the set of accessible worlds from $w$). The same split scope readings can be found for the examples analogous to (110) under discussion, (113). In other words, if split-scope construals are an argument for Penka’s analysis of negative existentials as existentials in the scope of negation (and I can think of no

[39] The locus of sentential negation does not have to be in CP, it can be as low as VP. See Penka (2011) for more discussion.

other explanation for these data), then the fact that split-scope construals are available for the plural negative existential shows that it, too, must be decomposed into a plural existential and a sentential negation.[40]

(115) Hans ist Hinduist. Er darf keine Kuh töten
Hans is Hindu. He may $no_{sg}$ $cow_{sg}$ kill
a. $\lambda w.\neg\exists w'[Acc_w(w') \wedge \exists x[x$ is a cow in $w' \wedge$ H. kills $x$ in w']
'It is not allowed for Hans to kill a cow.'
b. $\lambda w.\neg\exists x[x$ is a cow in $w \wedge \exists w'[Acc_w(w') \wedge$ H. kills $x$ in w']
?'There is no cow that Hans is allowed to kill.'
c. $\lambda w.\exists w'[Acc_w(w') \wedge \neg\exists x[x$ is a cow in $w' \wedge$ H. kills $x$ in w']
# 'It is allowed that Hans kills no cow.

(116) Hans ist Pazifist. Er darf kein Tagebücher von Bush und Blair lesen.
Hans is pacifict. He may $no_{pl}$ diaries of Bush and Blair read
a. $\lambda w.\neg\exists w'[Acc_w(w') \wedge \exists x[(x$ is a diary by Bush $\vee$ x is a diary by Blair in $w') \wedge$ Hans reads $x$ in w']
'It is not allowed for H. to read a diary that is by Bush or Blair.'

[40] Assuming that the plural negative indefinite is simply a different kind of determiner, such as universal negative (as in Zanuttini (1991)), (i), contradicts Penka's 2011 observations as it falsely predicts that if the negation scopes above the modal in (110), we only obtain a *de re* reading, (ii).

(i) $[\![\text{keine}]\!] = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.P \subseteq \bar{Q}$.

This escape strategy is also blocked by the fact that conjunction under plural existentials under overt negation behaves exactly like conjunction under the plural negative determiner. In order to show this point, one must consider bare plurals, as the plural existential *einige* (just as English *some*), is a positive polarity item, (112) and (as opposed to English) does not have a negative-polarity counterpart (Accordingly, the table I gave above is slightly sloppy, as I only make reference to *einige* rather than bare plurals). The adjective in (113), which modifies both NP-conjuncts, helps to establish the position of the determiner above the conjunction in bare plural configurations. Without a higher negation, (113) yields exactly the same interpretation as NP-conjunction under *einige*: for (iii) to be true, I need to know both famous men and famous women. In the scope of negation, however, we find exactly the same truth-conditions as for plural *keine*, (62b).[41]

(112) ?? Es ist nicht der Fall / ich bezweifle, dass Hans einige Tagebücher von Maria und Susi gelesen hat.
' It is not the case / I doubt that Hans read some diaries by Maria and Susi

(113) a. Durch meine Arbeit kenne ich geheime Tagebücher von Maria und Susi
Because-of my work know I $secret_{pl}$ diaries of Maria and Susi
'Because of my work, I know secret diaries of Maria and Susi.'
b. Durch meine Arbeit kenne ich [$\text{DET}_\exists$ [geheim [Tagebücher von Maria und Susi]]]

(114) a. Leider ist es nicht der Fall, dass ich geheime Tagebücher von Maria und Susi kenne.
'Unfortunately it is not the case that I know secret diaries by Maria and Susi.
≈ 'I do not know any secret diaries by Maria and I do not know any secret diaries by Susi.'
b. Ich bezweifle, dass Hans geheime Tagebücher von Maria und Susi kennt.
I doubt that Hans knows secret diaries by Maria and Susi.
≈ 'I do not believe that Hans knows any secret diaries by Maria and I do not believe that Hans knows any secret diaries by Susi.'

b. $\lambda w.\neg\exists x[(x$ is a diary by Bush $w \vee x$ is a diary by Blair in $w) \wedge \exists w'[Acc_w(w')\wedge$ Hans reads $x$ in w']
?'There is no diary by Bush or Blair that H. is allowed to read.'

c. $\lambda w.\exists w'[Acc_w(w') \wedge \neg\exists x[(x$ is a diary by Bush in $w' \vee x$ is a diary by Blair in $w')\wedge$ Hans reads $x$ in w']
# 'It is allowed that H. reads no diary that by both Bush or Blair.'

All is well for the singular negative existential – the truth-conditions of (109) are exactly those we expect we decompose the sentences as proposed by Penka and as illustrated in (117) for (109a) above. But we are in serious trouble when considering the plural negative existential. Decomposition á la Penka yields (118) for (110a) above, and given that we just assumed that the restrictor of the plural existential is (103b), the sentence should be true, contrary to fact, if I read a diary by Maria and nothing else or a diary by Maria and a diary by Karla and nothing else – these objects aren't in the extension of the restrictor.

(117) [¬ [ Ich habe $\text{DET}_\exists$ Tagebuch von Maria, Susi und Karla gelesen.]]

(118) [¬ [Ich habe $\text{DET}_\exists$ Tagebücher von Maria, Susi und Karla gelesen]]

A connected problem, in the present setting, is that a sentence such as (119) is defined and true if the boys, among them read diaries, all of which were written written by Maria and Susi. As we assumed the NP extension in (120), this is unexpected (but cf. Landman (2004)).[42] However, here, we might argue that even the non-downward entailing case in (120) does not require the collection to have diaries of each girl in it – hence, that maybe the NP-extension itself is not what we thought. This escape strategy is blocked in the case of the existential.

(119) Die Buben haben weniger als fünf Tagebücher von Maria, Susi und Karla gelesen.
'The boys read fewer than five diaries of Maria, Susi und Karla.'

(120) Die Buben haben genau fünf Tagebücher von Maria, Susi und Karla gelesen.
'The boys read exactly five diaries of Maria, Susi und Karla.'

The fourth problem is that the determiners-as-predicates analysis views determiners as predicates or modifiers of a plurality (Landman's 2000 and Champollion's 2010a proposals are slightly different, but, for my present purposes, indistinguishable).[43] Importantly, however, quantifiers differ from standard plurals in one respect: they do not exhibit homogeneity effects. The sentence in (121), for instance, is true, rather than unvalued, if not all birds were

[42]If we allow for empty plural individuals, the sentence is not expected to be false, in that scenario, but it is also not expected to be false in a scenario where the boys, among them, read 116 diaries written by Maria and Susi. This is undesirable.

[43]Champollion (2010a) assumes that *every NP* is construed as the sum of all individuals that have the property denoted by NP, he then accounts for the apparent subject / object asymmetry (in terms of which he reanalyzes Kratzer's 2000 agent restriction) by assuming that the quantifier moves, its being interpreted as a definite plural and the moved copy above a distributivity operator. As the distributivity operator, in his view (see also Champollion (2010b)) should be similar to that found in standard plural sentences, the asymmetry w.r.t. homogeneity is not expected.

shot by Hans, Maria and Karl, likewise, the sentence in (122) is true if only one bird was shot by Hans, Maria or Karl. Interestingly, this does not extend to standard plurals occurring in the same sentence: (121) is not true, but rather unvalued, if only Hans and Maria partook in the shooting, similarly in (122). This phenomenon extends to all quantifiers.[44]

(121) Es ist nicht der Fall, dass Hans, Maria und Karl jeden Vogel abgeschossen haben.
'It is not the case that Hans, Maria and Karl shot every bird.'

(122) Es ist nicht der Fall, dass Hans, Maria und Karl genau zwei Vögel abgeschossen

[44] Apart from this, quantifiers under their cumulative construal also maintain their monotonicity properties, which sets them apart from the standard plurals I discuss in section 5.1. Following Ladusaw (1979) in assuming NPIs can only occur in DE contexts, and taking the German NPIs *auch nur irgendein* (roughly *any*) as a test item, the standard universal (both singular and plural) licenses NPIs in its restrictor, (i). NPIs may also occur in the restrictor of the singular / plural universal when the latter partake in cumulative relations, (ii). Importantly, (ii) still has the "among them" reading for the subject w.r.t. the object.

(i) a. Jeder Vogel, der auch nur irgendeinen Pieps gemacht hat, wurde erschossen.
every bird RP PRT PRT *any* sound made has was shot
'Every bird that made any sound was shot.'
b. Alle Vögel, die auch nur irgendeinen Pieps gemacht haben, wurden erschossen.
all birds RP PRT PRT *any* sound made has was shot
'All birds that made any sound were shot.'

(ii) a. Hans, Maria und Karl haben jeden Vogel, der auch nur irgendeinen Pieps gemacht hat, abgeschossen.
Hans, Maria and Karl have every bird RP PRT PRT *any* sound made has shot
'Hans, Maria and Karl shot every bird that made any sound.'
b. Hans, Maria und Karl haben alle Vögel, die auch nur irgendeinen Pieps gemacht haben, abgeschossen.
Hans, Maria and Karl have all birds RP PRT PRT *any* sound made have shot
'Hans, Maria and Karl shot every bird that made any sound.'

When occurring in standard, i.e. non-cumulated contexts, DE cardinals also license NPIs in their nuclear scope, (iii). It seems to me that this property might be kept in cumulated contexts: (iv) licenses NPI-*brauchen* (the fact that it is indeed and NPI is illustrated in (iva)) and the most prominent reading of (ivb) is one where the three biggest companies, among them, need to fire less than 5 people (but obviously, showing that a cumulative reading is present is quite hard with DE arguments, as already mentioned at the end of Chapter 2). Interestingly, this property breaks down when they occur as an agent.

(iii) Weniger als 5 Leute hier haben auch nur irgendeine Ahnung von Computerspielen.
Less that five people here have PRT PRT any clue of computer-games

(iv) a. *Zwei Firmen brauchen jemanden zu entlassen.
Two companies need someone to fire
INTENDED: 'Two companies need to fire someone.'
b. Das ist ja gar nicht so schlimm. Es gibt 6 Firmen. Weniger als 5 Leute brauchen die größten 3 von denen zu entlassen.
That is PRT PRT not so bad. There are 6 companies. Less than 5 people need the biggest 3 of them to fire
'It's not so bad, after all. There are 6 companies and the biggest three need to fire less than 5 people.'

haben.
'It is not the case that Hans, Maria and Karl shot exactly two birs.'

I do not think that asymmetry is predicted by the semantic representations discussed above above. The problem here is the nuclear scope. Assume that we have three values, true, false and undefined and we simplify projection so that the non-negated sentence is true if there is an x which has the restrictor property and where $\langle x, h' \oplus m' \oplus k' \rangle \in {}^*[\![\text{shot}]\!]$, undefined if homogeneity is not met and false if homogeneity is met and $\langle x, h' \oplus m' \oplus k' \rangle \notin {}^*[\![\text{shot}]\!]$. Then the sentence should come out undefined, rather than false, if only one bird was shot by Hans or Maria or Karl.

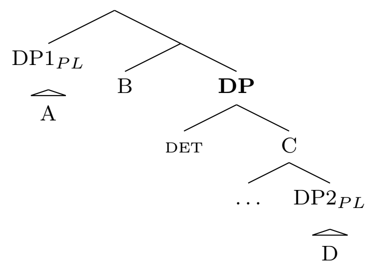
(123) $\neg(\exists x[|x| = 2 \wedge *bird'(X)] : **\,shot'(X)(h' \oplus m' \oplus k'))$

In sum, we saw above that DPs headed by what we usually consider quantificational determiners display the behavior of definite plural DPs in that they may partake in the cumulative construal of relations. However, there is no obvious way how this observation can be implemented in the analysis: The most prominent possibility, where the determiners are predicates or modifiers faces a number of problems. Further, we found that there are some quantificational remnants in the cases under consideration, as witnessed by the lack of homogeneity effects for sentences containing DPs headed by quantificational determiners.

### 2.5.3 Interim summary

This section showed that DPs headed by quantificational determiners pose a problem in two respects. On the one hand, determiners differ in their behavior w.r.t. plurals embedded in the DPs they head. We find determiners that distribute and those that don't distribute. I called this the *internal* problem. On the other hand, we found that all determiners, distributing or not, block the formation of predicates which subsequently form the input to cumulation across them. In other words, for any value for DET in the tree in (124), we cannot form a direct relation between plural DP1 and plural DP2 that would include the determiner, i.e. we cannot form the relation $\lambda x.\lambda y.yB[det[Cx]]$. I called this the *external* problem.

(124)




I tested a hypothesis (the motivation of which will be spelled out in chapter 4) according to which all plural expressions block the formation of such predicates across them if it would involve movement from within that plural expression. Accordingly, the external problem suggests that all DPs, headed by whichever determiner, are plural expressions. I gave some evidence that corroborated the claim – essentially, that DPs headed by quantificational determiners can partake in cumulative construals of relations – but then saw myself unable to implement these observations in any plausible way. Existing proposals proved to be insufficient and further, the behavior of definite plural DPs and DPs headed by quantificational determiners was not altogether parallel.

In this thesis, both the internal and the external problem will remain unsolved. The reasons why I introduced them here at some length are the following. The *internal* problem will be employed as a diagnostic. We saw that determiners fall into two classes when embedding plurals, should we find the same classification in other contexts, we should better check whether that context might not also involve an embedded plural. In particular, we will see that the classification extends to those cases, where determiners embed AC of predicates and I will use that observation as circumstantial evidence for my claim that AC are plural expressions and denote pluralities.

The *external* problem mainly be used as a destructive means, showing that in many cases, an obvious solution a particular theory offers cannot be on the right track. However, the essential observation – namely, that the derivation of predicates that are subsequently cumulated is not completely unconstrained – will also form the input to my discussion of plural syntax in chapter 4.

## 2.6 How general is the phenomenon?

As opposed to *projection*, *homogeneity*, and *quantifiers* the point I briefly address in this section does not have much of a bearing on the subsequent discussion but I add it in order to complete the discussion on cumulativity and also to prevent confusion.

Above, I discussed cumulativity only w.r.t. distributive predicates, but in my definitions, I assumed it to be a general phenomenon. Is this empirically warranted, i.e. does it extend to collective and mixed predicates?

Consider first purely collective predicates, such as *meet*. *meet* seems to denote a property of a plurality. Given (125), we can also specify what it means: the members of the plurality must be in the same place, at the same time and must somehow (and possibly intentionally) interact. If John is in the playground at 8 o'clock, and Bill is in the bar at the same time, then (125) is false. So let us assume that only pluralities the members of which are in the same place, at the same time and interact somehow are in the basic extension of *meet*. Then cases like (126), so-callled show that *meet* has a cumulated extension. (126) involves a so-called *intermediate* construal (cf. Schwarzschild (1996)) where the predicate does not hold of the entire plurality, nor of each atom, but rather of sub-pluralities.

(125) John and Bill met.

(126) In the evening, the children met. The girls met in the bar and the boys in the playground.

(127) The girls met. The boys met. ⇒ The children met.

However, note that there is a potential problem hidden here, which will become more explicit with mixed predicates. Recall that cumulated extensions of intransitive predicates are essentially a function like (128): a property of the parts is inherited by the plurality. I.e. if the parts are P', then the plurality is P', too. As I only addressed distributive predicates so far, which aren't defined for pluralities, we never faced the problem that the plurality could have a property different from the parts – in particular, *not-P'*.

(128) $^*[\![\text{P}]\!]_{\langle e,t\rangle} = \lambda x_e.P'(x) \vee \exists y, z[y \oplus z = x \wedge *[\![\text{P}]\!](y) \wedge [\![\text{P}]\!](\text{z})]$

This possibility emerges now, and indeed we find cases where we can make it explicit, as in (129).

(129) The girls met. The boys met. But the girls didn't meet with the boys, because they consider them perverts.

The problem is even more intricate for mixed predicates (cf. Heim (1994)). As mentioned above, Link (1983) argues that mixed predicates denote properties of both atoms and pluralities. Indeed, (130b) is true in a scenario where each of John and Peter lifted the piano, and one where they lifted it together. Again, we find intermediate construals, as in (131) (cf. in particular Gillon (1987) Schwarzschild (1996), vs. Van der Does (1993)) and also cumulative inferences, (132)– possibly with the same qualms as in (127).

(130) a. John lifted the piano.
b. John and Peter lifted the piano.

(131) Yesterday, I saw a very innovative contest: The men lifted the piano. John and Peter lifted it easily, but Bill, Conan and Seppl, although it was three of them together lifting it, could hardly manage.

(132) John lifted the piano. Peter lifted the piano. ⇒ John and Peter lifted the piano.

And yet again, the property is not truly inherited, as made explicit by (133).

(133) John and Peter lifted the piano – but not individually!

The most troubling case, where the problem becomes most evident (addressed in Heim (1994), Schwarzschild (1994)) are degree-constructions – in particular those involving predicates which relate individuals to monotonous scales, in the sense of Schwarzschild (2002, 2005, 2006).[45] Consider the sentence in (134). The sentence has two scenarios where it is true: One, where they 200 pounds together, and one where they each weigh 200 pounds. Note,

[45]Other constructions, such as *John and Bill saw 200 people* could be viewed as transitive, of course, and ambiguous between a plurality-construal of *200 people* and a quantificational construal, in the scope of **. See chapter 5 below.

however, that if they each weigh 200 pounds, the plurality $\{j', p'\}$ does not have the property of weighing 200 pounds: The plurality will weigh 400 pounds. Hence, again, the plurality does not inherit the property of its parts.

(134) John and Bill weigh 200 pounds (I just weighed them).

It has been argued (cf. in particular Heim (1994)) that this shows that cumulated extension yield truth-conditions that are too liberal and that sentences involving mixed predicates involve an ambiguity. In section 5.1 I sketch a proposal for some of the cases addressed here which also assumes ambiguity – but where this ambiguity is not rooted in the predicate, but rather in the object.

## 2.7 Summary of chapter 2

I showed (based on existing literature) how the meaning of plural sentences can be derived from the generalizing cumulative inferences.These inferences are taken to be indicative of predicate extensions, which leads to the assumption that extensions of predicates are closed under sum. The most general case for $n$-transitive predicates is repeated in (135).

(135) For any $P \subseteq A \times_n A$, $^{*n}$P is the smallest set $S \subseteq A \times_n A$, such that $P \subseteq S$ and for all $x^1, \ldots, x^n, y^1, \ldots, y^n$, if $\langle x^1_1, \ldots, x^n_n \rangle \in P$ and $\langle y^1, \ldots, y^n \rangle \in P$, then $\langle x^1 \oplus y^1, \ldots x^n \oplus y^n \rangle \in S$.

Based on these cumulated extensions, we correctly derive the truth-conditions for plural sentences, as schematized in (136).

(136) a. If $a$ is a plural and $O$ an intransitive distributive predicate, then
$[\![\text{a O}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow O'(x)$

b. If $a, b$ are plurals and $O$ is an transitive distributive predicate, then
$[\![\text{a O b}]\!] = \forall x[(x \leq a' \wedge x \in AT) \rightarrow \exists y[(y \leq b' \wedge y \in AT) \wedge O'(y)(x)]] \wedge \forall y[(y \leq b' \wedge y \in AT) \rightarrow \exists x[(x \leq a' \wedge x \in AT) \wedge O'(y)(x)]]$

c. If $a^1, \ldots a^n$ are plurals and $O$ is an $n$-transitive distributive predicate, then
$[\![\ \text{O}\ a^1_1, \ldots a^n_n\ ]\!] = \forall x^1[(x^1 \leq a^{1'}_1 \wedge x^1 \in AT) \rightarrow \exists x^2 \ldots x^n[(x^2 \leq a^{2'}_2, \ldots, x^n \leq a^{n'}_n \wedge x^2, \ldots x^n \in AT) \wedge O'(x^1) \ldots (x^n)]] \wedge \ldots \wedge \forall x^n[(x^n \leq a^{n'}_n \wedge x^n \in AT) \rightarrow \exists x^1 \ldots x^{n-1}[(x^1 \leq a^{1'}_1, \ldots, x^{n-1} \leq a^{n-1'}_{n-1} \wedge x^1, \ldots x^{1-n} \in AT) \wedge O'(x^1) \ldots (x^n)]]$

However, I also raised four potential problems for the standard analysis.

The first two issues were connected to our syntactic assumptions: I showed that the predicates which are subject to cumulation (sometimes) correspond to derived, i.e. non-lexical, predicates, but that those predicates cannot always be derived by standard syntactic processes. Plurals embedded under determiners, including quantificational ones, represent a special case: Determiners seem to block a formation of a derived predicate across them.

The other issues related to our semantic assumptions: I discussed the phenomenon of homogeneity – the fact that a plural sentence seems only "defined" if either all or none of the atoms of the plurality have the property in question (or, in the case of relations, all or none of the members of the plurality have the property of there being an atom of the other pluralities, such that they are bear said relation to it / them). Further, I showed that cumulativity, conceived of inheritance of properties of parts of the plurality by the plurality itself might not be completely general.

For the moment, all of these issues will remain unresolved. They will resurface in the next chapter only as typical properties of plural sentences which we may employ as diagnostics.

# 3 *and*-coordinations

The present chapter is concerned with AC across (semantic and syntactic) categories, i.e. sentences such as (1).

(1) a. John is fat and ugly.
    b. John insulted and molested Mary.
    c. God! Every crook and every prostitute showed up at my party.
    d. John is a crook and Mary is a liar.

Again, its purpose is two-fold, meandering, so to speak, between a negative and a positive goal. The negative goal is to show that none of the existing proposals on AC can derive the correct meanings for all sentences containing AC. This certainly holds for the traditional *intersective* analysis of *and*, but also extends to the most prominent *non-intersective analysis.* The positive goal, on the other hand, is to give a more precise characterization of the properties of AC. In particular, I show that AC display exactly the same behavior as standard plurals. To do so, I frequently recur to observations made in the preceding chapter. This might seem repetitive at times, but serves to emphasize the case I am stating here: First, we find that sentences containing and AC in addition to a a standard plural or another AC exhibit the same weak truth-conditions we observed for sentences with more than one standard plural – i.e. in a sense, we seem to obtain "cumulative" construals for relations between ACs and standard plurals or between two ACs. Second, this relation can, again, correspond to chunks of the clause that may contain syntactic islands or other barriers for movement. Third, some determiners – the same ones as above – represent exceptions to this latter claim. Fourth, we find homogeneity effects.

The chapter is structured as follows: I start with a very brief discussion of the traditional intersective analysis of AC and sketch the most prominent questions raised by this analysis. I then present a number of examples that are incompatible with the intersective analysis: In all cases, the meanings predicted by the intersective analysis are stronger than the meanings we actually find. Following this discussion, I argue that these data indeed falsify the intersective analysis, as there is no straightforward way to attribute the unexpected weakness of the examples in question to independent mechanisms. Concluding that the intersective analysis is on the wrong track, I consider its most salient alternative, Krifka's 1990 proposal for a non-intersective meaning for *and.* This proposal is shown to work rather well in a number of cases, however, it proves insufficient when faced with the data I discuss in the last section of this chapter – namely, those data, that show that AC and plurals exhibit a completely parallel behavior.

## 3.1 The classical dichotomy between intersective and non-intersective *and*

The standard view of AC (henceforth *intersective conjunction* or, for short *intersective AC*), put forth by von Stechow (1974), Gazdar (1980), Partee and Rooth (1983), Keenan and Faltz (1984), Winter (1996, 2001a,b) views *and* as a polymorphous operator $\sqcap$ on coordinates of $t$-conjoinable type, (2), which is recursively extended from the propositional connective $\wedge$ (with $p \wedge q = 1$ iff $p = q = 1$), as in the pointwise definition in (2) (from (Partee and Rooth 1983:336)).[1]

(2) The set of $t$-conjoinable types ($TC$) is the smallest set such that

a. $t$ is a $t$-conjoinable type and

b. If $b$ is a $t$-conjoinable type, then for all $a$, $\langle ab\rangle$ is a $t$-conjoinable type

(3) $$X \sqcap Y = \begin{cases} X \wedge Y & \text{if } X, Y \in D_t \\ \{\langle Z, X^1 \sqcap Y^1\rangle | \langle Z, X^1\rangle \in X \& \langle Z, Y^1\rangle \in Y\}, & \text{if } X, Y \in D_{\langle a,b\rangle}, \langle a,b\rangle \in TC \end{cases}$$

Intersective conjunction correctly derives when the sentences in (1) above are true: (1a) is true only if it is the case that John is fat and if is the case that John is ugly, (1b) if it is the case that he insulted Mary and if it is the case that he molested Mary, (1c) is true only if every crook showed up at my party and if every prostitute did, too, (1d), finally, is true only if it is the case that John is crook and if it is the case that Mary is a liar.

In the following, I discuss construals of AC that are not straightforwardly compatible with this view. I henceforth call them *non-intersective ACs*, which leaves open whether *and* itself is non-intersective or whether the AC involves underlyingly intersective *and* and the construal that we observe is due to independent mechanisms. Albeit the existence of such cases is well-known (cf. Partee and Rooth (1983), Link (1983, 1984), Hoeksema (1983, 1987), Krifka (1990), Lasersohn (1995), Winter (1996, 2001a,b), Szabolcsi and Haddican (2004), Heycock and Zamparelli (2005)), both the spectrum of data under consideration, as well the conclusions drawn vary across the literature.

[1] When discussing examples, I recur to standard functional notation, (i). Note that being a polymorphous operator allows for two conceptions syntactic conceptions of *and*: either *and* itself does not have a meaning and r AC are interpreted syncategorematically or *and* is a morpheme, i.e. has an underspecified meaning, namely $\lambda X_b.\lambda Y_b.X \sqcap Y$, for $b \in TC$ and is specified only by its immediate syntactic context (the coordinates). An alternative position is to assume that there are numerous homophonous lexical elements *and*. For my immediate purposes, these differences are of no consequence. However, it is important to keep them in mind, as, whenever I talk about "ambiguity of *and*" I could also be talking about different syntactic contexts triggering difference syncategorematic rules.

(i) $$X \sqcap Y = \begin{cases} X \wedge Y & \Longrightarrow \text{if } X, Y \in D_t \\ \lambda Z_a.X(Z) \sqcap Y(Z) & \text{if } X, Y \in D_{\langle a,b\rangle}, \langle a,b\rangle \in TC \end{cases}$$

The case that has probably received most attention (cf. in particular Partee and Rooth (1983), Link (1983, 1984), Hoeksema (1983, 1987), Krifka (1990), Winter (1996, 2001a)) is AC of coordinates that have individuals as their basic denotations (I write "basic denotations", rather than denotations, given the shifts discussed in Partee (1986)). Above, I simply assumed that they denote plurals. My reason for doing so (following Link (1983) and various others) is that they behave like plurals in all relevant respects: Just as standard plural DPs, they trigger plural agreement on $T^0$ and/ or pronouns, (4), and they license so-called *plurality seekers* such as *both, each, all* (cf. Schwarzschild (1996)), (5).

(4) a. The boys are / *is asleep.
b. Joe and Bill are / *is asleep.

(5) a. Both the boys are stupid. The boys are both stupid.
b. Both Joe and Bill are stupid. Joe and Bill are both stupid.

More importantly, they behave like plurals in that they do not consistently behave like universal quantifiers over atoms. They do so with distributive predicates (a fact that was attributed to the lexical specification of the predicate plus cumulation in chapter 2 above), (6a), but they don't with mixed predicates, (6b) or collective predicates (6c). (6b) can be true in a scenario where John and Mary are rather light individually, but that their collective weight is large, so that, collectively, they are considered heavy. (6c), on the other hand, involves a predicate that isn't even defined for atoms

(6) a. John and Mary slept. $\rightarrow$ John slept and Mary slept.
b. John and Mary are heavy. $\nrightarrow$ John is heavy and Mary is heavy.
c. John and Mary met. $\nrightarrow$ John met and Mary met.

Crucially and just like standard plurals, they further do not behave like a universal quantifier over atoms in the context of another plural, (7).

(7) a. John and Peter hit the girls. $\nrightarrow$ John hit the girls and Peter hit the girls.
b. John and Peter hit Sue and Mary. $\nrightarrow$ John hit Sue and John hit Mary and Peter hit Sue and Peter hit Mary.

Obviously, in these simple cases where both coordinates are singulars, intersective conjunction in the AC will yield the same sentence meaning as universal quantification over atoms (more generally, intersective conjunction is, of course, equivalent in result to universal quantification over the conjuncts). This is illustrated for (7b) in (8b), assuming each conjunct has been targeted by Partee's 1986 LIFT before conjunction, (8a).

(8) a. $e \Longrightarrow \langle\langle et\rangle t\rangle$
$\text{LIFT} := \lambda x_e.\lambda P_{\langle et\rangle}.P(x)$
b. $\lambda P_{\langle et\rangle}.P(j') \wedge P(p')(\lambda x_e.(\lambda Q_{\langle et\rangle}.P(s') \wedge P(m')(\lambda y_e.H'(y)(x)))) =$

$$= H'(m')(j') \wedge H'(s')(j') \wedge H'(m')(p') \wedge H'(s')(p')$$

Many (including Link (1983), Hoeksema (1983, 1987)) have taken these facts to suggest that the string *and* corresponds to two semantic objects, which cannot be reduced to each other (Winter (1996, 2001a) represents a notable exception): $\sqcap$ for types $a \in TC$ and $\oplus$ (or similar) for type $e$.

Two points can be raised against this position. On the one hand, Winter (1996, 2001a) points out that if there are two basic meanings for *and*, we should expect that at least some languages distinguish them formally – but this doesn't seem to be the case (cf. Payne (1985), Haspelmath (2007) for some typological aspects of AC). On the other hand, the generalization is insufficient, as it predicts that all cases of AC of type $a \in TC$ should be intersective. This is no the case: non-intersective construals of AC can be found with coordinates of almost any type $a \in TC$ ( cf. Link (1983, 1984), Krifka (1990), Winter (2001b), Heycock and Zamparelli (2005) but cf. also Carlson (1987), Moltmann (1992) Lasersohn (1992, 1995), Gawron and Kehler (2004) and section 3.2 for examples).

Importantly, this also means that if there are two basic meanings for *and* (whatever they may be), the logical type of the coordinates does not suffice to specify the required meaning of *and*. Both Winter (2001a) and Krifka (1990) aim to give an analysis that is not faced with this problem. Winter (2001a,b) argues that there is a uniform meaning for *and* and that this meaning is the intersective one: All cases where the AC does not express what an intersective meaning of *and* would predict it to express, can be reduced to independent mechanisms.[2] Krifka (1990), on the other hand, argues that the uniform meaning of *and* for $e$-conjoinable types – i.e. for expressions that denote individuals or properties (of properties) of individuals is non-intersective and that those cases, where it seems to be intersective, are just special cases of the non-intersective meaning.

Both approaches require us to become more specific on non-intersective ACs. In the following, I go through a number of examples, showing that they cannot straightforwardly be derived by means of intersective conjunction. I then discuss the two approaches mentioned above, arguing that Winter's take, where conjunction is underlyingly intersective, cannot be maintained (at least not in the way that he proposes): It simply doesn't derive the right facts. I then turn to Krifka's approach, showing it fares much better w.r.t. the basic cases.

[2] As I am mainly concerned with non-intersective conjunctions with coordinates of types other than $e$, I do not go through Winter's account for DP-conjunction, which I already addressed briefly in chapter 2. It only has the minor flaw that he eventually needs to introduce cumulation (a distributivity operator), which voids his initial claim that cases like (6a) show that DP-conjunction must be intersective. Winter does not consider extending it to other cases of AC, which could potentially be done (such an extension would involve a generalization of his COLL-operator, and a slightly revised version of what we coordinate) and which would, in effect, be compatible with the basic claims I make in chapter 4. (It might, however, be considered overly complicated, if my claims below are correct.) For some reason,Winter (2001b) choses an entirely different explanation for non-intersective construals of predicate AC and it is this latter explanation that I argue against below.

## 3.2 Non-intersective AC: Examples

In the following, I consider non-intersective ACs in various positions, of various types $a \in TC$. The general rationale is this: Given the intersective meaning for *and*, the schema in (9) represents the expected truth-conditions of sentences with AC, where SC stands for relation, including functional application in either direction and D for the rest of the sentence. Accordingly, if D is a plural or an AC, as in (10), (11), the truth-conditions should be those schematized in (10a), (11a) – where IS is to represent some relation of the appropriate type, possibly simply functional application. (Note that I assume that IS is distributive – or, if it is functional application, that $E, F$ are distributive. If this isn't the case, then we should obtain (9).) However, that's not what we find: In a number of scenarios, the conditions in (10a), (10b) are not fulfilled, yet the sentences are true. What emerges, rather, as the schematized meaning of AC are sentences with the weaker truth-conditions in (10b) and (11b). Those, evidently, are not the ones predicted by intersective AC and are therefore taken here as indicative of the existence of non-intersective AC. For readability, I henceforth refer to the (expected) (10a), (11a) as the *strong schema* and to the (unexpected) (10b), (11b) as the *weak schema*.

(9) D IS E and F.
true iff $\forall X[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\} \rightarrow X$ IS $[\![\text{D}]\!]]$

(10) $\text{D}_{pl}$ IS E and F.

a. EXPECTED: true iff $\forall X \forall y[(X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\}, y \leq [\![\text{D}]\!] \wedge y \in AT) \rightarrow is(X)(y)]$

b. ACTUAL: true iff $\forall X[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\} \rightarrow \exists y[(y \leq [\![\text{D}]\!] \wedge y \in AT) \wedge \rightarrow is(X)(y)]] \wedge$
$\forall y[(y \leq [\![\text{D}]\!] \wedge y \in AT) \rightarrow \exists X[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\} \wedge is(X)(y)]$

(11) D and G is E and F.

a. EXPECTED: true iff $\forall X \forall Y[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\}, Y \in \{[\![\text{D}]\!], [\![\text{G}]\!]\}, \rightarrow (X)(Y)]$

b. ACTUAL: true iff $\forall X[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\} \rightarrow \exists Y[Y \in \{[\![\text{D}]\!], [\![\text{G}]\!]\} \wedge \rightarrow is(X)(Y)]] \wedge$
$\forall Y[Y \in \{[\![\text{D}]\!], [\![\text{G}]\!]\}, \rightarrow \exists X[X \in \{[\![\text{E}]\!], [\![\text{F}]\!]\} \wedge is(X)(Y)]$

The schemata are so general, that they do not make reference to the syntactic scope of *and* – and other scope-bearing elements out-scoping it. This plays no (important) role for the discussion in the subsequent paragraph, but will become more relevant later.

### 3.2.1 Non-intersective ACs of type $a \in TC$

I start with some basic examples with one or more AC with coordinates of type $a, a \in TC$, in our basic extensional system. The sentences in (12) are true in the scenarios given (or rather, the utterances I ascribe to various speakers would be considered true utterances), but the strong schema would predict them to be false.

(12) a. SCENARIO *A party on my street. Half the children are dancing, the others are smoking in the corner. John and I are observing the scene. I say ...*
Just as I thought. The children are dancing and smoking in the street. Brats!

b. *Some street in Knoxville. The shops on on the right side of the street deal drugs, the ones on the left don't sell drugs but child labor and some shops at the far end do both. Walking through the street, I tell my friend Alex ...*
This is a dangerous area. The shops on this street sell drugs and provide cheap human labor.

c. SCENARIO *A French-German dinner party. The guests gather in the living room. Some are having beer, but no wine, the others have wine. The host checks on the guests and, on returning to the kitchen, tells her husband ...*
You don't need to hurry with dinner. The guests are drinking beer and sipping wine in the living room.

The following examples show that the phenomenon is not limited to intransitive predicates, or complex predicates with a plural subject, as in (12).

(13) a. SCENARIO *Young Brodsky wrote 20 poems which weren't ever translated and translated more than 200 by other people. I tell a literature conference ...*
At the beginning of his career, Brodsky wrote and translated several poems.

b. SCENARIO *John hit Sue and Mary (being the silent type, he didn't say anything during the assault) and Peter (having no arms) verbally insulted Katy and Erin. A bystander tells his friend later on ...*
It was appalling. John and Peter hit and insulted these poor girls.

The examples in (14) show that the weak schema is not limited to eventive predicates, furthermore the semantic relation between the predicates has no bearing on the effect: The predicates in (14) denote disjoint properties, but the predicates in (14) don't.

(14) SCENARIO *Two teachers, John and Sue, comparing pictures of their respective classes. In John's class, half of the children are blond, half are brunette. John says ...*
The children in my class are blond and brunette, but the ones in your class all have red hair. That's almost uncanny!

(14) SCENARIO *Two teachers, Bill and Karen, comparing pictures of their respective classes. In Bill's class, two-thirds of the children are fat, and all of the non-fat ones and some of the fat ones are ugly. Bill says to Karen ...*
The children in my class are fat and ugly but the ones in your class are completely normal. That's unfair!

Finally, the weak schema is not only found for sentences where an AC co-occurs with a plural DP, it is also found in sentences with two (or more) ACs and no plural DP.[3]

(15) a. SCENARIO *John made a drunk trip through the US. Various things happened. He got married to a prostitute in Las Vegas, made friends with a local mafia boss in Atlantic city and sold his sister to a drug dealer. I am telling you ...*
He had a hell of trip – Just imagine, in Vegas and in Atlantic city (respectively) he married a hooker and befriended a mobster– and in New York, he even sold his own sister to a drug dealer.

b. SCENARIO *The normal facts of our world. I am telling you ...*
Most cats and most dogs (will) chase mice and start barking (respectively) when left by themselves.

Non-validity of the strong schema is not limited to extensions. It is also found for the objects of intensional predicates and embedded questions.[4] As my proposal in chapter 4 is formulated only for the extensional part of the language (some intensional constructions will be employed, but their intensional parts will be glossed over) I just add these examples for the sake of completeness.[5]

---

[3](i) further illustrates another syntactic variant of the weak schema. However, the NPs here might not be $\langle et \rangle$ predicates, cf. Landman (1989b), Zobel (2010) for discussion).

(i) Als abstinenter Alkoholiker und ehemalige Heroinsüchtige müssen Hans und Maria
As abstinent$_{masc.sg}$ alcoholic$_{masc.sg}$ and former$_{fem.sg}$ heroin-addict$_{fem.sg}$ must Hans and Maria
sehr vorsichtig sein.
very careful be.
'As an abstinent alcoholic and a former heroin addict, Hans and Maria have to be very careful.'

[4]I leave out the discussion of antecedents of conditionals, as they are downward entailing, they introduce further complications into the discussion. I nevertheless think the weak schema can be found, (i).

(i) a. Let me tell you the worst possible scenarios for next year. If Strache wins the election and if Mary starts an affair with Peter, I will leave the country and jump out of a window, respectively.
b. Let me tell you the worst possible scenarios for next year. If Strache wins the election and if Mary starts an affair with Peter, John and I, respectively, will jump out of a window.

[5]Generally, intensions are taken to be functions from possible worlds to extensions, whereas extensions are intensions evaluated w.r.t. a particular world. One possible implementation is to embed the set $W$ of possible worlds into our model (but cf. Zimmermann (2011) for more discussion). All terminal expressions $\alpha$ are then assigned intensions, $\lambda w.X$ *relative to* $w$, which can combine with world variables or constants $w^1$ (objects assigned the semantic category $s$) (cf. Percus (2000)), yielding the extension of $X$ in $w^i$. Sentence intensions (propositions) are functions of type $\langle s,t \rangle$ and Accordingly characterize a set of worlds (the set of those worlds, where the sentence is true). Given that propositions are intensions of sentences and that extensions of sentences are conjoined by means of $\wedge$, conjunction of the intensions of two sentences $S$, $S'$ should clearly be intersective, namely, yielding that function (= proposition) from possible worlds to truth values which maps every world $w$ to 1 just case the extension of $S$ is 1 in $w$ and the extension of $S'$ is 1 in $w$. In other words, the conjunction of any two *propositions*, $p$, $q$ is the set W= p ∩ q, hence the results below are truly unexpected. I rule out that cases that seem to involve conjoined embedded propositions or question underlyingly involve AC of VPs and subsequent ellipsis. It cannot be a *general* strategy, anyway, given the existence for verbs denoted non-upward monotone functions, such as *deny* or *surprise* (cf.Moltmann (1994), Lahiri (2000), Asher (1987)) and it is ruled out as a strategy for the examples in question as we find the same results when topicalizing the object, (i) from German (where topicalization is less marked).

The sentences in (16) are all true in the scenarios given. Accordingly, they exhibit the weak schema for sentences containing plurals and AC with coordinates denoting propositions, (16a), or questions, (16b), (16c). (16d) exhibits the weak schema for a sentence containing a plural DP and the object of the opaque predicate *look for*.[6] (16e), finally, illustrates the weak schema for a sentence with an AC with coordinates denoting propositions and an AC of predicates that take as their arguments.

(16) a. SCENARIO *In 16th century France, the Christians held several conflicting beliefs (conflicting in the sense of doctrine). Some held the classical beliefs of transubstantiation, the trinity and the existence of hell, others refuted transubstantiation while maintaining the rest, while others still refuted transsubstantiation, the concept of the trinity and the existence of hell. A book on that time states ...*
The Christians in France, at that time, believed that the host is the body of Christ, (that) Jesus and God are of one substance, and (that) there is no hell.

---

(i) Das gibt es doch gar nicht, jetzt streiten sich Hans und Maria schon wieder. Dass OJ
I cannot believe it , now fight REFL Hans and Maria PRT again. That OJ
unschuldig ist und (dass er) ins Gefängnis gehört, behaupten sie, und bezichtigen den jeweils
innocent is and that he in-to jail belongs claim they and call the respective
anderen des Wahnsinns.
other lunatic

The predicates I use in the following mostly relations denote between individuals and propositions (such as *believe*, *know* etc., cf. in particular Hintikka (1969)), but predicates such as *look for* have received a number of analyses, amongst them those as relations between individuals and propositions, relations between individuals and quantifier intensions or relations between individuals and property intensions (cf.Zimmermann (1993, 2006) for discussion). Some predicates *necessary, possible* are, arguably, intransitive predicates of propositions (Kratzer (1977, 1981), but cf., Portner (2009), Lassiter (2011)).

Concerning embedded questions, we can distinguish two prominent proposals: On the one hand, Hamblin (1973), Karttunen (1977)), who identify a question extension with a set of propositions (i.e. an embedded question is an object of type $\langle\langle st\rangle t\rangle$, the set of all possible answers (Hamblin) and the set of all answers true in the world of evaluation (w*) (Karttunen) (iia), (iib). On the other hand, Groenendijk and Stokhof (1984b, 1989, 1997), who conceive of question denotations as partitions of logical space (the set of possible worlds), i.e. objects that "cut out" that parts of the logical space that behave alike w.r.t. facts related to in the question, (iic). Accordingly, question extensions are objects of type $\langle st\rangle$. In the following, I employ verbs relating individuals to question extensions *know, surprise* and verbs relating individuals to question intensions, such as *wonder*. The latter are objects of type $\langle s\langle\langle st\rangle t\rangle$ in HK and of type $\langle s\langle st\rangle\rangle$ in GS.

(ii) a. I know *whether John will go to the party.* $= \lambda p.p \in \{\lambda w.P(j)(w), \lambda w.\neg((P)(j))(w)\}$
b. I know *whether John will go to the party.* $= \lambda p.p \in \{\lambda w.P(j)(w), \lambda w.\neg((P)(j))(w)\} \wedge p(w*)$
c. I know *whether John will go to the party.* $= \lambda w.[\lambda w'. [\lambda w''.$ John goes to the party in $w''.(w')$ $= \lambda w''.$ John goes to the party in $w''.(w)]]$

It should be noted that intersective conjunction, as defined above, yields non-sensical results if thought to apply to question denotations in the H & System (cf. Groenendijk and Stokhof (1989) for extensive discussion): it would yield the set of answers that are possible / true answers to both questions. This will yield counterintuitive results (including, in many cases, the empty set), unless, of course. we make the answers sets very large and include all kinds irrelevant examples (including disjunctions).

[6] I think we can also reproduce the weak schema for Karttunen's 1977 *depend on* configurations (i).

(i) Who gets invited to my dinners and (who) doesn't depends on who wins the election and (who) loses it.

Hence, they were a pretty heterogenous group already at this point and the religious wars later in the century really come as no surprise.

b. SCENARIO *Moscow-based agency 1 has all the information about Russia, but none about Chechnya, while Grozny-based agency 2, has all the information Chechnya, but none about Russia. The security advisor tells the president ...*
Our agencies know if Putin will step down and when Kadyrov intends to murder his head of the army.

c. *Sue and John only read part of the literature for the course– Sue read all about Russian literature in the 19th century and John only dedicated himself to his favorite topic – Marinetti. Now, at the exam, they each can answer the questions about their speciality, but not the others. I tell some colleague ...*
Poor Sue and John. They studied for so long and now they sit there, wondering who wrote the futurist cookbook and whether Tolstoi was the author of *War and Peace*.

d. SCENARIO *All my friends have a very special taste in clothing. John went to Parise looking for an arbitrary coat with a pink collar, Mary went to New York looking for an (arbitrary) hat with a fur ribbon. Peter went to Milan to find a Viking armor. I am telling my friend Sue ....*
My friends have an exotic taste in clothing. They just went all over the place to find interesting stuff. They were looking for a coat with pink collar, a hat with fur ribbon and a Viking armor. I don't know whether they were successful. As far as I am aware, such things might not even exist.

e. It seems that Johnson and Evans are going to play an important role in the new government. According to the rumors, it is quite probable and absolutely certain, respectively, that Johnson will be the new defense minster and that Evans will be in charge of the nuclear committee.

In sum, what I aimed to show here is that AC can exhibit the weak schema in a number of contexts, including cases where the coordinates are of (extensional or intensional) types $a \in TC$. This is unexpected in light of the hypothesis that *and* denotes intersective conjunction.

### 3.2.2 AC under determiners

As indicated above, the schemata I gave do not take into account the possibility of other scope-bearing items in the clause. The default hypothesis is that *and* has surface scope.

One particular configuration I want to address – again on behalf of German data – concerns the restrictor of determiners, represented by DET in (17). DET ranges over quantificational determiners, the standard lexical entries of which were given in at the beginning of section 2.5, and the definite determiner, introduced in section 2.1. The negative existential is addressed further down below.

(17) DET [E and F ] IS D.

If AC is uniformly intersective and *and* has surface scope, the expected schema for binary determiners is (18a) and that for unary determiners is (18b). In case the determiners first order representation, this can be reproduced by our standard strong schema as in (19), where $\bullet$ is either $\rightarrow$ or $\wedge$.

(18) a. $[\![\text{DET}]\!]$ $([\![\text{E}]\!] \cap [\![\text{F}]\!])([\![\text{D}]\!])$
b. $[\![\text{DET}]\!]$ $([\![\text{E}]\!] \cap [\![\text{F}]\!])$

(19) a. $[\![\text{DET}_x]\!]$ $[\forall X[X \in \{ [\![\text{E}]\!], [\![\text{F}]\!] \} \rightarrow X(x)] \bullet [\![\text{D}]\!](x)]$
b. $[\![\text{DET}_x]\!]$ $\forall X\{[\![\text{E}]\!], [\![\text{F}]\!] \} \rightarrow X(x)])$

There is exactly one case that meets the prediction: AC under the singular existential. (20), is true just in case I met an individual which is both an actor and member of parliament, it isn't true if I met an actor who is not a member of parliament and a member of parliament who is not an actor and no one else.

(20) Ich habe einen Schauspieler und Nationalrat getroffen.
'I met an actor and member of parliament.'

Despite appearances, intersective AC is not the right analysis for AC under the singular definite determiner singular. The fact that we cannot coordinate disjoint properties, (21a) and that the DP in (21b) must denote a single atomic individual that is both a manager and an owner of the company, might suggest that it is, but it falsely predicts that $d_{sg}$ *P und Q* should be fine if there is more than one salient individual that is P and more than one salient individual that is Q, as long as there is only one salient individual that is both $P$ and $Q$. It seems to me, however, that $d_{sg}$ *P und Q* is licensed in the same scenarios where $d_{sg}$ *P* and $d_{sg}$ *Q* are licensed individually, i.e. there must be exactly one salient individual that is P and one salient individual is Q (and the two must be identical). (22) corroborates this intuition: (22c) is falsely predicted to be equivalent to (22b), however, only the latter is fine if there are several prisoners but only one individual that is both a prisoner and a mime.

(21) a. # Das war so eine tolle Reise, ich durfte sogar den Wal und Hai füttern
??'It was such a great trip, I was even allowed to feed the whale and shark.'
b. Wir haben den Geschäftsführer und Besitzer durch die Firma geführt.
'We showed the person that is both manager and owner around the company.'

(22) SCENARIO: *Upon arriving at the prison that she is supposed to write an essay on, and about which she does not know anything, except that it has 350 inmates, the journalist is told by a guard:*
a. # Außer dem Sträfling gibt es in dieser Anstalt keine Gefahren.
'#Except for the prisoner, there are no dangers in this facility.'

b. Außer dem Sträfling, der als Pantomime auftritt, gibt es in dieser Anstalt keine Gefahren.
'Except for the prisoner who does pantomimes there are no dangers in this facility.'

c. # Außer dem Pantomimen und Sträfling gibt es in dieser Anstalt für psychisch abnorme Straftäter keine Gefahren.
' #Except for the prisoner and mime there are no dangers in this facility.'

We can easily show that for all other determiners, the strong schema – and hence the intersective analysis of AC – is false (as noted by Bergmann (1982), cf. in particular Heycock and Zamparelli (2005)). As the properties in (23) are disjoint, it predicts that the determiner should always apply to the empty set. However, (23d) is true iff I saw some whales and some sharks. (23c) is true iff I fed most whales and most sharks. Further (23a) and (23b) are true if I fed every whale and every shark and not true if there are whales and sharks and I did not feed all of them.[7] This observation extends to AC of other DP-internal material, including

[7] The fact that *die meisten* (most, of which I only consider the majority construal, cf Hackl (2009)) distributes is maybe more straightforward in (i) (which I owe to Daniel Büring, pc). (i) is true only if the majority of Germans and the majority of Austrians love the German team. Accordingly, the sentence isn't true in the actual world, where about 60 million out of 80 million Germans and about 200 Austrians (openly) love the German team. This is the majority of the set consisting of all Germans and all Austrians, but whereas 60 million Germans is the majority of Germans, 200 is not the majority of Austrians.

(i) Die meisten Deutschen und Österreicher lieben die deutsche Nationalmannschaft.
'Most Germans and Austrians love the German team.'

It seems to me that *viele (many)* and *wenige (few)* under their *proportional* (cf. Partee (1989)) reading also fall into the class of distributing determiners (this also extends to the data discussed in section 2.5. In the proportional reading, a sentence *viele / wenige N sind P (= many N are P)* can be paraphrased as 'a large/ small proportion of the totality of N is P.' Under the proportional reading the determiner seems to distribute – in order for (iia) to be true, a large proportion of Germans and a large proportion of Austrians must be protestants: it is false in the actual world, because even though a rather large proportion of Germans is protestant, only 3 % of the Austrian population are. The fact that the overall number of protestants in Germany and Austria is large does not matter for this judgement. Analogously for (iib), which, in order to be true, requires that only a small proportion of Germans and a small proportion of Austrians are protestants. However, given the question whether the proportional construal should really have the status of a reading (cf. Solt (2009)) I omit the discussion of these data above, in order to prevent the discussion from becoming unnecessarily complicated.

(ii) a. Viele Deutsche und Österreicher sind Protestanten.
many Germans and Austrians are protestants
'Many Germans and Austrians are protestants.'

b. Wenige Deutsche und Österreicher sind Protestanten.
'Few Germans and Austrians are protestants.'

Finally, as opposed to Winter, Winter's 1995, 1998 claims for English, I believe that NP-conjunction under the singular universal does not have an intersective reading (alongside others). The discourse in (iii) (after Winter's 1998(9)) sounds contradictory.

(iii) Jeder Linguist und Philosoph kennt das Gödel-theorem. # Hans kennt es nicht, aber er ist ja auch nur Linguist.
'Every linguist and philosopher knows the Gödel-theorem.' Hans doesn't, but then, he's only a linguist.

adjectives, relative clauses, and PPs.[8]

(23) a. Ich habe jeden Wal und Hai in diesem Meer gefüttert!
‘ I fed every whale and shark in this ocean!’
b. Ich habe alle Wale und Haie gefüttert!
‘ I fed all whales and sharks!’
c. Ich habe die meisten Wale und Haie in diesem Meer gefüttert!
‘I fed most whales and sharks in this ocean!’
d. Auf dieser Schiffsreise habe ich einige Wale und Haie gesehen.
‘ On this cruise I saw einige whales and sharks.’

The set of determiners in (23) is, of course, the set of distributing determiners that we already encountered in section 2.5. And, in analogy to my first attempt to come to terms with them when embedding plurals (which involved wide-scope distribution of the plural), we could argue that the data just presented *are* indeed compatible with AC being intersective – and that rather than scope at NP-level, conjunction has scope at the DP-level (this is basically suggested by Partee and Rooth (1983), Dowty (1988) and Winter (1995, 1998)).[9] Accordingly, we obtain the strong schema in (24)– which is compatible with the data above.

(24) $\forall X[X \in \{ [\![\mathrm{E}]\!], [\![\mathrm{F}]\!] \} \rightarrow [\![\textsc{det}]\!](\mathrm{X})([\![\mathrm{D}]\!]) \wedge [\![\textsc{det}]\!](\mathrm{X})([\![\mathrm{D}]\!])$

Just as my first attempt to come terms with distributing determiners in the case of embed-

[8](ia) is true iff I know every Turkish delegate and every Syrian delegated and not true, for instance, if there is a Turkish delegated that I don't know. Analogously for (ib) (adapted from Winter (1995)) and (ic). I here use the complement the universal l for illustration, similar observations can be made for material inside the complements of all the determiners in (22).

(i) a. Ich kenne jeden türkischen und syrischen Abgeordneten.
‘I know every Turkish and Syrian delegate.’
b. Ich kenne jeden Abgeordneten der über 60 und (der) unter 20 Jahre alt ist.
‘I know every delegate who is over 60 years old and (who is) under 20 years old.’
c. Ich kenne jeden Abgeordneten aus Hamburg und aus Duisburg.
‘I know every delegate from Hamburg and from Duisburg.’

[9](Partee and Rooth 1983:(35)(36)) (with reference to Cooper (1979)) and Dowty (1988) propose that the following type-shift $N$ applies to the each conjunct, which takes the NP as its first argument and yields an expression of type $\langle\langle\langle et\rangle\langle\langle et\rangle t\rangle\rangle t\rangle$, which then applies to the determiner, yielding coordinates of type $\langle\langle et\rangle t$ which are subsequently conjoined. This can be rephrased as in (ii) so as to apply to the definite determiner, the result of application to the determiner would then have to be shifted to type $\langle\langle et\rangle t\rangle$ *qua* LIFT, which can be a problem if we are dealing with plurals. We could give an analogous shift for the definite determiner, (ii), the result of the function applying to the NP and the determiner, however, would have to undergo LIFT again before conjunction, which might become a problem if where are dealing with a plurality (cf. Winter (2001a) for more discussion). This problem is ignored below.

(i) $\langle et\rangle \rightarrow \langle\langle\langle et\rangle\langle\langle et\rangle t\rangle\rangle t\rangle$
$N = \lambda P_{\langle et\rangle}.\lambda \mathcal{P}_{\langle\langle et\rangle\langle\langle et\rangle t\rangle\rangle}.\mathcal{P}(P)$

(ii) $\langle et\rangle \rightarrow \langle\langle\langle et\rangle e\rangle e\rangle$
$N' = \lambda P_{\langle et\rangle}.\lambda \mathcal{P}_{\langle\langle et\rangle e\rangle}.\mathcal{P}(P)$

ded plurals, however, this cannot be a general strategy – which, in this case, means that intersective AC is not uniformly the type of AC under determiners. Once we consider non-distributing determiners, such as numeral and cardinal determiners, we find that that neither narrow-scope nor wide-scope intersective conjunction derives the right result. (25a) is true iff the total number of children crying is 5, (25b) is true iff the total number of children crying is large, no matter whether the number of crying boys or the number of cyring girls is large.

(25) a. Genau fünf Buben und Mädchen haben geweint.
Exactly five boys and girls were crying.
b. Viele Buben und Mädchen haben geweint.
Many boys and girls were crying.

But the problem for the intersective analysis does not stop here. Recall that section 2.5 also brought to light what I termed the external problem, which again surfaces in the configurations presently under consideration. In particular, we find that the strong schema does not even apply in cases where AC is embedded under a distributing determiner. To see this point, consider first AC under the plural definite determiner. We can conjoin disjoint properties in (26), which rules out intersective narrow scope disjunction. However, (26) cannot involve intersective wide scope conjunction, either – because (26) clearly has a cumulative construal, where the boys, *among them* fed all the salient sharks and whales. I.e. it suffices if each boy fed a whale *or* a shark, as long as all whales and sharks were fed.

(26) Die Buben haben die Wale und Haie gefüttert.
'The boys the whales and sharks.'

Crucially, and in analogy to the observations in section 2.5, we also find cumulative construals for all distributing and all non-distributing determiners. For the sake of brevity, I state I only give the two examples in (27). Both convey that Hans, Maria and Karl, among them, shot all the animals in this forest that were either bird or a beaver.

(27) a. Hans, Maria und Karl haben alle Vögel und Biber in diesem Wald abgeschossen.
'Hans, Maria and Karl shot all birds and beavers in the forest.'
b. Hans, Maria und Karl haben jeden Vogel und Biber in diesem Wald abgeschossen.
'Hans, Maria and Karl shot every bird and beaver in the forest.'

Note that as opposed to the cases listed in the previous paragraph, the examples addressed above (except for those in (27)) involve a non-intersective construal of AC in the *absence* of a plural or another AC – and further, that I have not employed the weak schema in order to describe the non-intersective construal. One might do so, of course, by assuming that the determiner introduces a plural variable or actually – re-introducing the determiners-as-predicates view from above– denotes a property of a plural individual. In this case, we can employ the weak schema, as above.

(28) $\exists x_e[( [\![\text{DET}]\!](x) \wedge \forall X[X \in \{ [\![\text{E}]\!], [\![\text{F}]\!] \} \rightarrow \exists y[y \leq_{AT} x \wedge X(y)]] \wedge$
$\forall y[(y \leq_{AT} x \rightarrow \exists X[X \in \{ [\![\text{E}]\!], [\![\text{F}]\!] \} \wedge X(y)]]) \wedge [\![\text{D}]\!](\text{x}) ]$

However, the problems with introducing this schema are exactly the same ones I already addressed in section 2.5, where I discussed plurals embedded under DPs headed by quantificational determiners. We have no *prima facie* account for why a determiner distributes and, again, we run into a serious problem with negation. (29a) behaves as expected: It is true iff no individual was arrested that is both a murderer and a rapist and accordingly will be true if a rapist, who is not a murderer was arrested, but noone else. The plural negative existential – a plural existential in the scope of sentential negation – is again the problem: (29b) is true iff no murdered was arrested and no rapist was arrested. The weak schema, as in (28), predicts it to be true, contrary to fact, if a murderer was arrested but no rapist.

(29) a. Sie haben keinen Mörder und Vergewaltiger festgenommen.
'They arrested no murdered and rapist.'
b. Sie haben keine Mörder und Vergewaltiger festgenommen.
'They arrested no murderers and rapists.'

In sum, what I showed here is that there is only a single case where AC under determiners behaves as predicted by the intersective analysis of AC. I showed that changing the scope of conjunction seems to save the intersective hypothesis in those cases where the AC is embedded under a distributing determiner, at first sight, however, it does not extend to non-distributing determiners and further cannot cope with fact that quantificational DPs with embedded ACs can partake in cumulative construals of relations. The weak schema, the application of which I only sketched, seems better suited at first sight, but I pointed out that it is met with the same problems already observed in section 2.5 above.

### 3.2.3 Interim summary

This section aimed to show that the intersective analysis of *and* makes the wrong predictions concerning the truth-conditions of sentences containing AC. I first listed a number of sentences that did not correspond to the strong schema (my rendering of the intersective analysis) but were more properly captured by the weak schema.

Two questions arise on behalf of this first point. On the one hand, albeit I have shown that the strong schema isn't appropriate in a number of cases, I have not given any arguments that the weak schema is. One could argue that the weak schema (despite of its name) is still too strong. However, it is not. Take the two sentences in (30). (30a) is true just in case John or Bill hit Sue and John or Bill hit Mary and John hit Mary or Sue and Bill hit Mary and Sue. (30b) is true just in case John or Bill were smoking and John or Bill were dancing and John was smoking and Bill was smoking. However, (30a) is *not* true if, all else being equal, Mary wasn't hit by anybody. Likewise, (30b) is *not* true if, all else being equal, neither John nor Bill were smoking.[10]

(30) a. Horrible party! John and Bill hit Sue and Mary.
b. Excellent party! John and Bill were dancing and smoking.

On the other hand, I only gave examples where the sentence contained an AC and a plural or an AC and another AC. Do we ever find the weak schema in structures where there is no plural or additional AC (exempting AC under determiners)?[11] (31) gives an example that suggests we do. For the moment, however, I exempt such cases from the discussion in order to avoid unnecessary complications. I return to them in chapter 5 below.

(31) The flag is green and white. (Krifka 1990:(13))

The second observation made above is that determiners, considered as an embedding context, again represent a special case. At first sight, AC embedded under determiners fit into the general picture: They corroborate the main claim that AC is not intersective. However, we still find that if an AC is embedded under a determiner, we cannot consistently form the weak schema across this determiner. The determiners that disallow it are again the same non-distributing determiners already identified in section 2.5 above. In other words, AC exhibit the same behavior as standard plurals in this respect.

In the following, I discuss how the weak schema for AC can be derived, ignoring the additional complication arising in the context of embedding determiners. The first possibility is that we maintain that *and* is intersective but find independent factors that can be made responsible for the observation that the sentences discussed above cannot be captured by the strong schema.

## 3.3 Maintaining an intersective meaning for *and*

We have established that (at least) in the context of plurals and other ACs (of any type), the truth-conditions of sentences involving ACs correspond to the weak schema in (32b) and (33b) rather than the strong schema derived by the intersective meaning of *and* in (32a) and (33a). I here investigate the possibility that the intersective meaning of *and* can still be maintained in light of these findings. This goal can be achieved if we find an independent mechanism that weakens the strong schema to the weak schema. Importantly, it must derive (32b) /(33b), rather than a random schema which just happens to be weaker than (32a)/(33a). A mechanism that applies to (32a) and can yield (34) would be useless.[12]

[10] Given the possibility of imprecision in plural sentences addressed in chapter 2, I should weaken the claim concerning (30a) in the sense that it isn't *precisely true* if Mary wasn't hit by anybody. However, given that imprecision is hardly ever found for cases where the atoms are made explicit, this relativization will hardly ever come to matter.

[11] I exclude collective nouns from the discussion.

[12] The proposal that Krifka (1990) ends up making– not the one I discuss below, but the one he *actually* makes – is a mechanism of the latter type.

(32) $D_{pl}$ IS E and F.

a. EXPECTED: true iff $\forall X \forall y[(X \in \{[\![E]\!], [\![F]\!]\}, y \leq [\![D]\!] \wedge y \in AT) \rightarrow is(X)(y)]$

b. ACTUAL: true iff $\forall X[X \in \{[\![E]\!], [\![F]\!]\} \rightarrow \exists y[(y \leq [\![D]\!] \wedge y \in AT) \wedge \rightarrow is(X)(y)]] \wedge$ $\forall y[(y \leq [\![D]\!] \wedge y \in AT) \rightarrow \exists X[X \in \{[\![E]\!], [\![F]\!]\} \wedge is(X)(y)]$

(33) D and G is E and F.

a. EXPECTED: true iff $\forall X \forall Y[X \in \{[\![E]\!], [\![F]\!]\}, Y \in \{[\![D]\!], [\![G]\!]\}, \rightarrow (X)(Y)]$

b. ACTUAL: true iff $\forall X[X \in \{[\![E]\!], [\![F]\!]\} \rightarrow \exists Y[Y \in \{[\![D]\!], [\![G]\!]\} \wedge \rightarrow is(X)(Y)]] \wedge$ $\forall Y[Y \in \{[\![D]\!], [\![G]\!]\}, \rightarrow \exists X[X \in \{[\![E]\!], [\![F]\!]\} \wedge is(X)(Y)]$

(34) $\forall y[(y \leq [\![D]\!] \wedge y \in AT) \rightarrow \exists X[X \in \{[\![E]\!], [\![F]\!]\} \wedge is(X)(y)]$

The two independent "mechanisms" I consider here (using quotation marks, because their internal make-up remains partially unspecified) are both independent properties of plural predication (or so it has been argued). Since both derive the non-intersective construal of ACs from a property of plural predication, they have the potential to derive the weakening from (32a) to (32b), but cannot derive that from (33a) to (33b). Hence, the weak truth-conditions of some of the examples discussed above, as well as the weak truth-conditions of the sentences in (35) will remain unaccounted for.

(35) a. On wednesdays and on fridays, John goes fishing and stays at home, respectively. (adapted from McCawley (1988))

b. Well, what a productive morning. Right before and right after breakfast I tortured my latest victim and wrote a novella. I kind of have to keep these things apart – and a hearty breakfast really clears my mind.

The first hypothesis, a variant of which is proposed by Malamud (2012), is that the weakening can be reduced to imprecision. Imprecision, as introduced in section 2.4 above, referred to the phenomenon that a plural sentence can be true even if not all of the atomic parts of the the plurality have the property expressed by the (distributive) predicate. The basic idea is that for a structure as in (36), we observe imprecision for both predicates $E$ and $F$, so that neither property denoted by the individual conjuncts has to hold of all atomic parts of the plurality denoted by $D$.

(36) $D_{pl}$ is E and F

The second hypothesis, put forth by Winter (2001b), is that the symptom of weakening in AC is similar to what we find in reciprocal constructions and that there is a particular mechanism which derives the latter which can be extended to the former. Let me clarify: A number of authors (cf. Fiengo and Lasnik (1973), Langendoen (1978), Dalrymple et al. (1994, 1998) a.o.) have pointed to the fact that sentences containing reciprocals show a great variation concerning their truth-conditions. I mention only two cases that are relevant to Winter's and my purposes: (37a) has been argued to exhibit *strong* reciprocity – in order for the sentence to be true, each boy in the room as to hate every other boy, while cases like (37b) have been taken to involve *weak* reciprocity –the sentence will be true, as long as every boy in the room danced with some other boy. It has further been argued (in particular by Dalrymple et al. (1998)) that the semantic feature that determines which truth-conditions we find is the lexical meaning of the predicate, or, more precisely, our world knowledge in combination with the predicate meaning. Thus, we know that it is possible to hate more than one person at a time, but most of us will consider it impossible – or, at least, untypical – to slow-dance with more than one person at a time.

(37) a. The boys in this room hate each other.
b. The boys in this room are slow-dancing with each other.

Obviously, strong and weak reciprocity correspond to our strong and weak schema above (cf. in particular Langendoen (1978), Scha (1981), Sternefeld (1998)). Taking this parallel as his point of departure, Winter argues that we start off with the strong schema in both reciprocals and AC, but, if our world knowledge in combination with the meaning of the predicate(s) tells us that the strong schema bears no chance of being true in our world, we apply pragmatic weakening, which will yield the weak schema.

In the following, I argue that neither hypothesis derives the correct results and that therefore non-intersective ACs cannot derived while maintaining that *and* is intersective.

## 3.3.1 Deriving non-intersective AC by means of imprecision

In section 2.4 , I illustrated imprecision on behalf of such as sentences (38): (38a) can be true if not all windows are open, (38b) can be true if not all of my children are fat.[13]

[13] I here follow Brisson (1998, 2000), Malamud (2006, 2012) and Križ and Schmitt (2012a) in assuming that the examples are *true* in the scenarios given – and the same extends to the cases of AC discussed below. In Križ and Schmitt (2012a) we argue that imprecision cannot be reduced to *pragmatic slack* or *loose talk* in Lauer's 2011 conception. There, these terms are to refer to the phenomenon that we utter sentences that are not strictly speaking true and that such sentences are also deemed acceptable.

I also rule out that non-intersective AC in general can be reduced to this. Lauer's basic idea is that we employ pragmatic slack if the alternative (true) utterance is more costly (which, essentially, boils down to being longer) and if the danger of being caught committed to something false is relative low (i.e. if the the difference between the loose and the precise assertion does not matter for the purposes of the conversation. Lauer further argues that a symptom of the use of pragmatic slack is that speaker will have to retract if the assertion is under discussion, as illustrated in (i). If the hearer is unlikely to know a lot about Austria or to be interested in its geographic details, a speaker might use slack, rather than being threatened with going through a lengthy explanation of what and where Pitten actually is. However, if her assertion becomes the subject of discussion, as in (i), she will have to retract.

(i) *A*: I grew up in Vienna
*B*: Really? How very interesting!
*A*: # In Pitten.
*A*: Well, actually I did not grow up in Vienna, but in Pitten, which is kind of close.

Now, we could argue that (iia) is an instance of pragmatic slack – the precise assertion in (iiia) is more costly, because it is longer. However, not all cases of non-intersective AC could be a such a *motivated* use of pragmatic slack: (iib) isn't any shorter than (iiib). Further, if an assertion involving non-intersective AC becomes the subject of discussion, the speaker will not have to retract, (iv), hence non-intersective

(38) a. We have to go back. The windows are open.
b. I'm desperate. My children are really fat.

It can easily be shown that if we assume that conjunction has surface scope, imprecision won't be of much help. The predicates in (39a) are disjoint and will therefore have an empty intersection, i.e. there are no individuals of which the complex predicate in (41b) holds.

(39) a. The children in my class are blond and brunette, but the ones in your class all have red hair. Strange.
b. $\lambda x$.blond'($x$)$\wedge$ brunette'($x$).

But even if the predicates are not disjoint, and conjunction has surface scope, the parallel to imprecision is not evident: (40) can be true in a scenario where not all of the children are smoking, as long as some of the children are smoking. It is false if no child is smoking. Now consider (41a). The sentence is true, for instance, in a scenario where half of the children are dancing, the other half is smoking and no child is both smoking and dancing. Accordingly, no child will have the property denoted by the AC.

(40) The children are smoking in the street.

(41) a. The children are dancing and smoking in the street.
b. $\lambda x$.blond'($x$)$\wedge$ brunette($x$).

Accordingly reducing non-intersective AC to intersective *and* and imprecision makes sense only if we assume that (42) is the underlying representation for (41a).[14] We then assume that each predication involves imprecision– i.e. what is going on in (38a) and (38b) is also going on, separately, in each conjunct in (42)– i.e. not all children have to be dancing for the sentence for the first conjunct to be true and not all children have to be smoking for the second conjunct to be true, accordingly, not all of the children have to be smoking and not all of the children have to be dancing for the sentence to be true – albeit *and* is standard

AC does not exhibit the *symptoms* of pragmatic slack.

(ii) a. The children are dancing and smoking.
b. Some children are dancing and some children are smoking (and some are dancing and smoking).

(iii) a. What a great party. John and Peter are smoking and dancing. Sue is crying. ...
b. What a great party. John is smoking and Peter is dancing. Sue is crying. ...

(iv) *A*: The children are dancing and smoking in the street.
*B*: Really? All of them? How very interesting!
*A*: Yes! The boys are smoking, Sue and Mary are dancing and Erin – you know her– is dancing and smoking at the same time!

[14]Note: (42) is equivalent to the representation we would obtain in an adaptation of Krifka's 1996 implementation of his partial predication, where predicates such as *dance* basically have the denotations $\lambda x.\exists y[y \leq x \wedge *D(y)]$. Accordingly, the conjunction would look like $\lambda x.\exists y[y \leq x \wedge *D(y)] \wedge \exists z[z \leq x \wedge *S(y)$. The problems I discuss below extend to his proposal, for other problems with his approach cf. Gajewski (2005).

intersective *and*.

(42) The children are dancing in the street and the children are smoking in the street.

Even on this very general level, there are a number of arguments against this hypothesis, all of which are based on the fact that imprecision in standard plural predication as in (38a) and (38b) is symptomatically distinct from non-intersective AC.

First, we do not tend to find imprecision in standard plural predication if the plural in an AC (cf. Brisson (1998)). It is very hard or even impossible to find a context where and utterance of (43a) is considered truthful and appropriate in a scenario where only John and Peter were smoking. However, in order to derive non-intersective AC from imprecision, we need to say that sentences with conjoined singular DPs can be imprecise – after all, (43b) can be true in a scenario where John and Peter are smoking and Jane is dancing. In fact, (43b) is now predicted to be equivalent to (43c), but while (43b) is true in the scenario given, (43c) isn't – at least there is no context that I can think of where it would be.

(43) a. It was a great party. John, Peter and Jane were smoking.
b. It was a great party. John, Peter and Jane were smoking and dancing.
c. It was a great party. John, Peter and Jane were smoking and they were dancing.

Second, imprecision tends to vanish with *all* (cf. Brisson (1998), but cf. Križ and Schmitt (2012a) for a more nuanced claim). It is hard to find a context where (44a) is true if not all of the children in my class are blond. However, (44b) retains its non-intersective construal, despite the presence of *all* – there cannot be any children that are neither blond nor brunette, but the sentence from being true and its utterance being appropriate in scenario where half the children in my class are blond and the other half is brunette. The alleged underlying sentence in (44c) quite obviously cannot be true in such a scenario – in fact, (44c) seems contradictory.

(44) a. The children in my class are all blond. The ones in your class all have red hair.
b. The children in my class are all blond and brunette. The ones in your class all have red hair.
c. The children in my class are all blond and the children in your class are all brunette.

Third, non-intersective AC do not have the same status as sentences involving imprecisions. As noted in section 2.6 above, based on discussion in Križ and Schmitt (2012a), plural sentences can be true if there are exceptions, but when we want to make these exceptions explicit, we must employ certain formal devices, such as the adverb *of course*. The sentence in (45) can be true in a scenario where Johnny isn't smoking, but once we want to make this explicit, we can do so by (45b) but not by (45a).

(45) Ah, I love my children, Johnny, Beth, Sue, Marc and Edward. I wonder what they are up to now. Ah, look at that – they are smoking in the street . . .

a. # (Fortunately) Johnny isn't, he has TB.
b. Of course, Johnny isn't, he has TB.

Now consider (46) in a scenario where Johnny is dancing but not smoking, Sue and Marc are smoking but not dancing and Beth and Edward are both smoking and dancing. According to what I sketched below, this should be case of imprecision, so that *Johnny* is an exception w.r.t. *smoke* and *Marc* and *Sue* are exceptions w.r.t. *dance*. However, there is no problem in making this explicit without any additional formal devices – as in any of the continuations in (46a)–(46c). If, however, we change the scenario so that, everything else being equal, Johnny neither smokes nor dances, we are back with the old pattern – we must use (46e) rather than (46d) to make this explicit. The examples in (47) make the same point.

(46) Ah, I love my children, Johnny, Beth, Sue, Marc and Edward. I wonder what they are up to now. Ah, look at that – they are smoking and dancing in the street . . .

a. (Fortunately) Johnny is dancing and not smoking, he has TB.
b. Johnny is dancing, Marc and Sue are smoking and Edward and Beth, these crazy bastards, are doing both.
c. Johnny is dancing. He doesn't smoke. Marc and Sue are smoking. They don't dance. But Edward and Beth, these crazy bastards, are doing both.
d. # Johnny isn't, he has TB and polio.
e. Of course, Johnny isn't, he has TB and polio.

(47) a. You don't need to hurry with dinner. The guests are drinking beer and sipping wine in the living room. The German brutes are happy with their Licher Pils and the French snobs are focussing on the Bordeaux.
b. You're lucky – the children in your class are perfect! Look at my class– the children are fat and ugly. Some of the ugly ones are even anorexic, which makes them look even worse. At least most of the fat ones are kind of pretty. Otherwise, I really couldn't bear it.

In other words, sentences with non-intersective AC do not exhibit the hallmarks of imprecision – and in this respect, they are similar to sentences with two or more plurals. These have weak truth-conditions, but we would not attribute this to imprecision – chapter 2 showed that we find them with plurals that are ACs of proper names and that "exceptions" can be made explicit without any additional formal devices. Further, the weak truth-conditions persist with *all* in (48), the only visible impact is that all boys must be involved in the hitting.[15]

(48) The boys all hit the girls.

[15] An analogous point can be made regarding *respectively* and for cases where the plural involves a precise numeral ("precise numeral" in these sense of Krifka (2002, 2007).

A final point concerns locality and directly relates to the assumption that conjunction cannot be interpreted in its surface position. I doubt that (42) can be derived by standard syntactic means – sentential coordination and subsequent gapping – given that the VP, in German, can be topicalize, (49), while the sentence retains the weak truth-conditions.[16]

(50) Getanzt und geraucht haben die Kinder.
Danced and smoked have the children.
'The children danced and smoked.'

I conclude that the weak schema cannot be explained by an analysis in which *and* is intersective and weakness comes in through imprecision. We cannot really give a sensible account of how the input structure should be derived and, more crucially, the phenomenon of non-intersective AC and the phenomenon of imprecision in plural predication are symptomatically distinct.

### 3.3.2 Winter's 2001b pragmatic weakening

Winter's 2001b point of departure is the interpretation of reciprocal structures. As already mentioned above, Fiengo and Lasnik (1973), Langendoen (1978) and, in particular Dalrymple et al. (1994, 1998) argue that sentences with reciprocals can have more than one meaning. Here, I concentrate only on Langendoen's strong reciprocity, illustrated by (51a) and his weak reciprocity, illustrated by (51b) (Dalrymple et al. (1994, 1998) come up with 6 different meanings (but cf. Beck (2001)).[18]

[16]Malamud (2012) opts for a different and rather complicated mechanism with two operators: Simplifying, one operator, REL takes the subject and the predicate as arguments and evaluates them w.r.t. relevance for the QUD, returning the plurality that is most relevant (see my brief sketch in section 2.6). It does so for each predicate in isolation, i.e. it yields one of more pluraliities $u^1 \ldots u^n \leq$⟦the children⟧ that are most relevant for the QUD w.r.t. *dance* and one or more pluralities $u^1 \ldots u^n \leq$⟦the children⟧ that are most relevant for the QUD w.r.t. *smoke*. Another operator, $O_{rel}$, takes these pluralities and combines them, pointwise, with the correct predicates, i.e. i.e. it combines them, pointwise, with the correct predicates, [17] so that we obtain a set of propositions S= $\{D'(u^1) \wedge S'(v^1), D'(u^2) \wedge S'(v^1), \ldots, D'(u^n) \wedge S'(v^b)\}$, from which an existential operator will pick an element. I think there are a number of inherent problems with this view – in particular, the complex sentence eventually picked by the operator is never evaluated w.r.t. its relevance for the QUD. However (apart from being completely non-compositional) the mechanism also suffers from the weakness that in Malamud's actual proposal it is much to restricted: $O_{rel}$ and REL need to somehow keep track of which plurality is identified with which predicate, and this is done by indexed $\theta$-roles (see (Winter 2001a:42ff) for general problems of such a view). Hence, in all cases, where the plural is not $\theta$-marked argument of the predicate, as in (49)– where the children can want different things (as well as in all the sentences I discuss under the heading *projection* in section 3.4, the mechanism should not apply). We could drop the assumption that co-indexing is done by $\theta$-relations, of course, but then we need something to replace it, i.e. something which tells us what exactly the arguments of REL and $O_{rel}$ are.

(49) These perverse children each have their secret, dark dreams about Mary. They want her to marry the priest, enter a convent, buy a cat and work as a prostitute.

[18]They list strong reciprocity ((51a) above), intermediate reciprocity ((ia), adapted from their (4)), one-way weak reciprocity ((ib), adapted from their (6), where not every member of the collection has to be stared at), intermediate alternative reciprocity (as in *Countless stones are arranged on top of each other* (their (47)), inclusive alternative ordering (as in *The inmates slept on boards stacked atop of each other* (adapted

(51) a. John, Mary, Sue and Bill hate each other. $\leftrightarrow$
$\forall x[x \leq_{AT} j' \oplus m' \oplus s' \oplus b' \rightarrow \forall y[y \leq_{AT} j' \oplus m' \oplus s' \oplus b' \wedge y \neq x \rightarrow H'(y)(x)]$

b. John, Mary, Sue and Bill are holding each other by the hand. $\leftrightarrow$
$\forall x[x \leq_{AT} j' \oplus m' \oplus s' \oplus b' \rightarrow \exists y[y \leq_{AT} j' \oplus m' \oplus s' \oplus b' \wedge y \neq x \wedge H'.H'.(y)(x)] \wedge$
$\forall y[[y \leq_{AT} j' \oplus m' \oplus s' \oplus b' \rightarrow \exists x[x \leq_{AT} j' \oplus m' \oplus s' \oplus b' \wedge y \neq x \wedge H.H.(y)(x)]$

Winter argues that these cases are parallel to AC descriptively: In both cases, there is a strong and a weak schema. He further argues that both cases should be derived in the same manner, taking the strong schema as basic and deriving the weak one from it.

He does so by positing an alternative formulation of the *strongest meaning hypothesis* (*SHM*). The original SHM, posited by Dalrymple et al. (1994, 1998) and given in (52), is a descriptive principle which aims to explain the distribution of strong / weak (and the other) truth-conditions of reciprocal sentences and, importantly, the fact that while reciprocal sentences *as a class* can have many different meanings, each token, i.e. each individual sentence containing a reciprocal will not be perceived as ambiguous.[19] Dalrymple et al. (1994, 1998) start off with the assumption that the reciprocal is underspecified and, when specified, can have six different meanings, represented here simply by $\mathcal{U}^1, \ldots, \mathcal{U}^6$ (corresponding to the six different meanings they observe for the class of reciprocal sentences). These meanings induce a partial ordering by implication (i.e. logical strength) on the set of propositions $\{\phi[X] | X \in \mathcal{U}^1, \ldots, \mathcal{U}^6\}$. At the core of the original SHM lies the observation that strong reciprocity is blocked whenever our lexical knowledge about the relation, represented by $I$ in (52) below– a combination, it seems, of knowledge of the intension of a predicate, situations which are typically described by use of that predicate and the make-up of objects in the extension of that predicate, here taken to be encoded by meaning postulates (as in Winter (2001b))– cannot possibly be met in our world. For instance, our lexical knowledge about

from their (54)), where pairs of boards are stacked up) and strong alternative reciprocity (for which no real examples are given). Weak reciprocity is not an actual meaning of reciprocal sentences in their system, but identified with inclusive alternative ordering with symmetrical predicates (as in (51b)). As their typology does not matter for my purposes (and is also subject to substantive criticism in Beck (2001)), I use 'weak reciprocity' to refer to one of the possible meanings of such sentences. Intuitions about strong and weak reciprocity might not entirely clear, because various factors (such as imprecision and contextual partitioning (cf. Fiengo and Lasnik (1973), Schwarzschild (1996), Beck (2001)) can intervene. Beck (2001) argues that the differences between strong and weak reciprocity can be shown by the following contrast: $B$ can straightforwardly contradict $A$'s utterance of (51a) by (iia), but cannot contradict $A$'s utterance of (51b) by (the analogous) (iib). I am not so sure about these data, a "well"-answer seems to be preferable to a no-answer. See also below.

(i) a. John, Mary, Sue and Bill sat alongside each other.
b. John, Mary, Sue and Bill were staring at each other.

(ii) a. $B$: No, that's not true. John hates Sue and Jack, but he certainly doesn't hate Mary! He just dedicated a poem to her.
b. $B$: # No, that's not true. John is holding Sue's hand and Jack's hand, but he isn't holding Mary's!

[19] On the question of whether we actually expect ambiguity and how we would be able to test for ambiguity, cf. Meyer and Sauerland (2009).

*hate* in (51a) tells us that hating several people simultaneously is certainly not a problem, hence $I$ does not stand in the way of a strong reciprocal construal for (51a). In order to make (51b) true under a strong reciprocal reading, however, every individual in the collection would have to hold the hand of every other individual. Our lexical knowledge tells us that generally speaking, humans can hold hands with at most two other humans simultaneously. Accordingly, the sentence, under a strong reading for the reciprocal, would always have to be false.[20] An analogous point is made relating to the other potential meanings of reciprocal sentences.[21] The SHM in (52) now states that for any sentence $S$ containing a reciprocal, we chose that meaning for the reciprocal which, when inserted into $[\![S]\!]$, will yield the strongest meaning compatible with $I$ – i.e. the strongest meaning – relative to the other meanings we could have derived by choosing a different meaning for the reciprocal – such that the sentence stands a chance of being true.[22]

[20] There is some question as to what features should be considered part of lexical knowledge about a relation. I think that some of the information must also have to do with the type of arguments the relation usually applies to and that this must be part of the lexical knowledge no matter what the actual arguments are that the relation applies to. To see what I mean, consider *hold hands* or *hold by the hand*. The arguments of this relation are, typically, phrases denoting human beings, (ia), but I guess as soon as we say of some other being that it has "hands", the relation can also be applied to it, (ib) (I refrain from a discussion of the relation to $\theta$-roles, as I am considering complex phrases here). Yet, I think the lexical knowledge about this relation must make reference to properties of its typical argument, somehow. Otherwise, it would seem that (iib), as opposed to (iia), should have a strong reciprocal reading only, according to the *SHM* (which it does not seem to have).

(i) a. How sweet! John is holding Mary by the hand.
b. How sweet! The giant cat is holding the horrible monster by the hand.

(ii) a. The ten boys are holding each other by the hand.
b. The nine spiders / eleven ten-armed monsters are holding each other by the hand.

[21] The fact that (i) (most prominently) seems to have an the meaning that the generative syntacticians do not hate each other, but hate the functionalists and the functionalist do not hate each other, but hate the generative syntacticians – cannot be due to our lexical knowledge of *hate* (see (51a) above). Following Schwarzschild (1996) and Beck (2001), (i) could still be treated as a case of strong reciprocity, involving paired covers.

(i) *Our department is in serious trouble. Two old functionalists have been working here for ages. And now we hired two young generative syntacticians.* Obviously, they absolutely hate each other.

[22] According to the original SHM, the strongest meaning is determined on the basis of propositions and hence globally. This is reminiscent of Krifka's 1996 take on plural predication, as is the idea that certain elements in the clause are underspecified and that specification happens according to such global principles (see below). Whether we choose the strongest meaning for the reciprocal itself or for the proposition is of importance once we consider reciprocal clauses under negation. The fact that both sentences in (i) are similar (I doubt that the relation holds for *any* pair $< x, y >, x \neq y$ that can be formed from the collection) would suggest that the principle applies globally.

(i) a. I doubt that John, Mary, Sue and Bill hate each other.
b. I doubt that John, Mary, Sue and Bill are holding each other by the hand.

Note further that it is the proposition itself, and not only the reciprocal relation applied to the plurality denoted by the subject, that must be consistent with $I$. In simple sentences, this does not make a difference. It might make a difference in those cases, where the reciprocal relation is part of an embedded clause. However, in (iia) we would expect a weak meaning of the reciprocal itself, because this would would yield a strong meaning for the entire proposition. (iib) and (iic) would only provide testing cases if

(52) A reciprocal sentence $S$ can be felicitously used in a context $c$, which supplies non-linguistic information $I$ to the reciprocals interpretation, provided the set $\mathcal{S}_c$ has a member that entails every other one:
$\mathcal{S}_c = \{p | p$ is consistent with $I$ and $p$ is an interpretation of $S$ obtained by interpreting the reciprocal as one of the six quantifiers $[\mathcal{U}^1, \ldots, \mathcal{U}^6]$. In that case, the use of $S$ in $c$ expresses the logically strongest proposition in $\mathcal{S}_c$.
(adapted from (Dalrymple et al. 1998:193))

Winter (2001b) argues that (52) should be altered in two respects. First, instead of being a principle applying in the case of reciprocal structures only, it should be generalized to all plural structures exhibiting (or which *may* exhibit) the universal schema in (53), where $\Psi$ is a relation of type $\langle b\langle a,t\rangle\rangle$ (b and a can be identical) – including double plural configurations, (53b) and AC co-occuring with plurals, (53c).[23]

(53) $\forall X_a \forall Y_b[\Phi(Y)(X)]$

a. The boys hate each other $\Phi = \lambda x_e.\lambda y_e.x$ hates' $y$
$\forall x_e \forall y_e[x, y \leq_{AT} [\![\text{the boys}]\!] \wedge x \neq y \rightarrow hate'(x)(y)]$

b. The boys hate the girs $\Phi = \lambda x_e.\lambda y_e.x$ hate's $y$
$\forall x_e \forall y_e[x \leq_{AT} [\![\text{the boys}]\!], y \leq_{AT} \in [\![\text{the girls}]\!] \rightarrow hate'(x)(y)]$

c. The ducks are swimming and flying. $\Phi = \lambda P_{\langle et\rangle}.\lambda x_e.P(x)$
$\forall x_e \forall P_{\langle et\rangle}[x \leq_{AT} [\![\text{the boys}]\!], P \in \{[\![\text{swimming}]\!], [\![\text{flying}]\!]\ \} \rightarrow M(x)]$

Second, the particular notion of ambiguity employed by Dalrymple et al. (1998) – lexical underspecification of the reciprocal, six possible specifications[24] – should be replaced by a general weakening mechanism applying to the universal schema. Simplifying greatly, if $I$ is such that if the sentence resulting from the relation being applied to its arguments does not stand a chance of being true, then and – only then – the universal schema (which requires the relation to hold of all pairs) is weakened to a statement that is true if the relation holds

lexical knowledge were the subject of beliefs or could be questioned.

(ii) a. It is impossible that John, Mary, Sue and Bill are holding each other by the hand.
b. Jack believes that John, Mary, Sue and Bill are holding each other by the hand.
c. Are John, Mary, Sue and Bill holding each other by the hand?

[23] I limit myself to the discussion of binary relations, Winter himself discusses $n$-ary relations.

[24] (Dalrymple et al. 1998:190) explicitly state that reciprocals are not a standard case of lexical ambiguity (or rather, homonymy), where two or more unrelated meanings are expressed by the same phonological string, due to historical Accident, but rather involve lexical underspecification. (Winter 2001b:334) worries about this claim, in that "[t]he SHM implies a peculiar kind of ambiguity in natural language: unlike lexical or structural ambiguity, SHM-based ambiguities are not compositionally derived from the meaning of sub-constituents or from different modes of their composition, but from a general interpretation principle that resolves vagueness in plural predication". Note that in this respect, too, Dalrymple et al.'s 1998 proposal is very similar to Krifka's 1996 view of plural predication, the only difference being that we have six very specific potential meanings for an underspecified lexical element, instead of two. As in Krifka's proposal, the possible specifications must be compared before or during specification, otherwise the *SHM* is not applicable.

of the *maximal number* of pairs compatible with $I$.[25] For illustration, consider again (51a) and (51b) above. Both sentences would be viewed as universal statements, (54). $I$ relative to *hate* does not contribute anything relevant for the evaluation, hence we must pick the standard universal meaning, illustrated in the picture on the left, where the relation holds of all pairs. $I$ relative to *hold hands*, on the other hand, tells us that each individual can hold hands only with two other individuals – one per hand. Hence, the picture on the right gives a scenario where the sentence should be true, as the relation holds of the maximal number of pairs compatible with $I$.

(54) $\forall x_e.\forall y_e[x, y \leq_{AT} j' \oplus m' \oplus s' \oplus b' \wedge x \neq y \rightarrow P(y)(x)]$

---

[25](i) is Winter's 2001b (17) extended version of the *SHM*.

(i) A complex plural predicate with a meaning that is derived from one or more singular predicates using universal quantification is interpreted using the logically strongest truth conditions that are generated from its *basic universal meaning* and that are not contradicted by known properties of the singular predicate(s).

I only give a very rough outline of the technical details presented in (Winter 2001b:359ff). What Winter is aiming at for (53c) above is that weakening should apply because given our lexical knowledge, *swimming* and *flying* are incompatible. First, we need an object on the basis of which this incompatibility can be formulated. According to Winter, the object we are looking at is an $m$-tuple (with $1 \leq m$) $\langle P_1, P_2, \ldots P_m\rangle$ of unary relation constants of type $\langle e, t\rangle$, i.e. for (53c) we obtain $\langle$ ⟦swimming⟧, ⟦flying⟧ $\rangle$. Second, we require a representation of lexical knowledge (henceforth $\Theta$) about the predicates *in* such a tuple. Winter assumes that lexical knowledge about an $m$-Tuple is interpreted as an $m$-ary relation (without free variables) between the objects in the tuple. For (53c), lexical knowledge is thus an expression of type $\langle et\rangle\langle\langle et\rangle t\rangle$. In particular, it tells us that the two predicates have an empty intersection, i.e. $\Theta_{\langle P1,P2\rangle} = \lambda Q_1.\lambda Q_2.Q_1 \cap Q_2 = \emptyset$. The function mapping the interpretation of the $m$-tuple to its normal universal form relative to this tuple is given in (ii). In (ii), $\psi$ is an expression of type $\langle et\rangle\langle et\rangle$, it takes $P_i, x_1$ as its arguments, mapping to an expression of type $t$. (iii) illustrates the normal universal form relative to $\langle$ ⟦swimming⟧$^{M,g}$, ⟦flying⟧$^{M,g}$ $\rangle$.

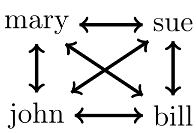
(ii) $\lambda B.\forall i \in [1, \ldots, m]\forall x \in B[\psi(P_i, x)]$

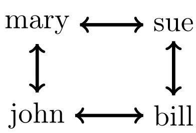
(iii) $\lambda B.\forall i \in \{1, 2\}\forall x \in B[P_i(x) = 1]$
where $\langle P_1, P_2\rangle = \langle$ ⟦swimming⟧, ⟦flying⟧ $\rangle$
$\psi = \lambda P_{\langle et\rangle}.\lambda x_e.P(x) = 1$

Finally, we must state that the relations between the plurality and the predicates in the tuple is maximal w.r.t. lexical knowledge. Taking again the ordered pair of unary predicates, $\langle P_1, P_2\rangle = \langle$ ⟦swimming⟧, ⟦flying⟧ $\rangle$ and lexical knowledge $\Theta = \lambda Q_1.\lambda Q_2.Q_1 \cap Q_2 = \emptyset$, (iv) states a plurality $B$ is in the extension of the weakened predicates iff for all $M_1, M_2$ that are possible denotations of ⟦swimming⟧$^{M,g}$ and ⟦flying⟧$^{M,g}$, the total number of pairs $< i, x >$, such that $P_i(x) = 1$ is greater than or equal to the total number of pairs with $M_1, M_2$. Assume that ⟦the ducks⟧$^{M,g} = a \oplus b \oplus c$. Assume further that $a$ and $b$ are swimming and $c$ is flying, which yields (v) (namely, $\langle swim, a\rangle, \langle swim, b\rangle, \langle fly, c\rangle$). This is the maximal number of pairs, given that all possible denotations $M_1$, $M_2$ of ⟦swimming⟧$^{M,g}$, ⟦flying⟧$^{M,g}$ must have an empty intersection. As far as I can see, this (unfortunately) doesn't prevent us from chosing $\langle swim, a\rangle, \langle swim, b\rangle, \langle fly, c\rangle$ as a possible weakened meaning.

(iv) $\lambda B.\forall M_1, \forall M_2[\lambda Q_1.\lambda Q_2[Q_1 \cap Q_2 = \emptyset](M_1), (M_2) \rightarrow |\{< i, x > \in \{1, 2\} \times B : P_i(x) = 1\}| \geq |\{< i, x > \in \{1, 2\} \times B : M_i(x) = 1\}|]$

(v) $|\{\langle i, x\rangle \in \{1, 2\} \times a \oplus b \oplus c : P_i(x) = 1\}| = 3$




Extending this view to predicate conjunction, we obtain the prediction that a weakened meaning can only occur if *I* tells us that they are incompatible – i.e. that they have an empty intersection. Winter argues on behalf of (55) (his (12)) that this is indeed the case. *swimming* and *quacking* in (55a) are not incompatible – as also shown in (56a) where the two properties can hold of the same atomic individual – hence (55a) cannot be weakened. He claims that, accordingly, the sentence is true only if each duck is both swimming and quacking. *swimming* and *flying*, on the other hand, are incompatible, according to *I* – (56b), where the subject of the conjoined predicates is an atomic individual, does not stand a chance of being true, as no animal can simultaneously swim and fly.[26] Therefore, (55b) can be weakened, yielding a sentence that is true if all ducks either swim or fly.

(55) a. The ducks are swimming and quacking.
b. The ducks are swimming and flying.

(56) a. Dagobert is swimming and quackking.
b. Dagobert is swimming and flying.

Even though Winter's basic idea – that double plural structures and predicate conjunction should be treated on a par – is appealing, it is based, I believe, on incorrect empirical observations and also makes false predictions (cf. also (Heycock and Zamparelli 2005:255ff) for a discussion on Winter's proposal).

First, I cannot see what facts the generalization of the SHM is based on – as I cannot see that the universal schema for double plural configurations, (53b) and for AC co-occurring with plurals is attested (but cf. Langendoen (1978) for discussion) (57) is simply true in a scenario where every boy hates some, but not all girls, and every girl is hated by some, but not all boys. I showed in chapter 2 above that this fact can even be made explicit (without the help of additional formal devices). Likewise, I contest Winter's judgements concerning (55a) – if we consider scenarios where (55a) is true, the case where seven out of 10 ducks are swimming, 2 are standing next to the lake, quacking and one is swimming and quacking, certainly counts as one. In the preceding paragraph, I even gave some examples where we could make this fact explicit (again without the help of additional formal devices). Winter predicts the universal schema for both cases, as the our lexical knowledge does not stand in the way of this universal schema, and this prediction is false. Generally, Winter predicts that the weak truth-conditions of double plural structures and non-intersective AC should only be possible if our lexical knowledge makes the universal schema impossible – given the

[26]Winter excludes singular sentences from the weakening process, attributing the universal scheme in (53) only to plural structures. This is based on the assumption that plural predication, but not singular predication, involves universal quantification.

examples I discussed in chapter 2 and section 3.2 above, this is simply incorrect. Several of the examples I employed above are such that the AC can also be predicated of a singular, as illustrated in (57).[27]

(57) The boys hate the girls.

(58) a. Just as I thought. Mary is [dancing and smoking] in the street.
b. At the beginning of his career, Brodsky [wrote and translated] this poem.
c. This shop [sells drugs] and [provides cheap human labor].
d. John is [drinking beer] and [sipping red wine] in the living room.

Further, I do not see how weakening derives us the weak schema observed in the preceding sections, rather than, say, disjunction. As far as I can see, nothing in Winter's proposal prevents (55a) to be weakened to a proposition that is true if all the ducks are swimming and no duck is quacking. As I pointed out above, this result is undesirable. Accordingly, I don't consider this proposal very convincing.

### 3.3.3 Interim summary

I discussed two hypotheses which assumed that *and* is intersective and that weak schema is derived by independent properties of plural predication. The first one took that property to be imprecision, i.e. both predications, $D_{pl}$ IS $E$ and $D_{pl}$ IS $F$ are imprecise, deriving an overall meaning for the sentence in (59), where neither $E$ nor $F$ have to hold of all atomic parts of

[27] The second empirical problem with Winter's proposal is that those cases which he predicts to allow for weakening – namely those, where the predicates have an empty intersection – are, at least in most cases, considered bad. All of the examples in (i) involve predicates which involve an empty intersection (given our lexical knowledge). In all instances, I and several speakers I consulted prefer *or* over *and*. See section 5.2 below.

(i) a. The workers [retired] ??and / or [started a new job].
b. The soldiers fighting at the battles of the Isonzo [died] ??and / or [became invalids].
c. At the party, the children [danced in the street] ?? and / or [stayed in the house].
d. The ducks are [swimming] ??and/ or [flying].

Note that Winter's 2001b main empirical argument against assuming a basic non-intersective (and thus for a basic intersective) meaning for *and* comes from the sentence in (iia) (his (11a)) when evaluated in the following scenario: there is a house, a single cloud above the house, some birds are above the house and below the cloud, the other birds are above the cloud (and thus also above the house). Winter claims that (iia) is false in this scenario. This is incompatible with a non-intersective meaning for *and*, which will derive the sentence meaning in (iib) (see section 3.4) and thus would predict (iia) to be true in the scenario.

(ii) a. The birds are above the house and below the cloud.
b. Some of the birds are above the house and the others are below the cloud.

I do not think that this example any evidence for Winter's claim. The crucial part of the argument is that (iia) cannot have the meaning in (iib), because if it did, the sentence should be judged true in the scenario. Now the problem with the argument is, that (iib) itself pretty bad in the scenario – it is true, strictly speaking, but most speakers, including myself, find (iib) a pretty odd description of the facts and hesitate calling it true. The same might carry over to (iia) – it might not actually be false in the scenario, but simply very odd.

$D$'s denotation. I argued that this proposal is not convincing because the non-intersective AC does not exhibit the hallmarks of imprecision and because there is no plausible way that would derive the two independent predictions, $D_{pl}$ IS $E$ and , $D_{pl}$ IS $F$, once we consider more complex cases.

(59) $D_{pl}$ IS E and F.

The second one assumed that all plural configurations for which the universal schema in (60), is attested (with $A$ a plurality $S$ as set or a plurality) can undergo pragmatic weakening if (and only if) our lexical knowledge about the relation $R$ leads us to conclude that the sentence under the universal schema does not stand a chance of being true – and that, accordingly, (59) is weakened if (and only if) the denotations of $E, F$ have an empty intersection. I argued that the empirically foundations of this approach are false – non-intersective AC is not limited to cases where the predicate-extensions are disjoint – and that weakening is too liberal, as it predicts that (59), if weakened, should be true if all Ds are Es but no Ds are Fs.

(60) $\forall X \forall Y[X \leq A, Y \leq / \in S \rightarrow R(X)(Y)]$

Since both hypotheses aimed to explain the data by (allegedly) independently attested properties of plural predication, both further suffered from the shortcoming that, irrespective of their explanatory power, they could not account for non-intersective construals of AC in the context of another AC (of type other than $e$).

Recall that these two strategies were supposed to save the standard hypothesis that *and* is uniformly intersective in light of the data that showed that seemed to falsify the intersective analysis of *and*. As neither of them works and as I can think of no other strategies to achieve that goal, the standard hypothesis has to be given up.

## 3.4 Non-intersective *and*

In the following, I drop the assumption that *and* is intersective and turn to alternatives. I focus in particular on Krifka's 1990 generalization of an original proposal by Link (1983, 1984). It assumes that the meaning of *and* is uniformly non-intersective and that the weak schema therefore directly reflects the meaning of ACs rather than being the result of independent mechanisms. As already mentioned in the introduction, what I refer to as *Krifka's proposal / account ...* is, in fact, a possibility he ends up discarding.

(61) a. $D_{pl}$ IS E and F.
true iff $\forall X[X \in \{[\![E]\!], [\![F]\!]\} \rightarrow \exists y[(y \leq [\![D]\!] \wedge y \in AT) \wedge \rightarrow is(X)(y)]] \wedge$
$\forall y[(y \leq [\![D]\!] \wedge y \in AT) \rightarrow \exists X[X \in \{[\![E]\!], [\![F]\!]\} \wedge is(X)(y)]$

b. D and G is E and F.
true iff $\forall X[X \in \{[\![E]\!], [\![F]\!]\} \rightarrow \exists Y[Y \in \{[\![D]\!], [\![G]\!]\} \wedge \rightarrow is(X)(Y)]] \wedge$
$\forall Y[Y \in \{[\![D]\!], [\![G]\!]\}, \rightarrow \exists X[X \in \{[\![E]\!], [\![F]\!]\} \wedge is(X)(Y)]$

### 3.4.1 Krifka's 1990 generalization of Link (1983, 1984)

Similar in spirit to Winter (2001a), Krifka (1990) aims to give a uniform meaning for *and*. However, he argues (as opposed to Winter (1996, 2001a))) that this uniform meaning is non-intersective.[28] I here pretend that Krifka's proposal includes atomicity, as I used it above, i.e. that singular DPs and singular proper names denote atoms and that there no parts of atoms (see chapter 5.2 below).

Krifka's proposal is based on cumulativity. As discussed in chapter 2 above, cumulativity refers to (and cumulation encodes) the observation that properties of its parts are inherited by the plurality itself. We could phrase this differently in terms of *truth*-inheritance: if a predicate is true of $u$ and true of $v$, it will also be true of the sum of $u$ and $v$. The intuition behind Krifka's account is that AC are a version of predicate cumulation: If an individual $u$ has the property $U$ and an individual $v$ has the property $V$, then the sum of these two individuals, i.e. $u \oplus v$ has both properties $U$ and $V$, (62a). Analogously so for properties of tuples: If $\langle u^1, u^2\rangle$ has the property $U$ – i.e. if $u^1, u^2$ stand in relation $U$ – and $\langle v^1, v^2\rangle$ has the property $V$ – i.e. if $u^1, u^2$ stand in relation $V$ – then $\langle u^1 \oplus v^1, u^1 \oplus v^2\rangle$ has both properties $U$ and $V$, (62b). The meaning of *and* is to encode this inference.[29]

(62) a. John is rich. Peter is stupid. ⇒ John and Peter are rich and stupid.
b. John hates Mary. Peter despises Sue. ⇒ John and Peter hate and despise Sue and Mary.

As a first step, we define the set of $e$-conjoinable types $EC$ – individuals or properties of (properties of) individuals, (63).

---

[28](i) is not a feasible alternative: Here, I assume that $\oplus$ and $\wedge$ are the primitive instantiations for types $e$ and $t$, respectively of an operation represented by $\sqcap_+$ and that the meaning of AC with coordinates of functional types is derived, so to speak, by adding up the function arguments in parallel with the values. Evidently, the problem is that for functions, the same plural individual can occur with two function values, as shown in (ii) w.r.t. the model $M$ in (65) below. This is also why we had to state cumulation as truth-inheritance in chapter 2 and not simply as inheritance of function values: The operator ⋆⋆ which I made up in (iiib) is to (64) what the standard ** is to Krifka's analysis.

(i)
$$X \sqcap_+ Y = \begin{cases} X \wedge Y & \text{if } X, Y \in D_t \\ X \oplus Y & \text{if } X, Y \in D_e \\ \{\langle Z^1 \sqcap_+ Z^2, X^1 \sqcap_+ Y^1\rangle | \langle Z^1, X^1\rangle \in X \& \langle Z^2, Y^1\rangle \in Y\} & \\ \quad \text{if } X, Y \in D_{\langle a,b\rangle} & \\ \{\langle Z_1^1 \sqcap_+ Z_1'^1, \ldots, Z_1^1 \sqcap_+ Z_n'^n, X^1 \sqcap_+ Y^1\rangle | \langle Z_1^1, \ldots Z_n^n, X^1\rangle \in X \& & \\ \quad \langle Z_1'^1, \ldots Z_n'^n, Y^1\rangle \in Y\} & \\ \quad \text{if } X, Y \in D_{\langle a_1 \langle \ldots \langle a_n, b\rangle \ldots\rangle\rangle} & \end{cases}$$

(ii) $[\![\text{dance and smoke}]\!]^{M,g} =$
$\{\langle m', 0\rangle, \langle s', 1\rangle, \langle j', 0\rangle, \langle b', 0\rangle, \rangle \langle \mathbf{m' \oplus j', 1}\rangle \langle \mathbf{m' \oplus j', 0}\rangle, \ldots\}$

(iii) a. $[\![\text{hit}]\!]^{M1,g} = \{\langle\langle m', j'\rangle 1\rangle, \rangle\langle m', b'\rangle 0\rangle, \langle\langle m', s'\rangle 0\rangle, \langle\langle s', j'\rangle 0\rangle, \langle\langle s', b'\rangle 1\rangle, \langle\langle s', m'\rangle 0\rangle, \ldots\}$
b. $\star\star\, [\![\text{hit}]\!]^{M1,g} = \{\langle\langle m', j'\rangle 1\rangle, \rangle\langle m', b'\rangle 0\rangle, \langle\langle m', s'\rangle 0\rangle, \langle\langle s', j'\rangle 0\rangle, \langle\langle s', b'\rangle 1\rangle, \langle\langle s', m'\rangle 0\rangle, \ldots,$
$\langle\langle \mathbf{m' \oplus s', j' \oplus b'}\rangle \mathbf{1}\rangle, \langle\langle \mathbf{m' \oplus s', j' \oplus b'}\rangle \mathbf{0}\rangle, \ldots\}$

[29]I write "the meaning of *and*", but again we can view (64) as syncategorematic rules.

(63) The set of $e$-conjoinable types ($EC$) is the smallest set such that

a. $e$ is an $e$-conjoinable type and
b. if $a$ is an $e$-conjoinable type, then $\langle ab\rangle$ is an $e$-conjoinable type and
c. if $a_1, \ldots, a_n$ are $e$-conjoinable types then $\langle a_1, \ldots, a_n, b\rangle$ is an $e$-conjoinable type

(64) states the rules for the meaning of AC. Note that I assume that *and* expresses what I here symbolize by $\sqcup_+$, an operation over coordinates of type $a \in EC$ and it is it is primitively defined for type $t$. My formulation here differs notationally from Krifka's in that I write functions as ordered pairs in these definitions (analogous to the definition of intersective conjunction at the beginning of this chapter), because I find it more comprehensive. Below, I return to a more standard notation.

(64)
$$X \sqcup_+ Y = \begin{cases} X \wedge Y & \text{if } X, Y \in D_t \\ X \oplus Y & \text{if } X, Y \in D_e \\ \{\langle Z, 1\rangle | Z \in D_a \wedge \exists Z^1, Z^2[Z^1 \sqcup_+ Z^2 = Z \wedge \langle Z^1, 1\rangle \in X \wedge \langle Z^2, 1\rangle \in Y]\}\cup \\ \{\langle Z, 0\rangle | Z \in D_a \wedge \neg(\exists Z^1, Z^2[Z^1 \sqcup_+ Z^2 = Z \wedge \langle Z^1, 1\rangle \in X \wedge \langle Z^2, 1\rangle \in Y])\} \\ \qquad \text{if } X, Y \in D_{\langle a,t\rangle}, \langle a, t\rangle \in EC \\ \{\langle\langle Z_1^1, \ldots, Z_n^n\rangle, 1\rangle | Z_1^1 \in D_{a1}, \ldots Z_n^n \in D_{an} \wedge \exists Z'^1, \ldots Z'^n, Z''^1, \ldots Z''^n \\ [Z'^1 \sqcup_+ Z''^1 = Z_1^1, \ldots Z'^n \sqcup_+ Z''^n = Z_n^n \wedge \langle\langle Z'^1, \ldots Z'^n\rangle, 1\rangle \in X \wedge \\ \langle Z''^1, \ldots Z''^n\rangle, 1\rangle \in Y]\}\cup \\ \{\langle\langle Z_1^1, \ldots, Z_n^n\rangle, 1\rangle | Z_1^1 \in D_{a1}, \ldots Z_n^n \in D_{an} \wedge \neg(\exists Z'^1, \ldots Z'^n, Z''^1, \ldots Z''^n \\ [Z'^1 \sqcup_+ Z''^1 = Z_1^1, \ldots Z'^n \sqcup_+ Z''^n = Z_n^n \wedge \langle\langle Z'^1, \ldots Z'^n\rangle, 1\rangle \in X \wedge \\ \langle Z''^1, \ldots Z''^n\rangle, 1\rangle \in Y])\} \\ \qquad \text{if } X, Y \in D_{\langle a_1\langle \ldots \langle a_n, t\rangle \ldots\rangle\rangle}, \langle a_1 \langle \ldots \langle a_n, t\rangle \ldots\rangle\rangle \in EC \end{cases}$$

I illustrate the application of (64) on behalf of the small model M in (65) below.

(65) The model M, where $AT = \{j', m', b', s'\}$ and
$[\![\text{girl}]\!]^{M,g} = \{\langle m', 1\rangle, \langle s', 1\rangle, \langle j', 0\rangle, \langle b', 0\rangle\}$ $[\![\text{boy}]\!]^{M,g} = \{\langle m', 0\rangle, \langle s', 0\rangle, \langle j', 1\rangle, \langle b', 1\rangle\}$
$[\![\text{dance}]\!]^{M,g} = \{\langle m', 0\rangle, \langle s', 1\rangle, \langle j', 1\rangle, \langle b', 0\rangle\}$ $[\![\text{smoke}]\!]^{M,g} = \{\langle m', 1\rangle, \langle s', 1\rangle, \langle j', 0\rangle, \langle b', 1\rangle\}$
$[\![\text{hit}]\!]^{M,g} = \{\langle\langle m', j'\rangle 0\rangle, \rangle\langle m', b'\rangle 1\rangle, \langle\langle m', s'\rangle 0\rangle, \langle\langle s', j'\rangle 0\rangle, \langle\langle s', b'\rangle 0\rangle, \langle\langle s', m'\rangle, 0\rangle, \ldots\}$
$[\![\text{molest}]\!]^{M,g} = \{\langle\langle m', j'\rangle, 0\rangle, \rangle\langle m', b'\rangle, 0\rangle, \langle\langle m', s'\rangle, 0\rangle, \langle\langle s', j'\rangle 1\rangle, \langle\langle s', b'\rangle, 0\rangle, \langle\langle s', m'\rangle, 0\rangle, \ldots\}$
$[\![\text{stupid}_{attr}]\!]^{M,g} = \{\langle\langle girl', m'\rangle, 0\rangle, \langle\langle girl', s'\rangle, 0\rangle, \langle\langle girl, j'\rangle, 0\rangle, \langle\langle girl', b'\rangle, 0\rangle,$
$\langle\langle boy', m'\rangle, 0\rangle, \langle\langle boy', s'\rangle, 0\rangle, \langle\langle boy', j'\rangle 1\rangle, \langle\langle boy', b'\rangle, 0\rangle, \ldots\}$
$[\![\text{ugly}_{attr}]\!]^{M,g} = \{\langle\langle girl', m'\rangle 1\rangle, \langle\langle girl', s'\rangle, 1\rangle, \langle\langle girl, j'\rangle, 0\rangle, \langle\langle girl', b'\rangle 0\rangle,$
$\langle\langle boy', m'\rangle, 0\rangle, \langle\langle boy', s'\rangle 0\rangle, \langle\langle boy', j'\rangle 1\rangle, \langle\langle boy', b'\rangle, 1\rangle, \ldots\}$

AC with coordinates of type $e$ yields the individual sum, (66a), and AC with coordinates of type $t$ is standard propositional conjunction, (66b)–(66d). For *smoke and dance* we now obtain that function that will map any individual to 1 just in case that individual has a part that smokes and a part that dances and no parts that neither smoke or dance, and to 0 otherwise. Once more, I give a very explicit version in (66e), which lists elements of the function (limiting myself to those which are mapped to 1), from now on I again employ the sets *characterized* by the function (or the function itself).

(66) a. $[\![\text{John and Mary}]\!]^{M,g} = j' \oplus m'$
b. $[\![\text{M. is smoking and J. is dancing}]\!]^{M,g} = \mathit{smoke}(m') \wedge \mathit{dance}'(j') = 1 \wedge 1 = 1$
c. $[\![\text{M. is dancing and J. is smoking}]\!]^{M,g} = \mathit{dance}(m') \wedge \mathit{smoke}'(j') = 0 \wedge 0 = 0$
d. $[\![\text{M. is smoking and J. is smoking}]\!]^{M,g} = \mathit{smoke}(m') \wedge \mathit{smoke}'(j') = 1 \wedge 0 = 0$
e. $[\![\text{danced and smoke}]\!]^{M,g} = \lambda x_e.\exists y, z[y \oplus z = x \wedge \mathit{dance}'(y) \wedge \mathit{smoke}'(z)] =$
$= \{\langle s', 1\rangle, \langle m' \oplus s', 1\rangle\langle m' \oplus j', 1\rangle, \langle b' \oplus s', 1\rangle, \langle b' \oplus j', 1\rangle, \langle m' \oplus s' \oplus j', 1\rangle, \langle b' \oplus s' \oplus j', 1\rangle, \langle m' \oplus s' \oplus j' \oplus, 1\rangle, \ldots\}$

Accordingly, relative to M, (67a) and (67b) are true , as both $[\![\text{John and Mary}]\!]^{M,g}$ and $[\![\text{John, Mary, Sue and Bill}]\!]^{M,g}$ have a smoking part and a dancing part. (67c) and (67d) are not true; neither $[\![\text{Bill}]\!]^{M,g}$ nor $[\![\text{Bill and Mary}]\!]$ have dancing parts. Finally, (67e) is true because Sue has a smoking part (Sue herself) and a dancing part (again Sue herself). This is the desired result.

(67) a. John and Mary are dancing and smoking.
b. John, Mary, Sue and Bill are dancing and smoking.
c. Bill is dancing and smoking.
d. Bill and Mary are dancing and smoking.
e. Sue is dancing and smoking.

The AC of the binary relations *hit and molest* denotes a property of all pairs $\langle u, v\rangle$, such that $v$ has a part that hit a part of $u$ and $v$ has a part that molested a part of $u$ and $v$ has no parts that neither hit nor molested any part of $u$ and $u$ has no parts that were not hit or molested by any part of $v$, (68). Relative to M, (69a) is true, but (69b) – (69d) aren't. Again, this is the desired result.

(68) $[\![\text{hit and molest}]\!]^{M,g} =$
$= \lambda x_e.\lambda y_e.\exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = x, y^1 \oplus y^2 = y \wedge \mathit{hit}'(x^1)(y^1) \wedge \mathit{molest}'(x^1)(y^1)] =$
$\{\langle m' \oplus s', b' \oplus j'\rangle\}$

(69) a. Bill and John hit and molested Mary and Sue.
b. Bill hit and molested Mary and Sue.
c. Bill and John hit and molested Mary.
d. Bill and John hit Mary and Sue.

AC of quantifiers is illustrated in (70). (In some cases, I made the rules that derive the subsequent line explicit, employing a smaller typeface).

(70) $[\![\text{most boys and most girls}]\!] =$
$= \lambda P.\exists P^1, P^2[P^1 \sqcup P^2 = P \wedge [\![\text{most boys}]\!](P^1) \wedge [\![\text{most girls}]\!](P^2)] =$

$(because\ P^1 \sqcup P^2 = \lambda y.\exists y^1, y^2[y^1 \oplus y^2 = y \wedge P^1(y^1) \wedge P^2(y^2)]$
$= \lambda P.\exists P^1, P^2[\forall y[y \in P \leftrightarrow \exists y^1, y^2[y^1 \oplus y^2 \wedge P^1(y^1) \wedge P^2(y^2]]\wedge$
$[\![\text{most boys}]\!](P^1)\wedge[\![\text{most girls}]\!](P^2)] =$
$\lambda P.\exists P^1, P^2[\forall y[y \in P \leftrightarrow \exists y^1, y^2[y^1 \oplus y^2 \wedge P^1(y^1) \wedge P^2(y^2]]\wedge$
$B' \cap P^1 > B' \cap \bar{P^1} \wedge G' \cap P^2 > G' \cap \bar{P^2}]$

(70) denotes a function that maps those predicates $P$ to 1, which are such that they can be split up into two subsets $P^1$ and $P^2$, such that every element of P has a part in $P^1$ and a part in $P^2$, and for any $u, v$, $u \in P^1$, $v \in P^2$, the sum of $u, v$, i.e. $u \oplus v$ is an element of P, and for which most boys are $P^1$ and most girls are $P^2$. Note that the restriction tells us that the predicates Ps we are considering are of the same type as the extensions of predicate AC: we only consider those for which there is a $P^1, P^2$ such that $P = \{x|\exists y, z[y \oplus z = x \wedge P^1(y) \wedge P^2(z)\}$. Predicates that have only atoms in their extension will not meet the requirement (except when they are singletons), as shown in (71).

(71) $U = \{a, b, c\}, U^1 = \{a, b, c\}, U^2 = \{a, b, c\}$.
$\surd$ $\forall x[x \in U \rightarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$
$\sharp$ $\forall x[x \in U \not\leftarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$

Hence, for sentence like (73), where the argument is a simple, i.e. non-conjoined predicate, the extension of the predicate must (i) be cumulated and (ii) we require $P^1 = P^2 = P$ (which is not excluded, as the familly of sets $\{P^1, P^2\}$ does not have to be a partition of $P$, is not excluded *per se*).[30] All other possibilities do not meet the requirement, as illustrated in (72). (73) would thus come out as false, because while $[\![\text{most girls}]\!]$ $(P^1(=[\![\text{smoked}]\!]^{M,g}))$ $= 1$, $[\![\text{most boys}]\!]$ $(P^2(=[\![\text{smoked}]\!]^{M,g})) = 0$. (Note: this makes the wrong predictions for downward entailing determiners, but this is part of a more general problem discussed in the following paragraph and in section 3.5).[31]

(72) $[\![\text{smoke}]\!]^{M,g} = \{m', s', b'\}$, $^*[\![\text{smoke}]\!]^{M,g} = \{m', s', b', m' \oplus b', m' \oplus s', s' \oplus b', m' \oplus s' \oplus b'\}$

a. $P^1 = P^2 = \{m', s', b', m' \oplus b', m' \oplus s', s' \oplus b', m' \oplus s' \oplus b'\}$
$\surd$ $\forall x[x \in^* [\![\text{smoke}]\!] \rightarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$
$\surd$ $\forall x[x \in^* [\![\text{smoke}]\!] \leftarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$

b. $P^1 = \{m', s'\}, P^2 = \{b'\}$
$\sharp$ $\forall x[x \in^* [\![\text{smoke}]\!] \not\rightarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$
$\surd$ $\forall x[x \in^* [\![\text{smoke}]\!] \leftarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$

[30] Krifka (1990) introduces the family of sets as a partition. But I do not see how this follows from the definition of non-intersective conjunction.

[31] In particuar, NNext should be true in M, because (74b) is such that $P^1 \cap [\![\text{boys}]\!] < 2$ and $P^2 \cap [\![\text{girls}]\!] < 2$, albeit, in effect, 2 girls are smoking and 2 boys are smoking or dancing. This prediction is probably false (and similar false predictions are made for all right-downward monotone quantificational determiners).

(i) Less than 2 girls and less than 2 boys danced and smoked.

c. $P^1 = \{m', s', b'\}, P^2 = \{m', s', b'\}$
$\surd$ $\forall x[x \in^* [\![\text{smoke}]\!] \nrightarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$
$\sharp$ $\forall x[x \in^* [\![\text{smoke}]\!] \leftarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$

(73) Most boys and most girls +smoked.

If the predicate argument itself is an AC, as in (75), we have three possible families of sets that fulfill the restriction: the complex predicate extension (74a), the extensions of the individual conjuncts, (74b) or the cumulated extensions of the individual conjuncts, (74c). Hence, (75) is true if for one of these, $[\![\text{most girls}]\!]$ $(P^1) = 1$ $[\![\text{most boys}]\!]$ $(P^2) = 1$ (it is false w.r.t. M).

(74) $[\![\text{smoke}]\!]^{M,g} = \{m', s', b'\}$, $[\![\text{dance}]\!]^{M,g} = \{s', j'\}$, $[\![\text{smoke and dance}]\!]^{M,g} = \{s', m' \oplus s', b' \oplus s', s' \oplus j', b' \oplus j', m' \oplus j', m' \oplus s' \oplus j', b' \oplus s' \oplus j', s' \oplus m' \oplus b', j' \oplus m' \oplus b', j' \oplus s' \oplus b' \oplus m'\}$
a. $P^1 = P^2 = [\![\text{smoke and dance}]\!]^{M,g}$
b. $P^1 = [\![\text{smoke}]\!]^{M,g}$ $P^2 = [\![\text{dance}]\!]^{M,g}$
c. $P^1 = [\![\text{smoke}]\!]^{M,g}$ $P^2 = [\![\text{dance}]\!]^{M,g}$

(75) Most boys and most girls smoked and danced.

For modifiers, we derive the following, (76). The restrictions on the predicates are the same. (77) will come out as true w.r.t. M, because $P^1 = P^2 = *[\![\text{boys}]\!]^{M,g}$ and $P^1 \cap [\![\text{stupid}]\!]^{M,g} \neq \emptyset$ and $P^1 \cap [\![\text{ugly}]\!]^{M,g} \neq \emptyset$. Again, this is the desired result.

(76) $[\![\text{stupid and ugly}_{attr}]\!]^{M,g} =$
$\lambda P_{\langle et \rangle}.\lambda x_e.\exists P^1, P^2 x^1, x^2[P^1 \sqcup P^2 = P, x^1 \oplus x^2 = x \wedge S'(P^1)(x^1) \wedge U'(P^2)(x^2) =$ (*because* $P^1 \sqcup P^2 = \lambda y.\exists y^1, y^2[y^1 \oplus y^2 = y \wedge P^1(y^1) \wedge P^2(y^2)$)
$= \lambda P_{\langle et \rangle}.\lambda x_e.\exists P^1, P^2 x^1, x^2[\forall y[y \in P \leftrightarrow \exists y^1, y^2[y^1 \oplus y^2 \wedge P^1(y^1) \wedge P^2(y^2]], x^1 \oplus x^2 = x \wedge S'(P^1)(x^1) \wedge U'(P^2)(x^2] =$
*qua modifier meaning* $= \lambda P_{\langle et \rangle}.\lambda x_e.\exists P^1, P^2 x^1, x^2[\forall y[y \in P \leftrightarrow \exists y^1, y^2[y^1 \oplus y^2 \wedge P^1(y^1) \wedge P^2(y^2]], x^1 \oplus x^2 = x \wedge S'(x^1) \wedge P^1(x^1) \wedge U'(x^2) \wedge P^2(x^2)]$

(77) John and Bill are ugly and stupid boys.

So far, the results derived by Krifka's system were exactly parallel to our description by the means of the weak schema. There is one case where they aren't (others are discussed below), and this case is a problem, raised by Krifka himself (and his reason to abandon of what here called "his proposal"). It arises with attributive adjectives modifying a singular NP, as in (78).[32] If we assume that singular NPs, such as $[\![\text{boy}]\!]^{M,g}$ denote a set of atoms, then there is no family of sets $\{P^1, P^2\}$ that would meet the restriction (see above). Obviously,

[32] As stated above, Krifka himself discards the proposal I just sketched and replaces it by the following, which involves *approximative* recursive semantic rules for conjunction. First, we define an inclusion relation, as in (i). The meaning of *and*, $\sqcup_+$ is now defined *qua* (i) in (ii).

(i) a. If $\alpha, \alpha'$ are of type $e$, then $\alpha \sqsubseteq \alpha'$ iff $\alpha = \alpha'$
b. If $\alpha, \alpha'$ are of type $t$, then $\alpha \sqsubseteq \alpha'$ iff $\alpha \rightarrow \alpha'$
c. If $\alpha, \alpha'$ are of type $\langle ab \rangle$, then $\alpha \sqsubseteq \alpha' iff \forall \beta \in D_a \rightarrow \alpha(\beta) \sqsubseteq \alpha'(\beta)$

for cases such as (78) (but not for the example discussed by Krifka), there are two escape strategies: Either, we assume that singular NPs can also have cumulated extensions (at the present stage, there is nothing that would rule out this assumption) or we argue, with Heim and Kratzer (1998) (and against Montague (1970a,b, 1973), Kamp (1975), Partee (in press)) that attribute adjectives are predicates, i.e. of type $\langle et \rangle$.[33]

---

(ii) a. If $\alpha, \alpha'$ are of type $e$, then $\alpha \sqcup_+ \alpha' = \alpha \oplus \alpha'$
b. If $\alpha, \alpha'$ are of type $t$, then $\alpha \sqcup_+ \alpha' = \alpha \wedge \alpha'$
c. If $\alpha, \alpha'$ are of type $\langle ab \rangle$, and $\beta, \beta'$ are of type $a$, then $\alpha(\beta) \sqcup_+ \alpha'(\beta') \sqsubseteq \alpha \sqcup_+ \alpha'(\beta \sqcup_+ \beta')$

This is, of course, excessively weak. In particular, it predicts that there should be no truth-conditional difference between the sentences in (iii). (Krifka 1990:172) suggests that this is a matter of pragmatics: whenever we use *and*, rather than *or*, '$\rightarrow$' is strengthened to '$\leftrightarrow$'. However, since the solution of this problem is crucial for the proposal to work, one would need a more elaborate account of this strengthening – a possibly interesting connection here are, of course, homogeneity effects.

(iii) a. John and Mary smoked or danced.
b. John and Mary smoked and danced.

[33] The crucial sentence in for Krifka, his (28) involves conjunction of restrictive modifiers of, importantly, a singular NP, where the two properties are disjoint, (i).

(i) This is a green and white flag.

Krifka (just as Link) assumes that non-intersective AC is not limited by the standard atoms introduced above, but rather accesses "sub-atomic" parts. I.e. the predicate in (ii), *green and white* is the set of all those individuals that have a part that is green and a part that is white (i.e. an individual flag of Rapid Wien might be amongst them). Accordingly, for (i) we would need a partition on the predicate *flag* that is such that one part contains all green chunks of flag matter (plus other stuff) and the other contains all white chunks of flag matter (and other stuff), and we consider all individuals that have a part in one cell of the partition and another part in another cell of the partition. The problem, however, is that the second condition of the restriction on predicates in (iii) is not fulfilled: If it were to be met, then the extension of *flag* should contain all kinds of objects that aren't flags: for instance the object obtained by adding the green pieces of the Werder-Bremen flag to the white pieces of the Vfl-Wolfsburg-flag. The problem is, of course, more general: It involves all examples where a modifier AC involves disjoint properties and modifies a singular NP.

(ii) This flag is green and white.

(iii) $\surd$ $\forall x[x \in^* [\![\text{smoke}]\!] \rightarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$
$\sharp$ $\forall x[x \in^* [\![\text{smoke}]\!] \nleftarrow \exists y, z[y \oplus z = x \wedge U^1(y) \wedge U^2(z)]$

The reason why I do not discuss Krifka's example in the text above is twofold: On the one hand, I only introduce "sub-atomic" parts in section 5.1 below. On the other hand, I believe (thanks to discussion with Katharina Hartmann) that Krifka's actual examples might involve pseudo-coordination, i.e. structures involving *and* which have the character of compounds, rather than coordinate structures (cf. de Vos (2005) and also Cooper and Ross (1975)). More generally, this claim might extend to all adjectives in attributive position that denote disjoint properties and modify a singular NP.

First, German, which does not allow for pseudo-coordination *must* use a compounding strategy as in (iva) in examples similar to (i). (I call this compounding without actually knowing what it is.) These compounds differ from conjunction in that they also allow for configurations such as *rot-weiß-rot* (red-white-red) vs. # *rot und weiß und rot* (red and white and red).) (ivb), which is a standard conjunction where both modifiers carry inflectional morphology, sounds contradictory. (ivc), where only the second conjunct bears inflectional morphology is slightly better (but note that *rot und weiße* behave like a phonological word, just as *rot-weiße* in (iva)).

(iv) a. Das ist eine rot-weiße Flagge.
This is a red-white flag

(78) John is an ugly and stupid boy.

In sum, Krifka's proposal derives the weak schema for all these basic cases, provided we can indeed solve the modifier problem as proposed (see section 5.1). One could, of course, argue that intersective AC is a more wide-spread phenomenon than currently predicted – after all, we found it for all kinds of objects of types $a \notin EC$ - propositions, questions and predicates of either. At the present stage, this should not be a major worry – after all, we could enrich the ontology, adding more primitives (events, times – or a multi-sorted $D_e$) and expand the system accordingly.[34]

---

b. # Das ist eine rote und weiße Flagge.
this is a red$_{sg}$ and white$_{sg}$ flag

c. ?/?? Das ist eine rot und weiße Flagge.
this is a red and white$_{sg}$ flag

Second, (i) exhibits all of de Vos's 2005 criteria of pseudo-coordination: It does not allow a prosodic boundary between the conjuncts, (va) vs. (vb), *and* may not be stressed, (vc). and the second conjunct cannot be further modified, (vd).

(v) a. # This is a red | and white flag.
b. This is a nice | and affable man.
c. This flag is not red or white. # This is a red AND white flag.
d. ?/?? This is a green and strikingly white flag.

[34]Lasersohn's 1995 proposal on the meaning of *and* in an event-based semantics, in combination with Landman's 1996 theory of "cumulated" $\theta$-relations is such an expansion. We enrich the ontology by adding the set $E$ of primitives, the set of events. ($e(^i)$ are variables ranging over $E$, $\epsilon$ is used as the type of events.) Following Lasersohn, sentences do not denote truth-values (or sets of worlds where the sentence is true) but rather sets of events where the sentence is true. Accordingly, a sentence is an expression of type $\langle \epsilon, t \rangle$. Predicates of syntactic categories $V$, $A$ contribute $\theta$-role relations for each of their arguments, i.e. functions of type $\langle \epsilon \langle et \rangle$. Unary predicates (of syntactic category V, A) are expressions of type $\langle \epsilon, t \rangle$, but as opposed to sentences contribute a $\theta$-role-relation. (i) has the representation in (ia) and is interpreted *qua* the predication rule in (ib), yield the set of dancing events, in which John is the agent of the dancing.

(i) John danced

a. $j'_e[dance'_{\langle \epsilon,t \rangle}\bar{\theta}]$

b. $\lambda e_\epsilon.dance'(e) \wedge \bar{\theta}(e)(j)$

Simplifying greatly, Lasersohn assumes that *and* forms sums from primitives, both of individuals (the operation $+_e$) and events (the operation $+_\epsilon$). In (ii), with the representation in (iia), conjunction is interpreted as in (iib); subsequent application of the predication rule yields (iic): The set of events which have a sub-event that is a dancing event and a sub-event that is a smoking event (and no other subevents) and where the dancing event has John as the agent and the smoking event also has John as an agent. As pointed out by (Winter 2001a:42), however, as there is no way to keep track of the $\theta$-roles w.r.t. the sub-events, nothing prevents the derivation of (iid), and this is not a desired result.

(ii) John danced and smoked.

a. $j'_e[dance'_{\langle \epsilon,t \rangle}\bar{\theta}_D]and[smoke'_{\langle \epsilon,t \rangle}\bar{\theta}_S]$

b. $j'_e[\lambda e_\epsilon[\exists e^1, e^2[e^1 +_\epsilon e^2 = e \wedge dance'_{\langle \epsilon,t \rangle}(e^1) \wedge smoke'_{\langle \epsilon,t \rangle}(e^2)]]\bar{\theta}_D\bar{\theta}_S$

c. $\lambda e_\epsilon[\exists e^1, e^2[e^1 +_\epsilon e^2 = e \wedge dance'_{\langle \epsilon,t \rangle}(e^1) \wedge smoke'_{\langle \epsilon,t \rangle}(e^2) \wedge \bar{\theta}_D(e^1)(j)\bar{\theta}_S(e^2)(j)$

d. $\lambda e_\epsilon[\exists e^1, e^2[e^1 +_\epsilon e^2 = e \wedge dance'_{\langle \epsilon,t \rangle}(e^1) \wedge smoke'_{\langle \epsilon,t \rangle}(e^2) \wedge \bar{\theta}_D(e^2)(j)\bar{\theta}_S(e^1)(j)$ .

As Lasersohn's 1995 system does not involve cumulated relations, a sentence such as (iiia) will always be distributive in the sense that it denotes the set of events which have a sub-event that is a dancing event and a sub-event that is a smoking event (and no other subevents) and where the dancing event has

Heycock and Zamparelli (2005) propose an alternative analysis of non-intersective AC (which is formulated mainly in order to deal with the perplexing properties of AC under determiners). They assume that *and* denotes the operation SP (set-product), as in (79) (their (91)). They do not give a cross-categorial definition, but (79) is considered the general form for sets $S_1, \ldots, S_n$ of the same order. $S_1, \ldots, S_n$ are the sets characterized by the functions denoted by the individual conjuncts in cases of predicate AC. As they work with a set-theoretic rendering of the structure of $A$ (see Schwarzschild (1996) for discussion), (79) also carries over to unary predicates of individuals.[35] Extensions can be cumulated before and after application of SP (as the derivation is straightforward, I don't go through examples).

(79) SET PRODUCT SP $\langle S_1, \ldots, S_n \rangle := \{X | X = A_1 \cup \ldots \cup A_n, A_1 \in S_1, \ldots, A_n \in S_n\}$

The system is less explicit in its formulation that Krifka's and I also deem it less convincing. For the basic cases of predicate AC, such as (80), it makes the same predictions – unless, however, if one of the predicate extensions is empty. In this case, the empty extension will simply be ignored by SP. Hence, if there aren't any smokers and John is dancing, (81a) should be true. Likewise, if there aren't any unicorns and if Peter is a criminal, (81b) should be true. (Heycock and Zamparelli 2005:fn.41) argue that the fact that it doesn't seem to be should be attributed to pragmatics (because we wouldn't utter it if the extension were empty), but this would mean that (81b) is true but inappropriate, whereas (81d) is false. I grant that there is a difference in status between the two (upon which more below) but whether it should really be that between truth and falsity seems doubtful. In particular, I don't think that there is any difference between (81b) and (81c). For them, however, (81b) would be true and inappropriate, whereas (81c) would be false. Further, the exact make-up of the pragmatic

the plurality John and Mary as the agent and the smoking event also has John and Mary as an agent. Accordingly, it does not derive the weak schema for predicate AC.

(iii) a. John and Mary danced and smoked.
b. $j +_e m\ \lambda e.\exists e^1, e^2[e^1 +_\epsilon e^2 = e \wedge dance'_{\langle\epsilon,t\rangle}(e^1)] * *\theta$
$\lambda e.\exists e^1, e^2, x^1, x^2 \exists e^1, e^2[e^1 +_\epsilon e^2 = e, x^1 +_\epsilon x^2 = j +_e m \wedge dance'_{\langle\epsilon,t\rangle}(e^1) \wedge \theta_D(e^1)(x^1) \wedge \theta_D(e^2)(x^2)]$

Combining Lasersohn's system with Landman's 1996, however, yields the weak schema for (iii). Omitting some of the basic ideas of Landman's proposal, the relevant point for the present discussion is that he assumes that the $\theta$-relations themselves can be "cumulated": a $\theta$-relation will related an atomic event to its (atomic) agent (theme, etc.), while a cumulated $\theta$-relation (**$\theta$) relates a plural event to its plural agent– for every atomic event there is a part of the plurality that is the agent of that event, and every (relevant) part of the plurality is the agent of an atomic event in the plurality of events. Broadly speaking, this will yield the weak schema schema in (iiib) for (iiia). (Again, this is not the only possibility that arises- the problem pointed out by Winter w.r.t.(ii) above remains.) In the following, I will mainly ignore event-based accounts of AC, as they simply run into the same problems as the other analyses. Further, one might wonder whether they are as general as assumed by Lasersohn (1990, 1995), a point discussed in Schwarzschild (1994). This latter question, of course, depends on our notion of events themselves. For a discussion of Schein (1986, 1993), I refer to (Winter 2001a:43ff) (I agree with everything Winter says).

[35] When discussing this proposal in the future, I will use the implementation into the present system in (i).

(i) S= $\{\{a\}, \{b\}\}$, S' $\{\{c\}, \{d\}\}$, SP$_+$ $\langle S, S' \rangle = \{a \oplus b, a \oplus d, b \oplus c, b \oplus d\}$

principles is unclear to me: I can still utter (81d), thinking there are unicorns (or lying), and someone else can point out to me that the sentence is false.

(80) The children / John danced and smoked.

(81) a. John danced and smoked.
b. Peter is a unicorn and a criminal.
c. Peter is a unicorn and Peter is a criminal.
d. Peter is a unicorn.

Further, the system requires an extra rule for conjunction of individuals (and, I suppose, sentential conjunction). Assuming Schwarzschild's 1996 set-theoretic implementation of the structure of A, individuals can be associated with the singletons containing them (cf. Van der Does (1992), Schwarzschild (1996) for discussion, based on (Quine 1980:parts 1, 3). By the same principles (which I don't discuss here, see the afore-mentioned references), we can associate singletons of individuals with the singletons containing them, as indicated by $\Longrightarrow$ in (82). This will yield the right kind of object that SP can apply to. The result, however, does not appear to me to be the right object that a predicate of individuals can apply to, i.e. we would need a further operator, similar to Winter's 2001a E.[36] Note that *and* will be *obligatorily* non-associative in these cases (as in Hoeksema (1983, 1987)), a hypothesis which has (correctly, I believe) been subjected to severe criticism Schwarzschild (1996)).[37]

(82) $[\![\text{John}]\!] = \{j\}$, $[\![\text{Mary}]\!] = \{m\} \Rightarrow ([\![\text{John}]\!]) = \{\{j\}\}$, $\Rightarrow ([\![\text{Mary}]\!]) = \{\{m\}\}$
$\text{SP}_{+}\ \langle\{\{j\}\},\{\{m\}\}\rangle = \{\{j, m\}\}$.

### 3.4.2 AC under determiners

I note that neither Krifka's 1990 nor Heycock and Zamparelli's 2005 account derives the correct results for all configuration where AC occurs under determiners. (83) summarizes the basic data (from German) that I discussed in section 2.5 and 3.2.

(83) a. $d_{sg}$ $\text{E}_{sg}$ und $\text{F}_{sg}$ $\approx \iota x_{\in AT} : \exists x \in AT[[\![\text{E}]\!](x) \wedge [\![\text{F}]\!](x) \wedge \forall y[[\![\text{E}]\!](y) \rightarrow y \leq x] \wedge \forall y[[\![\text{F}]\!](y) \rightarrow y \leq x].[\![\text{E}]\!](x) \wedge [\![\text{F}]\!](x)$.
b. $d_{sg}$ $\text{E}_{sg}$ und $\text{F}_{sg}$ $\approx \iota x_{\in AT} : \exists x \in AT[[\![\text{E}]\!](x) \wedge [\![\text{F}]\!](x) \wedge \forall y[[\![\text{E}]\!](y) \rightarrow y \leq x] \wedge \forall y[[\![\text{F}]\!](y) \rightarrow y \leq x].[\![\text{E}]\!](x) \wedge [\![\text{F}]\!](x)$.

(84) a. $jed-/every_{sg}$ $\text{E}_{sg}$ und $\text{F}_{sg}$ IS C $\approx [\![\text{E}]\!] \subseteq [\![\text{C}]\!] \wedge [\![\text{F}]\!] \subseteq [\![\text{C}]\!]$
b. $alle/all_{pl}$ $\text{E}_{pl}$ und $\text{F}_{pl}$ IS C $\approx [\![\text{E}]\!] \subseteq [\![\text{C}]\!] \wedge [\![\text{F}]\!] \subseteq [\![\text{C}]\!]$
c. $einige/some_{pl}$ $\text{E}_{pl}$ und $\text{F}_{pl}$ IS C $\approx [\![\text{E}]\!] \cap [\![\text{C}]\!] \neq \emptyset \wedge [\![\text{F}]\!] \cap [\![\text{C}]\!] \neq \emptyset$
d. $keine/no_{pl}$ $\text{E}_{pl}$ und $\text{F}_{pl}$ IS C $\approx [\![\text{E}]\!] \cap [\![\text{C}]\!] = \emptyset \wedge [\![\text{F}]\!] = [\![\text{C}]\!] \neq \emptyset$

[36] The alternative rendering they give by means of generalized quantifiers seems to be more plausible.
[37] Only conjunction with conjuncts of type *e* is non-associative. This seems incorrect: All the facts where something like non-associativity seems to be observable, are cross-categorial effects, cf. Wagner (2010), Winter (2007).

e. *die meisten/most*$_{pl}$ $E_{pl}$ und $F_{pl}$ IS C $\approx$ $([\![E]\!]\cap[\![C]\!]>[\![E]\!]\cap[\![\bar{C}]\!])\wedge([\![F]\!]\cap[\![C]\!]>[\![F]\!]\cap[\![\bar{C}]\!])$
f. *ein – /some*$_{sg}$ $E_{sg}$ und $F_{sg}$ IS C $\approx$ $[\![E]\!]\cap[\![F]\!]\cap[\![C]\!]\neq\emptyset$
g. *kein – /no*$_{sg}$ $E_{sg}$ und $F_{sg}$ IS C $\approx$ $[\![E]\!]\cap[\![F]\!]\cap[\![C]\!]=\emptyset$
h. *n* $E_{sg/pl}$ und $F_{sg/pl}$ IS C $\approx$ $([\![E]\!]\cup[\![F]\!])\cap[\![C]\!]=n$
i. *mehr als n/ more than n* $E_{sg/pl}$ und $F_{sg/pl}$ IS C $\approx$ $([\![E]\!]\cup[\![F]\!])\cap[\![C]\!]>n$
j. *weniger als n/ less than n* $E_{sg/pl}$ und $F_{sg/pl}$ IS C $\approx$ $([\![E]\!]\cup[\![F]\!])\cap[\![C]\!]<n$
k. *viele*$_{pl}$ $E_{pl}$ und $F_{pl}$ IS C $\approx$ $([\![E]\!]\cup[\![F]\!])\cap[\![C]\!]>k$ for some large $k$
l. *wenige*$_{pl}$ $E_{pl}$ und $F_{pl}$ IS C $\approx$ $([\![E]\!]\cup[\![F]\!])\cap[\![C]\!]<k$ for some small $k$

Recall what I called the internal problem: We find distributing and non-distributing determiners. In the former case, the meaning of DET *E and F* is equivalent to the meaning of the string DET *E and F*, in the latter case it isn't.

If we categorize the data according to what Krifka can and cannot explain, the resulting distinction is not that between distributing and non-distributing determiners, but a different one. The general prediction made by Krifka is that any structure of AC with determiners should be the one in (85). Obviously, not all cases above adhere to this prediction.

(85) DET E and F $[\![\text{DET}]\!]$ $\{x_e|\exists y,z[y+z=x\wedge[\![E]\!](y)\wedge[\![E]\!](z)\}$

First, there are the non-monotone and upward monotone cardinal expressions (which we can evaluate w.r.t. Krifka's proposal only if we assume a predicate or modifier account of these expressions – a standard generalized quantifier analysis, as in Barwise and Cooper (1981) will yield absurd results). Here, one might raise a question concerning the data: My rendering above is based on the intuition that (86) is true, yet awkward, in a scenarion where 8 bears were fed but no foxes (which sets it apart from plural *some*, which would be false).

(86) Gestern wurden in diesem Wald mehr als 5 Bären und Füchse gefüttert.
'Yesterday, more than 5 bears and foxes were fed in this forest.'

I do not want to put to much weight on these data. More importantly, Krifka's account makes false predictions for configurations where the AC under a downward entailing operator. I will address this problem in greater generality in section 3.5 below, for the moment, I only focus on the restrictor of determiners. Here, we can specify the problems of the proposal as follows: The proposal fails wherever the context is downward-entailing and quantification is not restricted to atoms (arguably, the contexts where we can replace *and* by *or*, but see section 5.2 below). Consider the small model in (87a) and Krifka's meaning for the predicate ACs in (87b). From Krifka's perspective, we can no longer assume that the singular existential and its negation in (87) combine exclusively with NPs that have only atoms in their extensions (as I assumed in section 2.5), as any predicate AC will have pluralities in its extension. What we can assume, however, is that these determiners only take the subset $S'\cap AT$ as their extension.[38] Then (88a) will not come out as true – which is desired, and its negation in (88b) will, which is also desired (but see section 3.5 below). For the plural existential and its negation we drop the assumption that quantification is over atoms. Accordingly, (89a) comes out as false, which is the desired result. However, (89b) comes out as true and this is certainly not what we want. The sentence simply does not seem to be true if a collector is smoking, as is the case here. As (89b) is simply the negation of (89a), something cannot be right about the rendering of (89a), either.

(87) a. $[\![\text{dance}]\!]^M = \{j', b'\}$, $[\![\text{smoke}]\!]^M = \{m'\}$ $[\![\text{artist}]\!]^M = \{j', m'\}$, $[\![\text{collector}]\!]^M = \{b'\}$
b. $[\![\text{smoke and dance}]\!]^M = \{j' \oplus m', b \oplus m', j' \oplus b' \oplus m'\}$
$[\![\text{artists and collector}]\!]^M = \{j' \oplus b', m' \oplus b', j' \oplus b' \oplus m'\}$

(88) a. Ein Künstler und Sammler raucht.
'An artist and collector is smoking.'
b. Kein Künstler und Sammler raucht. = ¬ (Ein Künstler und Sammler raucht)
'No artist and collector is smoking.'

(89) a. Einige Künstler und Sammler rauchen.
'Some artists and collectors are smoking.'
b. Keine Künstler und Sammler rauchen. ¬ (Einige Künstler und Sammler rauchen)
'No artists and collectors are smoking.'

The problem persists, of course, with downward entailing cardinals. Krifka predicts that (90) is true if 90 bears (which I consider not a small number, when it comes to bears) were fed but no foxes or only a single fox, likewise, similarly for (91).

(90) Wenige Bären und Füchse wurden gefüttert.
'Few bears and foxes were fed.'

(91) Weniger als fünf Bären und Füchse wurden gefüttert.
'Fewer than five bears and foxes were fed.'

Finally, we also find it for the restrictor of both universal quantifiers. Obviously, we must assume that the singular universal – albeit morpho-syntactically singular – does not quantify over atoms only (but cf. Sauerland (2003) for more discussion), otherwise we have not the slightest chance to derive the right meanings. If it is unrestricted, the problem is less straightforward:[39] It consists in the fact that as as opposed to the existentials, a sentence can still be true if the extension of one of the conjuncts is empty. In particular, if there are

[38] If so, singular and plural morphology on NP-internal material will be interpretable only on the determiner (or possibly above it, as in Sauerland (2003)). See section 4.1 below.

[39] Note also that Krifka even seems to offer an explanation of why collective predicates cannot occur with the singular universal whenever the complement is a non-conjoined NP-complement, (ia), but may occur if the complement is an conjunction, (ib). But then this would have to extend to cases involving embedded plurals, (ii), and here the explanation is less clear. Why would an embedded plural force cumulation of the singular NP?

bears but no yetis in the forest, then (92) is true if the hunter shot every bear in the forest, but not true if the hunter shot only 3 out of 10 bears. As Krifka predicts the extension of the complex NP to be empty in such cases, (93a), he predicts the sentence to be true, no matter how many bears the hunter actually shot.

(92) Dieser Jäger hat jeden Bären und Yeti in diesem Wald erlegt.
'This hunter has killed every bear and yeti in this forest.'

(93) a. $[\![\text{Bär}]\!]^{M,g} = \{a, b\}$, $[\![\text{Yeti}]\!]^{M,g} = \emptyset$, $[\![\text{Bär und Yeti}]\!]^{M,g} = \emptyset$
b. $[\![\text{Bär}]\!]^{M,g} = \{a, b\}$, $[\![\text{Yeti}]\!]^{M,g} = \emptyset$, $[\![\text{Bär und Yeti}]\!]^{M,g} = \{a, b\}$

As already stated above, most of these facts are reflections of the more general problem of Krifka's analysis concerning downward-entailing contexts, to which I return in section 3.5.

Let me briefly note that Heycock and Zamparelli's 2005 account fares no better. As they potentially allow for one of the conjuncts to have an empty intersection, they can derive AC under both universals. However, as it allows for one of the conjuncts to be empty, it does not derive the correct results for AC under either of the existentials. Despite appearances, it also does not explain AC under the singular negative determiner: Assume that $[\![\text{Yeti}]\!]^{M,g}$ has an empty extension. Then they derive that (94) is true if I saw no bears and false if I saw bears. I have the strong intuition that it should be true irrespective of my bear sightings.

(94) Ich habe keinen Bären und Yeti gesehen (aber ich habe einen Bären gesehen).
I have no$_{sg}$ bear$_{sg}$ and yeti$_{sg}$ seen (but I have a bear seen)
'I saw no bear and yeti... but I saw a bear.'

Concerning the plural negative existential, and all downward-entailing cardinals, they make exactly the same (false) predictions as Krifka's analysis, provided both NP-conjuncts are non-empty.

In sum, neither account consistently derives the correct meaning for AC under determiners.[40] Given that I showed in section 3.2 that the analysis of *and* as intersective cannot

(i) a. # Ich habe jeden Künstler einander vorgestellt.
I have every artist$_{sg}$ each-other introduced
'?? I introduced every artist to each other.'
b. (?) Ich habe jeden Künstler und Sammler einander vorgestellt.
I have every artist$_{sg}$ and collector$_{sg}$ each-other introduced
'I introduced every artist and collector to each other.'

(ii) Ich habe jeden Aufsatz der Mädchen miteinander verglichen.
I have every essay of-the girls with-each-other compared
'I compared every essay of the girls with each other.'

[40] As an aside, which I will not pursue here any further, I point out that there is another problem with those proposals, where conjunction of NP involves the formation of a predicate that contains individual sums consisting of individuals from both NP-extensions – i.e. Krifka's 1990 and Heycock and Zamparelli's 2005. These proposals predict that for some determiners (those which are not solely quantify over atomic individuals) under which collective predicates cannot occur as restrictive modifiers with simple, i.e. non-conjoined NPs, such as *every*, (ia), we should find those modifiers to be licensed with conjoined NPs, because the extension of the complex NP now contains pluralities. This prediction is false, (ib). As these

explain the full set of data, either and as I know of now (significantly) different analyses of AC, I conclude that we simply cannot explain these facts as of yet.[41]

### 3.4.3 Interim summary

Above, I spelled out Krifka's 1990 proposal for non-intersective *and*, which views *and*, in a way, as another way to encode cumulation: For a simple predicate AC *E and F*, we obtain a property that holds of all individuals that have a part that is $E$ and a part that is $F$. This strategy is expanded to all other types $a \in EC$ by recursive application. Accordingly, any higher-order AC will require cumulated extensions for all basic predicates.

Krifka's analysis accounts for all the basic facts. However, it does not extend to AC under determiner, although the problem presents itself in a different guise this time: Krifka's problem is that his proposal consistently derive the wrong facts for AC under negation (or

analysis use the same mechanism to explain the availability of collective predicates in predicative position in those configurations, (ic), something must be wrong about that explanation as well.

(i) a. Die meisten parallelen Linien sind schwarz, die meisten nicht-parallen grün.
'Most parallel lines are black, most non-parallel ones are green.'

b. # Ich habe jede parallele Innenwand und Außenwand in dem Plan hier gekennzeichnet.
I have every parellel inner-wall and outer-wall in this plan here indicated

c. ?Auf dem Plan sind jede Innenwand und Außenwand parallel – da kann was nicht stimmen!
on the plan are every inner-wall and outer-wall parallel – there can something not be-right
'On this plan, every internal wall and external wall are parallel – something can't be right!'

[41] The table below summarizes the facts. I included the intersective analysis (under the assumption that *and* has surface scope) and an additional analysis where *and* (again with surface scope) is disjunction (represented here as set-union, see section 5.2 below.) It's distribution can be deduced from the approximative meanings of the structures given in (84) above.

| | $d_{sg}$ | $d_{pl}$ | $\exists_{sg}$ | $\exists_{pl}$ | $\neg(\exists_{sg})$ | $\neg(\exists_{pl})$ | $\forall_{sg}$ | $\forall_{pl}$ | MOST | N | > N | < N | MANY | FEW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\cap$ | - | - | + | - | + | - | - | - | - | - | - | - | - | - |
| $K$ | + | + | + | + | + | - | - | - | + | ?- | ?- | - | ?- | - |
| $HZ$ | - | - | - | - | - | - | + | + | - | ?- | - /? | - | ?- | - |
| $\cup$ | - | - | - | - | - | + | ?+ | ?+ | - | + | + | + | + | + |

Some clarification is in order concerning those cells which I have not addressed above. First, Krifka clearly derives the correct meaning for the singular and the plural definite, as discussed in sections 2.5 and 3.2. H & Z don't, because they allow for empty extensions of one of the conjuncts. Second, if we are to evaluate *die meisten* (most) w.r.t. Krifka's 1990 and Heycock and Zamparelli's 2005, we cannot consider the complement set of the cumulated predicate in the nuclear scope of the determiner, but rather the cumulated version of the complement of the basic predicate (see Schwarzschild (1994) for related discussion), as schematized in (i). In this case, Krifka's analysis will derive the right results, Heycock and Zamparelli's 2005 won't, as it still allows for one of the conjuncts to be empty.

(i) $[\![\text{die meisten}]\!]_{\langle\langle et\rangle\langle et\rangle t\rangle} = \lambda P_{\langle et\rangle}.\lambda Q_{\langle et\rangle}.| * P \cap *Q| > | * P \cap *(\bar{Q})|$

possibly downward-entailing operators). Below, this problem will resurface in more general form.

In the following, I discuss some properties of AC that have not surfaced so far. The properties are the same that we observed to be properties of standard plurals in chapter 2 above. We will see that some of these observation falsify Krifka's proposal – and they do so more clearly than any of the problems that arose so far had the potential to.

## 3.5 The parallels between pluralities and AC

One particular aspect of AC that has hardly been addressed (but cf. Beck and Sauerland (2000), Beck (2001), Beck (2000b), Gawron and Kehler (2004) for observations that go into this direction) is that its behavior is parallel to that of plurals. Let PLURAL range over plurals and AC: Then, for any sentence $S$ (which does not contain collective or mixed predicates) we find the strong schema if there is a single occurrence of a PLURAL and the weak schema if there is more than one occurrence of a PLURAL, (95).

(95) a. The boys hit the girls.
b. The boys sang and danced.
c. In Vegas and in Atlantic city he married a hooker and befriended a mobster.

In the following, I show that the parallels go further than that.

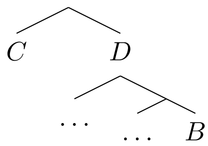
First, we find *homogeneity* for both plurals and AC: That is, a sentence seems "defined" only if the "property" in question holds of all "atoms" of the object denoted by the PLURAL or of none of them (my excessive use of quotation marks here is based on the lack of proper general definitions of the respective terms at this stage).

Second, *projection* can be witnessed in structures with plurals as well as in structures with AC: Let $E$, $F$ in (96) be a PLURAL (E ranges over $\in, \leq$) then IS does not have to be functional application but can correspond to a large chunk of syntactic structure (which may include islands for syntactic movement).

(96) E IS F
$\forall X[X \text{E} E' \rightarrow \exists Y \text{E} F' \wedge \text{IS}(X)(Y)] \wedge \forall Y[Y \text{E} F' \rightarrow \exists X \text{E} E' \wedge \text{IS}(X)(Y)]$

Finally, we find parallels concerning the question of *quantifiers*, i.e. of a PLURAL under a determiner. There are two aspects to be considered.

The first aspect– the fact that determiners differ concerning the question of whether or not they are so-called *distributing* determiners – was already addressed above, where I pointed out that the categorization is stable no matter whether PLURAL is a plural or an AC. However, I think there is a second aspect of interest here: It concerns structures where a PLURAL is embedded in a PLURAL, i.e. structures as in (98). Assume that $D$ in (97b) is a node immediately dominating a PLURAL – i.e. either the highest DP node in a case such as *the boys* or the top node of an AC such as *swim and dance*. Then, if $B$ is a PLURAL and $C$ is a PLURAL we find that presence of $D$ blocks the weak schema for the relation between $B$ and $C$, i.e. it blocks (97b), where IS is a relation corresponding to a chunk of the structure containing $D$.

(97) a. 


b. $\forall X[XeB' \rightarrow \exists YeC' \wedge \text{IS}\ (X)(Y)] \wedge \forall Y[YeC' \rightarrow \exists XeB' \wedge \text{IS}(X)(Y)]$

(98) a. The boys read the diaries of the girls.
b. The boy fed the cats and hit dogs.

In sum, I aim to show that ACs behave like plurals across-the-board. More precisely, I try to show that an AC with coordinates of type $a$ behave like plural expressions and that their denotations and the denotations of standard plural DPs such as *the boys* form a semantic class.

At the same time, the present section shows that despite Krifka's proposal is on the wrong track. Up to this point, this proposal was met with some problems, but we haven't encountered any evidence that the general line of investigation is flawed. While the discussion of homogeneity will raise some more problems of a less important nature, the discussion of projection yields that type of evidence which, I believe, shows that Krifka's general take on AC cannot be correct.

The crucial factor is Krifka's treatment of ACs *D and D'* with $D, D'$ of functional types as the formation as complex predicates. Assume that $D, D'$ each denote a function of type $\langle a, t\rangle$ ($a \in EC$). For Krifka, *D and D'* will denote a property of pluralities: *D and D'* denotes that function, that will map any object of type $a$ to 1 if that object has a part in ⟦D⟧ and a part in ⟦D'⟧. Now consider the schema in (96) above and assume that $F$ = *D and D'*. Krifka's prediction is that the weak schema in (96) will only be derived if $E$ is an argument of $F$.

What I show here is that the weak schema persists, no matter whether there is a predication relation between $E$ and $F$. More generally, weak schema is dissociate from the question of whether $E$ is an argument of $F$. This means we cannot attribute the fact that $F$ appears to behave like a plurality with "atoms" ⟦D⟧, ⟦D'⟧ to the assumption that it denotes a property of objects that have a part that is in ⟦D⟧, ⟦D'⟧.

### 3.5.1 AC and Homogeneity

I start with one of semantic properties of plural sentences observed in chapter 2 above, homogeneity. Recall that a plural sentence (with distributive predicates) such as (99a) is true only if all members of the plurality have the property in question. Its negation in (99b) is true only if no member of the plurality has the property in question. For all in-between-scenarios, the sentences seem neither true nor false, which, following Löbner (1987), was called "undefined". As I emphasized above, we mainly have to rely on our intuitions as other possible ways of diagnosing the meanings, such as discourse data (continuations of and responses to utterances of (99a)) were shown to be notoriously unreliable. Further, there is the complicating factor of imprecision, which I ignore here and henceforth when talking about *truth* and *falsity*.

(99) a. John and / the boys Peter are blond.
b. John and Peter / the boys aren't blond.

Homogeneity was shown to extend to sentences $n$-ary predicates, $n > 1$ with plural arguments. (100a) is true only if all of the boys hit some girl and all of the girls were hit by some boy and its negation is true if no boy hit any girl. In-between-scenarios, such as one where Peter hit Mary but John didn't hit any of the girls are again a grey area where the sentence is neither true nor false.

(100) a. John and Peter / the boys hit Mary and Sue / the girls.
b. John and Peter / the boys didn't hit Mary and Sue / the girls.

Finally, we found that that occurrence of *both, all, each* or, in case of AC of type $e$, stress on *and*, voided the phenomenon.

(101) a. Both John and Peter /the boys are blond.
b. John and Peter / the boys are both blond.
c. Well, I you might not have noticed, but John AND Peter are blond – I think the Scandinavians are taking over – and Burzum is behind it!

(102) a. John and Peter / the boys aren't both blond.
b. Fortunately, it's not the case that John AND Peter are blond – otherwise, I might have thought that Burzum is preparing to take over the world.

I submit that we find the same for all sentences with AC (and the data reported in Winter (1995), Geurts (2005), Szabolcsi and Haddican (2004) (the discussion in the latter being limited to DP-conjunction) point in a similar direction). In other words, negation of AC is not standard negation of intersective *and*.[42]

Consider first the sentences in (103) (crucially, *and* must be unstressed). (103b) is true only if Brown has both properties in question. (103b) on the other hand, is true *only* if he has neither of the properties in question (cf. Geurts (2005) for the same intuition). In other words, (103b) is not true if Brown is tall or if he is handsome. Accordingly, in such an in-between scenario, both (103b) and (103b) are neither true nor false.

(103) a. Brown is tall and handsome.
b. Brown isn't tall and handsome. (Geurts 2005:(48a))

[42]Which should adhere to adhering to*de Morgan first law*, according to which $\neg(p \wedge q) = \neg p \vee \neg q$. The prediction that negation of an AC is equivalent to the disjunction of the negation of the coordinates is not dependent on the intersective analysis: Krifka's 1990 analysis yields the same result.

I try my best to provide independent evidence that corroborate my intuitions (and those of the afore-mentioned authors) here, but, as I stated above, this not an easy matter.

Despite first appearances, the status of *yes* and *no* as a diagnostic of truth and falsity of sentences with AC is questionable. Askedal (2001) argues that response particles seem to be (propositional) anaphors and in Križ and Schmitt (2012b) we claim that just like individual anaphors with plural antecedents may relate to the entire plurality or to "parts" of it Hendriks and Dekker (1996), response particles may related to an entire AC or to "parts" thereof. This is particularly evident with sentential AC, as witnessed by the possibility of conjoined response particles in (104a), but may also occur with AC of smaller constituents, (104b) (cf. in particular Groenendijk and Stokhof (1989)). In Križ and Schmitt (2012b) we argue that a single response particle without any further specification is likely to related to the entire AC, hence the fact that *B*'s response in (105) and (106) seems inappropriate in a scenario where John is tall might be taken as circumstantial evidence for my claims above.

(104) a. Did John go to the party and did Peter clean the house? Yes. And no.
b. Did John and Mary go to the party? Yes. And no.

(105) a. *A*: Is John tall and handsome?
*B*: No (he isn't).
b. *A*: John is tall and handsome.
*B*: No (he isn't).

(106) *A*: John isn't tall and handsome.
*B*: Yes, he is.

Further, we find a parallel behavior for negated plurals and AC in all cases where imprecision is unlikely to interfere, as shown in (107) and (108). In both cases, your reaction is not accounted for under the standard view.[43]

(107) SCENARIO: *We are standing at a bar, checking out the other people.*
I: Poor guy. He doesn't have any teeth. And he isn't tall and handsome.
YOU: Are you blind? He is at least 7 feet.

(108) SCENARIO: *We are standing at a bar, checking out the other people.*
I: Ah, these two guys are kind of sad. They don't have any teeth. They aren't tall.
YOU: Are you blind? The one on the left is 7 feet.

(109) a. *A*: I just met this guy, John. He isn't old and rich, but he is happy.
*B*: Are you stupid? He's a fucking millionaire.
b. *A*: I just met this guy, Jopie. He isn't old and poor but he is unhappy.
*B*: Are you stupid? He's 108 years old!
c. *A*: Last weekend, John didn't take his mother to the dance and his father to

[43] One could argue that we could get as similar reaction when employing *not E or not F*. But then, using *or* while facing the facts is so marked anyway, so we cannot really test this.

the cinema. He went to a strip club with his buddy Jack.
*B*: Well, let me tell you, you are quite badly informed. He DID take his mother to the dance. (It took place at the strip club, but then... she enjoyed it.)

d. *A* : What a shitty party. I didn't dance and smoke. I drank like a horse.
*B*: Well, maybe you are amnestic, but let me tell you that you DID dance. Naked, that is.

The standard intersective view of AC (or any other view which derives the intersective construal in the absence of a plural) also predicts (110b) to behave like (110a) (the context is given so as to prevent stress on *every* and *and*). I don't think it does.[44]

(110) a. This class is kind of special but not THAT special. Every child in it is fat and every child wears spectacles. But it's not the case that every child is a red-head. . . . Some are, but the majority isn't. That's to be expected, since red-heads are really rare.

b. John is great, but not THAT special. He is smart and jovial. He is funny. But he isn't tall and handsome. . . . # He is tall, but he isn't handsome. That's to be expected, because it is very unlikely that someone should have every attractive property.

I conclude that (103b) is not true in an in between-scenario, where Brown is not handsome, but tall or *vice versa*. Accordingly, (103b) will not be false in such an in between-scenario, either. In these cases, the sentences will neither be true nor false (or however we want to characterize this grey area, see section 2.4 above). Showing this "undefined" status independently is virtually impossible. I showed in section 2.4 that *well* -answers do not seem to distinguish

[44](i) provides a similar example. (ii), on the other hand, seems to contradict my claims. Note, however, that AC and plurals behave completely parallel in (ii). Accordingly, these examples should probably feature in the discussion of imprecision.

(i) a. I doubt that every boy is a red-head. Every boy is an asshole, that's for sure and some might be redheads.

b. I doubt that John is tall and handsome. He is an asshole that's for sure and he might be handsome.

(ii) a. In John's class, every child is a red-head. In Peter's class, every child has black hair. But, fortunately, it is not the case that in my class, every child is blond. Some children are, but that's ok. I was just worried that there could be a pattern.

b. I was really worried that everyone would inherit the properties of their parents, i.e. the most salient property of the father and the most salient property of the mother. Jackie is fat and stupid. Mary is ugly and has a horrible voice. But Peter isn't tall and handsome. He's handsome, but that's ok - his father's enormous size was not passed on.

c. I was really worried that everyone would bring their two best friends. Peter brought Mary and Sue. John brought Jackie and Erin. But Alexis didn't bring Alicia and Joni. She brought Joni, but that's ok– it was just the pairs that I was worried about.

d. I was really worried that everyone would bring their entire group of friends. Peter brought the girls from Frankfurt. John brought the girls from Vienna. But Alexis didn't bring the girls from Singapore. She brought her best friend Lore from Singapore, but that's ok– it was just the enormous groups I was worried about.

between false and undefined (or imprecise). The same holds for the *Are you blind /stupid?*-responses above.[45]

I extend this claim to all cases of AC including sentential (propositional) AC. (111) and (112) are examples from or cited in Križ and Schmitt (2012b).(111a) is true (of course) only if John believes both propositions and (111b) is true only if John believes it unlikely that $p$ and if he believes it unlikely that $q$ (see Winter (1995) for similar judgements concerning his own example). Similarly for (112): (112b) is true only if the kitchen has windows and if there is no mould in the bathroom.[46] As circumstantial evidence I cite the fact that $B$'s responses in (113) are inappropriate if the house doesn't have a kitchen.

(111) a. John believes that Mary has a new cat and Peter has adopted a dog.
 b. John denies that Mary has a new cat and Peter has adopted a dog.
 (after(Winter 1995:(38)))

(112) a. This house is much better than the other one. The kitchen has windows and the bathroom is free of mould.
 b. This house is much better than the other one. Here it's not the case that the kitchen is windowless and (that) the bathroom is infested with mould.

(113) a. $A$ : Does this house have a kitchen and is the bathroom free of mould?
 $B$: No.
 b. $A$ : This house has a kitchen and the bathroom is free of mould.
 $B$: No.

[45]As illustrated in (i).

(i) $A$: Nobody bought anything at my stall.
 $B$: Are you stupid / blind? John bought all of your old blankets.

(ii) $A$: Yesterday, I saw the king of France on the train.
 $B$: Are you stupid? There is no king of France.

[46]Obviously, this would have a bearing on the analysis of AC of matrix questions as in (i), (ii) as discussed in Groenendijk and Stokhof (1989): Since, in their view, the meaning of a question is determined by the propositions that answer them and since they argue that answers in (i) and (ii) involve intersective conjunction, this means that AC of questions must, at some level, involve Boolean conjunction. If what I state above is correct, then the answers do not involve Boolean conjunction. In fact, if what I state in chapter 4 is correct, then the answers are pluralities of propositions, accordingly (at least given the view taken in Groenendijk and Stokhof (1984b,a, 1989, 1997)) conjunctions of questions must involve pluralities, too. Given my general claim that all ACs denote pluralities, I would assume so, anyway, albeit I will not be more specific on this particular issue. See Beck and Sharvit (2002) and below for related discussion.

(i) $Q$: Does Mary like port for breakfast and will Sue have raw eggs?
 $A$: Mary does not like port for breakfast and Sue will have raw eggs.

(ii) $Q$: What does Mary like for breakfast and why doesn't Sue ever take off her hat?
 $A$: Mary likes gin for breakfast and Sue never takes off her hat because she is bald.

I further believe that the claim can be generalized to sentences where, according to the terminology above, there is more than one occurrence of a PLURAL, as in (114). (114b) and (114c) are true only if neither of the boys danced or smoked. (114e) is true only if Sue considers it unlikely that John danced or smoked and that Bill danced or smoked. Similarly for (115): (115b) seems true only their is no point in time before John's 20th or after his 30th birthday where he either married a prostitute and no point in time before his 20th or after his 30th birthday where he slept under a bridge. The tests from above can be reproduced for these cases.

(114) a. John and Bill / the boys danced and smoked.
b. John and Bill didn't dance and smoke.
c. It's not the case that John and Bill danced and smoked.
d. Sue believes that John and Bill / the boys danced and smoked.
e. Sue doubts that John and Bill / the boys danced and smoked.

(115) a. John married a hooker and slept under a bridge before his 20th and after his 30th birthday. In between, he worked as real estate agent.
b. John didn't marry a hooker under a bridge and try to commit suicide before his 20th and after his 30th birthday. In between, he did both.

Accordingly, all sentences with PLURALS exhibit homogeneity.

Recall that homogeneity was unexpected under our standard view of cumulated predicate extensions (i.e. it didn't fall out from the cumulation analysis=. It therefore comes as no surprise that it is also unexpected from Krifka's 1990 perspective. Consider the small model in (116) with three individuals, $[\![\text{Ailton}]\!]^M = a$, $[\![\text{Brown}]\!]^M = b$, $[\![\text{Cesare}]\!]^M = c$. In Krifka's analysis, (103b) above comes out as false and (103b) as true. Likewise, (116a) comes out as false and (116b) as true. In fact, however, both are neither true nor false.

(116) $[\![\text{tall}]\!]^M = \{a, b, c\}$, $[\![\text{handsome}]\!]^M = \{c\}$, $[\![\text{tall and handsome}]\!]^M = \{c, a \oplus c, b \oplus c, a \oplus b, \oplus c\}$.
a. Ailton and Brown are tall and handsome.
b. Ailton and Brown aren't tall and handsome.

As Krifka's story is based on cumulation, we could try to expand Schwarzschild's 1994 explanation of homogeneity, which I introduced in section 2.4 above. Simplifying the model even further to M1, (117), we obtain the result that (116a) is false and involves a PS-failure in the case where both of them are tall, and neither is handsome, and that (116b) is true and involves a PS-failure. Apart from the, possibly undesired asymmetry between the two, which I already commented on above, this seems pretty much the desired result, as both cases now involve a PS-failure, (118).

(117) $[\![\text{tall}]\!]^{M1}{}_{+} = \{a, b\}$, $[\![\text{tall}]\!]^{M}{}_{-} = \emptyset$. $[\![\text{handsome}]\!]^{M1}{}_{+} = \emptyset$, $[\![\text{handsome}]\!]^{M}{}_{-} = \{a, b\}$.

$[\![\text{tall and handsome}]\!]^{M1}{}_{+} = \emptyset$, $[\![\text{tall and handsome}]\!]^{M}{}_{-} = \emptyset$.

(118) $[\![(116a)]\!]^{M1} = \langle 0, 0\rangle$ $\qquad$ $[\![(116b)]\!]^{M,1} = \langle 1, 1\rangle$

However, the fact that Schwarzschild's 1994 system makes false predictions for relation in standard plural predication (see section 2.4 above) means that it also makes false predictions when combined with Krifka's system: Relative to the model $M2$ in (119), (116a) is true and (116b) is false, but Schwarzschild would predict lack of a truth-value. Hence we cannot employ it to account for homogeneity if Krifka's analysis is our point of departure.

(119) $[\![\text{tall}]\!]^{M2}{}_{+} = \{a\}$, $[\![\text{tall}]\!]^{M}{}_{-} = \{b\}$. $[\![\text{handsome}]\!]^{M2}{}_{+} = \{b\}$, $[\![\text{handsome}]\!]^{M}{}_{-} = \{a\}$.
$[\![\text{tall and handsome}]\!]^{M2}{}_{+} = \{a, b\}$, $[\![\text{tall and handsome}]\!]^{M}{}_{-} = \{a, b\}$.

(120) $[\![(116a)]\!]^{M2} = \langle 1, 1\rangle$ $\qquad$ $[\![(116b)]\!]^{M,2} = \langle 0, 0\rangle$

Nevertheless, we could venture to say that if there is an analysis that takes a cumulation analysis of plural predication as its basis and solves homogeneity, this analysis, when combined with Krifka's account, can also solve all cases of homogeneity in AC. But this cannot be correct, because, as I show below, Krifka's analysis does not extend to all cases of AC– and we still find homogeneity effects even in those instances. Consider (121). The sentence is true if John wants Sue to commit suicide and does not want her to enter a convent and Mary wants her to enter a convent and does not want her to commit suicide. Evidently, we cannot derive this by Krifka's theory (more examples of this type are derived in the next paragraph): He would predict that the sentence is true only if both Sue and John want Mary to both commit suicide and enter a convent. However, we still find homogeneity: (122) seems to express that I consider it unlikely that John has any of these evil desires and that I consider it unlikely that Mary has any of these evil desires. The sentence does not seem true if I consider it likely that John wants Sue to commit suicide.

(121) *Everyone hates Sue. Her ex-husband John and her "friend" Mary are particularly nasty.* They want Sue to commit suicide and enter a convent.

(122) I doubt that John and Mary want Sue to commit suicide and enter a convent.

Summing up, I suggested that homogeneity is witnessed in all sentences involving multiple occurrences of a PLURAL: A sentence is only defined if all "atoms" of the "plural" have the "property" in questions or if no "atom" has the "property". There is no explanation for this parallel. It is clearly unexpected under the standard intersective view of AC, and it cannot, as of yet, be explained by the non-intersective view.

As an afterthought, let me briefly commented on those cases that I excluded from the discussion above, namely, ACs with *both* or stressed *and*.[47] As with standard plurals, homo-

[47] I omit the discussion of another issue, namely, the question of whether we also find homogeneity effects with negative indefinites, i.e. in sentences such as (i) and (ii). I have the intuition that, at least in the singular cases in (ii), we don't. I have no explanation for this intuition.

geneity effects are not found for these cases (cf. in particular Schwarzschild (1994)). Both (123b) and (124b) seem true if Brown is tall and ugly.

(123) a. Brown is both tall and handsome.
b. Brown isn't both tall and handsome.

(124) a. Brown is tall AND handsome (what a man)!
b. Brown isn't tall AND handsome (he's just tall – you'll have to go with that).

I cannot and do not aim to explain these facts here. However, I emphasize that I do not follow Winter (1995, 1998) and Szabolcsi and Haddican (2004), who argue that stressed *and* reveals the true, underlyingly intersective nature of *and* (a similar claim could probably be made about *both ... and*, if analyzed as a discontinuous morpheme, cf. Neijt (1979)). I think this conclusion is wrong – stressed *and* is not intersective. Szabolcsi and Haddican (2004) emphasize that it cannot occur with collective predicates, (125a), but (125b) is perfectly fine. Further (126a) has a cumulative construal (as does (126b)), where neither of the boys has to hit all of the girls. Third, and analogously, we also find that predicate AC retains a weak construal with both stressed *and* and *both ... and*, (126).[48]

---

(i) a. Keine Mörder haben getanzt und geraucht.
'No murderers danced and smoked.'
b. Keine Mörder und Vergewaltiger wurden festgenommen.
'No murderers and rapists were arrested.'

(ii) a. Kein Mörder hat getanzt und geraucht.
'No murderer danced and smoked.'
b. Kein Mörder und Vergewaltiger wurde festgenommen.
'No murderer and rapist was arrested.'

[48]This even concerns examples similar to Krifka's original ones, where we consider sub-atomic parts, (i).

(i) This chair is so expensive because it is not made from glass, it is made from glass AND from wood.

So what does stressed *and* (and possibly *both*) do? I cannot go beyond the very blurry claim that when using stressed *and* we are contrasting PLURAL with a smaller – and possibly more he expected, (ii)– PLURAL, where "small" refers to the number of "atoms" (cf. also Szabolcsi and Haddican (2004) for a discussion that takes a similar direction). How this claim really extends to AC will become clear in chapter 4 below, where the notion of "atom" is defined.

(ii) a. Surprisingly he is (both) rich AND a philanthrope.
b. ?Unsurprisingly, he is (both) rich AND a philanthrope.

Let me add one word concerning *respectively*. As I stated above, *respectively* seems to be parasitic on structures involving two PLURALS (see below). It seems to force a particular mapping, i.e. we cannot simply pick any combination of the PLURALS $E$, $F$ that will make the sentence true: For (iiia) to be true we John must have hit Sue and Bill must have hit Mary and for (iiib) to be true, John must have smoked and Bill must have danced. Now, what happens under negation (this questions was raised by Clemens Mayr (pc)) as in (iv)? Does it void homogeneity, such as *both* and stressed *and*? I.e. are (iva) and (ivb) true if John hit Sue and Bill hit Mary and if John danced and Bill smoked? It seems hard to find judgements on these data (and, as far as I am aware, they are not discussed in the literature). First, most speakers that I consulted didn't like either of the sentences (but were fine with the ones in (iii)). Further, the discourses in (v) were perceived as almost contradictory. Should these judgements prove reliable, this would show that *respectively* does not block homogeneity. What would need further investigation, then,

(125) a. # John even managed to sit between Sue AND Mary – lucky guy!
b. John even managed to sit between Sue, Gillian AND Mary (not only Sue and Gillian)– lucky guy!

(126) a. John AND Peter hit the girls, not just John.
b. Both John AND Peter hit the girls, not just John.

(127) a. The children in the Scandinavian neighborhood are blond. The children in the Italian neighborhood are brunette. That's kind of boring. It's more mixed in the German neighborhood are blond AND brunette.
b. I think that this time, the children really went to far. They are dancing, smoking AND doing pot – the house will be completely destroyed.
c. Well, I have no problem with parties. But this is going to far: The children are both dancing and smoking. The dancers will destroy the furniture and the smokers will burn down our nice little house.
d. The children didn't just smoke and dance, they smoked, danced AND burnt down the house!

### 3.5.2 AC and projection

I now turn to the syntactic properties of plural sentences, starting with what I termed projection in chapter 2 above. In standard plural configurations we found that predicates can hold cumulatively: Let $E$, $F$ below be plurals and IS some binary predicate, then (128) is true if the predicate holds cumulatively of the denotations of $E$ and $F$, as expressed by the weak schema in (129), where E stands for $\leq$. As shown in section 2.3 the predicate represented by IS does not need to be realized by a head, i.e. a terminal, but can correspond to larger chunks of structure which may even span clause boundaries and syntactic islands. What I show here is that this claim can be generalized for all cases where $E$, $F$ represent a PLURAL.

(128) E IS F

(129) $\forall X[X \text{E} E' \rightarrow \exists Y \text{E} F' \wedge \text{IS}(X)(Y)] \wedge \forall Y[Y \text{E} F' \rightarrow \exists X \text{E} E' \wedge \text{IS}(X)(Y)]$

is the interaction of imprecision and homogeneity.

(iii) a. John and Bill hit Mary and Sue, respectively.
b. John and Bill smoked and dance, respectively.

(iv) a. ?John and Bill didn't hit Mary and Sue, respectively.
b. ?John and Bill didn't smoke and dance, respectively.

(v) a. ?I don't want John and Peter to marry Sue and Bill, respectively. ?/??Rather, I want John to marry Bill and Peter to marry Sue – that would be a much better match!
b. ?I don't want John and Peter to smoked and dance, respectively. John has TB and Peter has polio, it would be really bad for them. ?/?? But I would be very happy if John danced and Peter smoked – they should make the most of this party, these poor lads.

The following gives some examples. In each case, I gave the corresponding weak schema, making the relation between the PLURALs explicit. (Further, as indicated in (130a) I assumed that so-called control structures either involve raising to object or actual control with a subject $PRO$, interpreted here as abstraction as in Heim and Kratzer (1998).)

(130) a. SCENARIO: *John met three people in Watertown: Father Paul, Crazy Bill and Jane, the bar owner. Father Paul considered him cruel but couldn't tell whether he is intelligent or not. Crazy Bill thought him arrogant and highly intelligent, but didn't notice anything else. Jane liked him a lot and considered him highly intelligent.*
The people that John met during his stay in Watertown considered him (to be) cruel, arrogant and highly intelligent.

b. $\forall X[X \leq_{AT} [\![$the people John met in Watertown$]\!] \rightarrow \exists Y[Y \in \{[\![1\ [t_1$ cruel$]]\!]$, $[\![1\ [t_1$ intelligent$]]\!], [\![1\ [t_1$ arrogant$]]\!]\} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x considers' [j' P]$.(Y)(X)]] \wedge$ $\forall Y[Y \in \{[\![1\ [t_1$ cruel$]]\!], [\![1\ [t_1$ intelligent$]]\!], [\![1\ [t_1$ arrogant$]]\!]\} \rightarrow \exists X[X \leq_{AT}$ $[\![$the people John met in Watertown$]\!]^{M,g} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x considers' [j' P]$.(Y)(X)]]$

(131) a. SCENARIO: *John met three people in Watertown: Father Paul, Crazy Bill and Jane, the bar owner. Father Paul considered him cruel but couldn't tell whether he is intelligent or not. Crazy Bill thought him arrogant and highly intelligent, but didn't notice anything else. Jane liked him a lot and considered him highly intelligent.*
The people that John met during his stay in Watertown thought that he was cruel, arrogant and highly intelligent.

b. $\forall X[X \leq_{AT} [\![$the people John met in Watertown$]\!] \rightarrow \exists Y[Y \in \{[\![$ cruel$]\!], [\![$intelligent$]\!]$, $[\![$arrogant$]\!]\} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x thought' [j' P]$.(Y)(X)]] \wedge \forall Y[Y \in \{[\![$ cruel$]\!], [\![$intelligent$]\!]$, $[\![$ arrogant$]\!]\} \rightarrow \exists X[X \leq_{AT} [\![$the people John met in Watertown$]\!]^{M,g} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x thought' [j' P]$.(Y)(X)]]$

(132) a. *John and Mary both have a very bad opinion of Peter, but for different reasons. Mary believes that he is cruel to dogs, but has no beliefs about his attitude to kids, John believes that the is a pedophile, but has no beliefs about his behavior towards animals.*
John and Mary both believe that Peter should be jailed. They believe(that) he molests children and kills little animals.

b. $\forall X[X \leq_{AT} [\![$John and Mary$]\!] \rightarrow \exists Y[Y \in \{[\![$molests children$]\!]$, $[\![$kills little animals$]\!]\} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x believes' [p' P]$.(Y)(X)]] \wedge$ $\forall Y[Y \in \{[\![$molests children$]\!], [\![$kills little animals$]\!]\} \rightarrow \exists X[X \leq_{AT}$ $[\![$John and Mary$]\!]^{M,g} \wedge \lambda P_{\langle et \rangle}.\lambda x_e.$ x believes' [p' P]$.(Y)(X)]]$

(133) a. SCENARIO: *All of John's relatives have different plans for his future. His uncle wants him to be an astronaut, his mother a cab driver, his father a jockey and*

*his sister a male model.*

John's relatives are terrible. They just overwhelm him with their plans. They want him to be an astronaut, a cab driver, a jockey, a male model and God knows what else!

b. $\forall X[X \leq_{AT} [\![\text{John's relatives}]\!] \rightarrow \exists Y[Y \in \{[\![\text{ astronaut}]\!], [\![\text{ cab driver}]\!], [\![\text{jockey}]\!], [\![\text{male model}]\!]\} \wedge \lambda P_{\langle et \rangle}.\lambda x_e. \text{ x wants' [j' P]}.(Y)(X)]] \wedge \forall Y[Y \in \{[\![\text{ astronaut}]\!], [\![\text{ cab driver}]\!], [\![\text{jockey}]\!], [\![\text{male model}]\!]\} \rightarrow \exists X[X \leq_{AT} [\![\text{John's relatives}]\!]^{M,g} \wedge \lambda P_{\langle et \rangle}.\lambda x_e. \text{ x wants' [j' P]}.(Y)(X)]]$

The non-local relation witnessed in these examples (and in several of those given in section 3.2 above) is completely unexpected under any of the theories of AC discussed above.[49]

All of them viewed AC with coordinates of functional types to denote another function of that type. Take (131a) for instance. In Krifka's system, the AC *cruel, arrogant and highly intelligent*, simplified here as ternary branching structure (with an analogous extension of *and* to an $n$-ary operator) will denote another predicate, namely (134). This may or may not hold of John and the proposition that it holds of John is among the beliefs of the people met in Watertown. The fact that each atom of the plurality *the people John met in Watertown* may have a belief that relates John only to a "part" of the AC is unexpected. Analogously so for the other examples above.

(134) $\lambda x.\exists x^1, x^2, x^3[x^1 \oplus x^2 \oplus x^3 = x \wedge C'(x^1) \wedge A'(x^2) \wedge I'(x^3)]$

One could counter what I just said by claiming I mis-analyzed the sentences above syntactically, that (131a) in fact involves AC of $CP$s as in (135) and that the surface structure is derived by gapping. Then one could assume that there are pluralities of propositions, just as there are pluralities of individuals and that *think* denotes a cumulated relation between individuals and propositions. Similar claims could be made about the other examples above. What one would avoid, by this claim, having to say anything new about expressions that occur as functors (*cruel, arrogant and highly intelligent*).

(135) The people that John met during his stay in Watertown thought that he was cruel and (that) he was arrogant and (that) he was highly intelligent.

[49]It also extends to questions, including, in particular, *pair-list*-readings, cf. Groenendijk and Stokhof (1989).

(i) a. SCENARIO: *John knows whether Bill was present at the party. Mary knows whether Sue was present.*
John and Mary knows whether Bill and Sue were present at the party.
b. SCENARIO: *John is Bill's husband and knows everything about him but knows nothing about Sue, Mary is Sue's wife and knows everything about her.*
John and Mary know what Bill and Sue like for breakfast.

(ii) a. *Q*: Did Bill and Sue come to the Party? *A*: Bill was there, Sue wasn't.
b. *Q*: What do Bill and Sue like for breakfast? *A*: Bacon and gin, respectively.

I do not consider this a viable strategy. It is syntactically implausible, as illustrated below by some German examples. (Given its greater word order flexibility, German provides a better setting for tests.) First, we can topicalize the AC as shown in (136), which is analogous (save the topicalization) to (131a) above and true in the same scenario.

(136) [Grausam, arrogant und sehr intelligent]$_i$, dachten die Leute, die John in
Cruel arrogant and very intelligent thought the people RP John in
Watertown traf, dass er sei $t_i$. In Wirklichkeit war er einsam.
Watertown met that he be$_{subj}$ . In reality was he lonely
'Cruel, arrogant and very intelligent, that's what the people that John met in Watertown thought that we was. Lonely, that was what he really was!

(137a) and (137b) also involve topicalization, (137a) is parallel to (133a) and (137b) involves a syntactic variant thereof.[50] (Note I changed some of the verbs to allow for topicalization. Further, I do not know whether the English translations allow for the same weak construal.)

(137) a. [Ein Astronaut, ein Jockey und ein Taxifahrer]$_i$ glauben Johns
An astronaut, a jockey and a cab-driver believe John's
Familienmitglieder, dass er $t_i$ werden kann. Aber dass er ein Schauspieler
family-members that he become can. But that he an actor
wird, das halten sie alle für unwahrscheinlich.
becomes that take they all for improbable.
An astronaut, a jockey and a cabdriver, that's what John's family members believe that he could be in the future. But they all consider it unlikely that they he will become an actor.'

b. [Astronaut, Jockey und Taxifahrer]$_i$ kann Hans nach der Vorstellung seiner
astronaut, jockey and cab-driver can Hans after the idea of-his
Familienmitglieder $t_i$ werden – und nicht Schauspieler!
family-members become – and not actor

---

[50] (i) gives another example (the type of which is inspired by Wurmbrand (2001)).

(i) SCENARIO: *Yesterday, the farmers tried to repair the tractor while the rural hippies tried to paint it (which, in turn, made the farmers really angry). (For (b): everyone tried to perform the act he was after on his own land.)*

a. Zu reparieren und zu bemalen haben die Landbewohner den Traktor nur gestern
To repair and to paint have the rural-inhabitants the tractor only yesterday
versucht – heute haben sie ihn alle gemeinsam verbrannt.
tried – today have they it all together burnt
'Only yesterday did the rural population try to paint and repair the tractor – today, they collectively burnt it.'

b. Gestern haben die Landbewohner den Traktor auf ihren jeweiligen Äckern zu reparieren
Yesterday have the rural-inhabitants the tractor on their respective fields to repair
und zu bemalen versucht – heute haben sie ihn alle gemeinsam auf dem Dorfplatz
and to paint tried – today have they it all together on the village
verbrannt.
square burnt.
'Yesterday, the rural population tried to repair and pain the tractor on their respective fields – today, they collectively burnt it on the village square.'

'According to the opinion of his family members, Hans can become an astronaut, a jockey and a cab driver – but not an actor!'

Second, if the surface structure in (138) were derived by gapping, gapping would have to cross clause-boundaries, which it normally cannot do (cf. Ross (1970) a.o.).

(138) SCENARIO: *Hans believes that Peter's boss is a child lover, Maria believes Peter's boss hates children. Hans believes that Peter was fired because the boss found out that he hates children. Maria has no beliefs about Peter's attitude towards children and believes that we was fired because he is always late.*
Hans und Maria glauben, dass Peter gefeuert wurde, weil er keine Kinder mag und immer zu spät kommt.
'Hans and Maria believe that Peter was fired because he hates children and is always late.'

Third, the strategy does not extend to cases such as the following.

(139) a. SCENARIO: *Two of the children believe that John is a doctor, the other four that Peter is a teacher.*
The children believe that John and Peter are a doctor and a teacher.

b. SCENARIO: *Half of the children play hockey. They do it because the hockey field is beautiful. The other half plays football. They are incited by the instructor's physical appearance.*
The children play hockey and football because the hockey field is beautiful and the football instructor is hot.

In sum, we found that for all structures as in (140), where $E$, $F$ are PLURALs and IS is some relation-denoting expression, we will find the weak schema in (141), no matter whether $E$ and $F$ are in a syntactically local relation or in a non-local relation (where IS may span a large part of syntactic structure (including islands for movement). Crucially, this is unexpected from the perspective of theories of AC discussed up to this point: If $F$ is a function and $E$ is not its argument, then the schema in (141) should simply not occur.

(140) E IS F

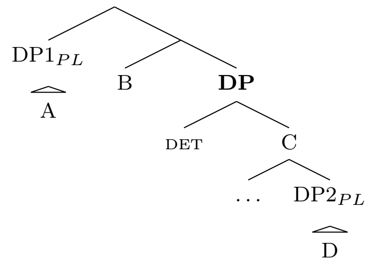
(141) $\forall X[X \text{E} E' \rightarrow \exists Y \text{E} F' \wedge \text{IS}(X)(Y)] \wedge \forall Y[Y \text{E} F' \rightarrow \exists X \text{E} E' \wedge \text{IS}(X)(Y)]$

### 3.5.3 Embedded ACs

The final point I turn to concerns another syntactic property, namely aspects of the discussion which, in chapter 2, ran under the heading *quantifiers*. This means that I consider PLURALs embedded under determiners.

Recall that there were two unexpected problems with such configurations. The first one, which I termed the *internal* problem referred to the fact that the meaning of a PLURAL or a phrase containing a PLURAL seems to vary with the determiner and that, as of yet, there is no account thereof. The second one, which I termed the *external* problem was shown to involve the fact that all determiners behave like syntactic island for the formation of plural predicates across them if they embed a plural. More precisely, for any value for DET in the tree in (142), we cannot form a direct relation between plural DP1 and plural DP2 that would include the determiner, i.e. we cannot form the relation $\lambda x.\lambda y.yB[det[Cx]]$.

(142)

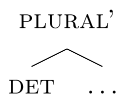



This holds whenever we embed a PLURAL under a determiner – no matter whether that PLURAL is a standard plural definite DP or an AC. For the latter case, I illustrate this again below, using the definite determiner as the value for DET. The sentence is true if half of the ski-jumpers, among them, shot the ravens and the other half, among them, shot the finches. If we could form the relation across the embedding determiner, we would expect the sentence to be false in this scenario, as we would predict that every ski-jumper would have to shoot some raven (and every raven would have to be shot by some ski-jumper) and every skijumper would have to shoot some finch (and every finch would have to be shot by some ski-jumper).

(143) Die Skiflieger haben die Raben und Finken erschossen
$\not\approx$ 'The ski-jumpers, among them shot that plurality contained every raven in this forest and the skijumpers, among them, shot that plurality that contained every finch in this forest.'
$\approx$ 'The ski-jumpers, among them, shot that plurality that contained every salient individual that was a raven and every salient individual that was a finch in this forest.

I now make a simplifying step: Given the messy situation with quantificational determiner, I limit my discussion here to plural definite determiners. Further, I will be sloppy w.r.t. my syntactic assumptions: I will say that such DPs are plural expressions, but I don't really say where that syntactic feature is located – accordingly, I assume the simplified representation in (144).

(144)




I now add the following reformulation of the claim made above: Instead of saying that the weak schema cannot relate ⟦E⟧, ⟦F⟧, E, F each a PLURAL across a determiner, I say that it cannot relate ⟦E⟧, ⟦F⟧, E, F each a PLURAL, across a PLURAL. "Relate X Y across Z" means relate X to Y, where Z dominates either X or Y (but not both).

Once we have established this claim (whatever it might be due to), another parallel between standard plurals and *AC* becomes evident. Let us assume that all PLURALs have the denotation PLURAL', i.e. the top node of a standard plural DP will have the denotation PLURAL' and the top node of an AC will have the denotation PLURAL. Now we can see that the claim above, namely, that the weak schema cannot relate ⟦E⟧, ⟦F⟧, E, F each a PLURAL, across a PLURAL becomes more general, as it extends to *AC*. And this is exactly what we witness in (145). (146) is true, for instance, if there are three boys, John, Ali and George, two cats, Jimmy and Mörder and two dogs, Bea and Wilma, and if John fed Jimmy, Ali fed Mörder, Ali brushed Bea and George brushed Wilma.

(145) The boys fed the cats and brushed the dogs.
≉ The boys, among them, fed the cats and the boys, among them, brushed the dogs.
≈ The boys among them fed the cats and brushed the dogs.

When we consider Krifka's 1990 predictions, there is nothing unexpected about (143) and (145). (143) follows immediately from his system and so does (145), as shown in (146)– there is no need to retract to the rather complicated description of the facts I just gave.

(146)
$$**[\![\text{fed}]\!] = \lambda x.\lambda y.F'(x)(y) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = x, y^1 \oplus y^2 = y \wedge **F'(x1)(y1) \wedge **F'(x2)(y2)]$$
$$**[\![\text{brushed}]\!] = \lambda x.\lambda y.H'(x)(y) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = x, y^1 \oplus y^2 = y \wedge **B'(x1)(y1) \wedge **B'(x2)(y2)]$$
$$**[\![\text{fed}]\!]([\![\text{the cats}]\!]) = \lambda y.F'([\![\text{the cats}]\!])(y) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = y \wedge **F(x1)(y1) \wedge **F(x2)(y2)]$$
$$**[\![\text{brushed}]\!]([\![\text{the dogs}]\!]) = \lambda y.B'([\![\text{the dogs}]\!])(y) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = y \wedge **B(x1)(y1) \wedge **B(x2)(y2)]$$
$$[\![\text{and}]\!]\ (**[\![\text{fed}]\!]\ ([\![\text{the cats}]\!]))\ (**[\![\text{brushed}]\!]\ ([\![\text{the dogs}]\!]) =$$
$$= \lambda z.\exists z^1, z^2[z^1 \oplus z^2 = z \wedge (F'([\![\text{the cats}]\!])(z^1) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = z^1 \wedge **F(x1)(y1) \wedge **F(x2)(y2)]) \wedge (B'([\![\text{the dogs}]\!])(z^2) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = z^2 \wedge **B(x1)(y1) \wedge **B(x2)(y2)]$$
$$[\![\text{and}]\!]\ (**[\![\text{fed}]\!]\ ([\![\text{the cats}]\!]))\ (**[\![\text{brushed}]\!]\ ([\![\text{the dogs}]\!])\ ([\![\text{the boys}]\!]) =$$
$$= \exists z^1, z^2[z^1 \oplus z^2 = [\![\text{the boys}]\!] \wedge (F'([\![\text{the cats}]\!])(z^1) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = z^1 \wedge **F(x1)(y1) \wedge **F(x2)(y2)]) \wedge (B'([\![\text{the dogs}]\!])(z^2) \vee \exists x^1, x^2, y^1, y^2[x^1 \oplus x^2 = [\![\text{the cats}]\!], y^1 \oplus y^2 = z^2 \wedge **B(x1)(y1) \wedge **B(x2)(y2)]$$

However, this is only granted, again, if the PLURAL that is external to the AC is an argument of the AC. Accordingly, none of the sentences in (147) can be derived in this manner– although they exhibit the same phenomenon. I added the more complex German sentence in (147c) to show that we are not dealing with underlying gapping. If so, the construal we find here should be impossible.[51]

(147) a. SCENARIO: *Mary and Sue are matchmakers. Each wants to hook John up with a celebrity, unfortunately, most celebrities aren't single, so John's meeting them would also mean for him to get rid of his rival. Mary considers Nicole Kidman the most beautiful woman on Earth and wants John to meet her (but she doesn't know Taylor Swift and probably wouldn't want John to meet her) and, accordingly, to beat up Keith Urban, Sue wants John to meet Taylor Swift and beat up young Kennedy (she has no desire w.r.t. Nicole and her husband.*
Mary and Sue want John to meet Nicole and Taylor and to beat up Keith and young Kennedy.

b. SCENARIO: *Mary and Sue are nosy and constantly observe John. This morning, Mary saw him snort 1 line of cocaine and have a beer in bar, this evening, Sue saw him snort 2 lines of cocaine and have 3 beers in a brothel.*
   (i) Mary and Sue saw John snort 3 lines of cocaine and drink 4 beers.
   (ii) Mary and Sue observed that John snorted 3 lines of cocaine and drank 4 beers.
   (iii) Mary and Sue observed that John snorted 3 lines of cocaine and drank 4 beers (in a bar and in a brothel).

c. SCENARIO: *Maria and Susi work for the police and are observing Hans' actions, as he might be dealer. Today, they were watching his interaction with his friends, Karl, Otto and Max. Maria, who had the morning shift, observed that Hans offered two joints to Karl and sold him 2 grams of cocaine and that he offered one joint to Otto and sold Otto 1 gram of cocaine. Susi, who had the evening shift, observed that he sold 1 gram of cocaine to Max.*
Maria und Susi sahen, wie / dass Hans seinen Freunden drei Joints anbot und 4 Gramm Koks verkaufte.
Mary and Sue saw how / that Hans offered 3 joints and sold 4 grams of cocaine to his friends.

In sum, as we cannot derive all these cases from Krifka's theory, I maintain my rather awkward description of the facts, which involve another parallel between plurals and AC, i.e. another case where all instances of PLURAL behave alike: that the weak schema cannot relate ⟦E⟧, ⟦F⟧, E, F each a PLURAL, across a PLURAL.

[51] The lower VP in (147c) [seinen Freunden 3 Joints anbot und 4 Kokstüten verkaufte] can be solved by Krifka's mechanism, of course.

### 3.5.4 Interim summary

In this section, I showed that plurals and AC display a number of semantic and syntactic parallels, which indicates that AC of any type and standard plural DPs are the same type of expression, i.e. the same syntactic object (obviously, this does not mean that they have the same category in terms of standard syntactic categories) and that the denotations of AC and the denotations of standard plural DPs such as *the boys* form a semantic class.

The semantic analogies are that the weak schema applies in both cases whenever another plural / AC is present and that both display homogeneity effects. The syntactic analogies concern projection – syntactic unboundedness of the relation between that displays the "weak" constual – and the behavior of AC under determiners. The observation that we find projection is crucial, as it is completely unexpected from the stance of Krifka's 1990 proposal: Krifka falsely predicts that the weak schema only arises for sentences containing *AC* with coordinates of functional type $\langle a, t \rangle, a \in EC$ if the plural DP is an argument of the AC. The behavior of AC and plurals under determiners, other hand, is similar w.r.t. to the *internal* problem discussed in chapter 2, a re-consideration of the *external* problem led me to the tentative suggestion that (all) determiners head DPs which themselves fall into the class of plural expression and that any plural expression acts as a barrier (presently, this usage of the term is a metaphorical one) for the standard application of the weak schema.

## 3.6 Summary of chapter 3

This chapter served two purposes.

On the one hand, I tried to show that none of the existing proposals on AC can derive the correct meanings for all sentences containing AC. My basic observation was that in a number of cases the weak schema seems a more appropriate description of the truth-conditions of sentences containing AC than the strong schema. The traditional intersective analysis of AC – the predictions of which were represented by the strong schema – derives the wrong truth-conditions in a number of cases. As we find no independent mechanism that would account for these facts while leaving the intersective analysis of AC untouched, I suggested that it should be given up. The non-intersective analysis – most prominently Krifka's 1990 fared much better w.r.t. the basic data, however it turned out to be too limited, as it could not be extended to all cases where the weak schema applied.

On the other hand, I tried to emphasize the parallels between plurals and AC. The data presented suggest that AC and plurals are the same kind of expression, as their syntactic behavior is identical. The data furthermore indicate that AC and plurals have the same kind of denotations, as their semantic behavior is identical.

In sum, this chapter leaves out without a viable analysis for AC, but it has provided some clues of what such an analysis could look like.

# 4 *and*-coordinations as pluralities

The following chapter presents a proposal that takes the parallels between plurals and AC at face value. I submit that all ACs are the same kind of expression as standard plural DP – plural expressions, that is – and that all plural expressions denote pluralities. More specifically, an AC with conjuncts of type $a$, $a$ any type, will denote a plurality with atoms corresponding to objects of type $a$. The weak schema is generally derived as the result of (a version of) cumulated relations. The derivation of such relations proceeds according to specific set of syntactic rules and the notion of plurality and cumulation are altered so as to derive homogeneity effects.

The core aim of this chapter is to implement this more general notion of plurality and cumulativity. I simplify the discussion by focussing on extensions only; as far as I can see, a generalization to intensional constructions should be straightforward.

What I put forth here in terms of plural denotations departs in some respects from Link's 1983 original proposal, which I have employed so far for characterizing the meanings of plurals. In effect, the system I outline can be seen as one that meanders between a double domain approach, such as Link's and a single domain approach (see chapter 2). It resembles the former in that pluralities have their extensions in domains separate from the functional domain; for any semantic domain in the functional hierarchy there is an isomorphic structure that serves as the domain of plural denotations. It resembles the latter, because plural extensions have to be re-inserted, so to speak, into the functional structure, and, furthermore, do not serve as primitives in the model, but rather are derived semantic objects. It departs from both in that plural extensions are hybrid objects that can be accessed by functional structure only *qua* their atomic parts. The role of a plural, in this conception, is that of a linguistic device for generating weak truth-conditions; one could, of course, follow up this line thought and view plurals, more generally, as a device for semantic imprecision (cf. Malamud (2012), Križ and Schmitt (2012a)).

This change to the denotations of plurals correlates with a slight change to the standard conception of cumulation, as put forth in Link (1983), Sternefeld (1998) a.o. The operation corresponding to cumulation in the present system is one that turns a function from atoms to atoms into a function from pluralities to pluralities.

The proposal furthermore departs from existing proposals as I introduce a special level of plural syntax, subject to its own set of syntactic constraints.

## 4.1 Pluralities and the meaning of *and*

This section implements the claim that all ACs with conjuncts of type $a$, $a$ any type, uniformly denote pluralities of objects of type $a$ and also the underlying claim that for each semantic domain $D_a$ there is a semantic domain that contains the denotations of pluralities of objects of type $a$. Most other treatments of plurality (with the exception of Gawron and Kehler (2004)) assume that pluralities are only found for domains the elements of which are either primitives in the model (such as individuals, events (cf. Lasersohn (1995), Champollion (2010b) for discussion or possible worlds (cf. Schlenker (2004) cf. also Klinedinst (2007b)), or, if not primitives, mainly occur as arguments in overt syntax, such as propositions or question-denotations (cf. Lahiri (2000), Beck and Sharvit (2002)). Here, on the other hand, pluralities are posited to be part of (or rather, associated with) all domains, including the functional ones: while ⟦John and Mary⟧ denotes a plurality of individuals, ⟦sleep and dance⟧ denotes a plurality of function in $D_{\langle et\rangle}$ and attributive ⟦Turkish and Syrian⟧ denotes a plurality of functions in $D_{\langle\langle et\rangle\langle et\rangle\rangle}$. In other words, I aim to form pluralities directly from any object, including functions, without reducing them to more primitive objects in the model. Accordingly, the function denoted by ⟦dance⟧ should function as atom of the plurality denoted by ⟦sleep and dance⟧, the function denoted by ⟦Turkish⟧ as an atom of the plurality denoted by ⟦Turkish⟧ and so forth. The present proposal yields a uniform treatment of *and* (either as a polymorphous sum-operator, or else, as semantically vacuous, with a syncategorematic rule for coordinate structures (cf. Winter (1995, 1998) for a proposal that is similar in this respect). Note however, that the actual semantic impact of *and* that I propose here is very abstract: *AC* forms objects with denotations in the plural domain, and objects of the plural domain differ from objects of the singular domain in the way they combine with their sisters.

### 4.1.1 The plural and the functional domain

In the following, I distinguish between two types of expressions, singular expressions and plural expressions. Expanding my usage above, the terms are no longer limited to DPs: Syntactically simple (i.e. non-conjoined) plural DPs and all ACs with coordinates of type $a$ are plural expressions, whereas all other expressions are singular expressions. (Section 5.1 raises the question whether the distinction is as stable as I assume here.) I introduce two sets of extensions, the set of singular extensions $D$ – the extensions of singular expressions and the set of plural extensions $\mathcal{R}$. All lexical expressions have their extensions in $D$, which means that plurals are syntactically derived expressions. The system is compatible with the assumption that other, syntactically simple, expressions are plural expressions and, accordingly, have extensions in $\mathcal{R}$, but I keep the scope of the discussion here as narrow as possible.

As above, the language consists of logical forms (LFs), i.e. binary branching structures, generated by the standard syntactic rules.[1] All expressions of the language are semantically

[1]The syntactic properties of coordinate structures suggests that they are indeed $n$-ary branching structures and hence that syntax does not only generate binary branching structures. I do not discuss this question here, nor the possibility that the structural flatness in coordinate structures can be mimicked by

categorized w.r.t. the recursively derived set of logical types $T$, (1) and the set of "plural types" $T*$, of which $T^{*0}$ in (2) is a subset ($T*$ itself is fully specified in section 4.2). For any type $a$ in T, I write $a*$ for its image in $T^{*0}$.

Elements of the set of lexical elements $L$, which includes both constants and variables (which I take to be lexically specified as such), are assigned a logical type by a type-assignment $\theta : L \rightarrow T$ (in other words, there are no lexical elements with plural types).

(1) The set of types $T$ is the smallest set such that

a. $e$ type

b. $t$ is a type

c. If $a$ is a type in T and $b$ is a type in T, then $\langle a, b\rangle$ is a type.

(2) $T^{*0}$ is the image of T under a fixed bijection $\Phi$, such that $T^{*0} \cap T = \emptyset$.

Our vocabulary is the set of terminals, consisting of the constants – the set of constants is henceforth written as $C$ – and the set of variables – the set of variables is henceforth written as $V$. The set of interpretable expressions is given in (3).

(3) will be supplemented in the subsequent paragraphs, whenever I add such as supplement, I refer to the set of rules in (3) as SYNTAX. Accordingly, whenever I write $\ldots +$ SYNTAX, I mean that ... is added to (3).

(3) a. If $\alpha$ is a constant or variable of type $a \in T$, $A$ is an interpretable expression of type $a$.

b. If $\alpha$ a non-branching node and its daughter is an interpretable expression of type $a \in T$, then $A$ an interpretable expression of type $a$.

c. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta$ is an interpretable expression of type $a \in T$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle \in T$, then $A$ is an interpretable expression of type $b \in T$.

d. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ an interpretable expression of type $b \in T$, then $A$ is interpretable expression of type $\langle a, b\rangle \in T$.

e. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $R$ and $\gamma$ an interpretable expression of type $a \in T$, then $\alpha$ is an interpretable expression of type $a*$.

f. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $\bar{R}$ and $\gamma$ an interpretable expression of type $a \in T^{0}*$, then $\alpha$ is an interpretable expression of type $b \in T$, such that $a = b*$.

Relative to a non-empty set of individuals $A$, the singular ontology is given in (4). I henceforth write $D$ for $\bigcup D_a$, as based on (4). I further write $D_a^+$ for $\wp(D_a) \setminus \{\emptyset\}, a \in T$ and $D+$ for $\bigcup D_a^+$,

derivational flatness, as suggested in Wagner (2010).

(4) a. $D_e = A$

b. $D_t$ is the set of truth values, $\{1, 0\}$

c. $D_{\langle a,b\rangle}$ is the set of all functions from $D_a$ to $D_b$.

Expressions are interpreted relative to the model $\mathcal{M}$ in (6) and an assignment $g$, (6), (29). $\mathcal{F}$ is the interpretation function and $\rho$ is a family of bijections from $D+$ to suitable sets. $\rho$, relative to a type $a$, is the function $\rho_a$, defined in (6). The subscript on $\rho$ will henceforth be surpressed unless confusion is likely to arise, further, I write $\mathcal{R}$ for $\bigcup \mathcal{R}_a$, as based on (6).

(5) The model $\mathcal{M} = \langle A, \mathcal{F}, \rho\rangle$, where

a. $A \neq \emptyset$

b. $\mathcal{F} : C \rightarrow \bigcup D_a$

c. $\rho$ is the family all isomorphisms $(\rho_a), a \in T$.

(6) a. For any type $a \in T$, $\rho_a$ is a bijection $\rho_a : D_a^+ \rightarrow \mathcal{R}_a$

b. For any two types $a, b \in T, a \neq b, \mathcal{R}_a \cap \mathcal{R}_b = \emptyset$

(7) $g : V \rightarrow \bigcup D_a$

The bijection $\rho_a$ induces a Boolean structure upon $\mathcal{R}_a$. In order to prevent confusion, I use the following notation: I write $\rho(\{\mathcal{X}\}) + \rho(\{\mathcal{Y}\})$ for $\rho(\{\mathcal{X}\} \cup \{\mathcal{Y}\})$ and call this the "sum" of $\rho(\{\mathcal{X}\})$ and $\rho(\{\mathcal{Y}\})$. For the sake of readability, I henceforth write $+X : X \in S$ rather than $+_{X \in S} X$ for the sum of all $X$ in $S$. I write $\rho(\mathcal{X}) \leq \rho(\mathcal{Y})$ if $\mathcal{X} \subseteq \mathcal{Y}$ and call $\rho(\mathcal{X})$ a "part of" $\rho(\mathcal{Y})$. Further, for any $X \in D_a$, $\rho_a(\{X\})$ is called an *atom* in $\mathcal{R}_a$. $AT_a$ is the set of all atoms in $\mathcal{R}_a$. Finally, I write $\rho(\mathcal{X}) \leq_{AT} \rho(\mathcal{Y})$ if $\rho(\mathcal{X}) \leq \rho(\mathcal{Y})$ and $\rho(\mathcal{X})$ is an atom.

Interpretable LFs are assigned an extension w.r.t. to $\mathcal{M}$ on the basis of (8). (8) will also be supplemented below. I refer to the set of rules in (8) as SEMANTICS, accordingly, I write … + SEMANTICS, whenever … is added to (8).

(8) a. If $\alpha$ is a constant of type $a \in T$, then $[\![\alpha]\!]^{M,g} = \mathcal{F}(a)$.

b. If $\alpha$ is a variable of type $a \in T$, then $[\![\alpha]\!]^{M,g} = g(a)$.

c. If $\alpha$ is a non-branching node with daughter $\beta$, where $\beta$ is an interpretable expression of type $a \in T$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g}$.

d. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle \in T$, then $[\![\alpha]\!]^{M,g} = [\![\gamma]\!]^{M,g} ([\![\beta]\!]^{M,g})$.

e. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ and interpretable expression of type $b \in T$, then $[\![\alpha]\!]^{M,g}$ is that function $f$ of type $\langle a, b\rangle \in T$, such that for all objects $u$ of type $a$, $f(u) = [\![\alpha]\!]^{M,h}(\mathrm{x})$, where $x$ is the $n$-th variable of type $a$ and $h = g^{[x/u]} = (g \setminus \{x|g(x)\}) \cup \{\langle x, u\rangle\}$

f. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $R$ and $\gamma$ an interpretable expression of type $a \in T$, then $[\![\alpha]\!]^{M,g} = \rho_a(\{[\![\gamma]\!]^{M,g}\})$

g. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $\bar{R}$

and $\gamma$ an interpretable expression of type $a \in T^0*$, then $[\![\alpha]\!]^{M,g} = \downarrow (\rho_a^{-1}(\,[\![\gamma]\!]))$ (where, for any $x \downarrow= \{\langle\{x\}, x\rangle | x \in D_a\}$.[2]

In the following, I introduce plural expressions: Definite DPs and, more crucially, ACs.

### 4.1.2 The definite determiner

As a first supplement to the language I add (9), where DEF stands for the definite determiner.

(9) a. SYNTAX + If $\alpha$ is a binary-branching node with daughters, DEF, $\beta$, such that $\beta$ is an interpretable expression of type $\langle et\rangle$ then $\alpha$ is an interpretable expression of type $e*$.

b. SEMANTICS + If $\alpha$ is a binary-branching node with daughters, DEF, $\beta$, such that $\beta$ is an interpretable expression of type $\langle et\rangle$ then $[\![\alpha]\!]^{M,g} = \rho_e([\![\beta]\!]^{M,g})$ (or rather $\rho_e(\{x|[\![\beta]\!]^{M,g}(x)\})$).

If the NP denotes a singleton, DEF $NP$ denotes an atom in $\mathcal{R}_e$, if the NP-denotation is non-empty and not a singleton, DEF $NP$ denotes a plurality in $\mathcal{R}_e$. In both cases, the DP has the plural type $e*$.

This difference correlates, of course, with a morpho-syntactic difference: We find singular morphology (within the DP and all agreeing material external to the DP) in the former case and plural morphology in the latter. Following Sauerland (2003) in his general idea that morpho-syntactic number features are interpretable only in the position of $\phi$ above DP, as in the leftmost tree in (11),[3] I assume here that SG is simply an instantiation of $\bar{R}$. If a definite

[2] In other words, $\bar{R}$ will only yield an element in $D_a$ if application of $\rho^{-1}(x)$ yields a singleton, which means that $\rho(x)$ must be a member of $AT_a$.

[3] There are a number of reasons to make this assumption, which are discussed in Sauerland's paper. Note also that at least in German, which has strong number morphology, we don't ever find coordination of morpho-syntactically plural and singular NPs , as the left-hand tree in (ii) (where the singular determiner and the plural determiner form are even syncretic and which is modeled after an, apparently grammatical, English example from (Heycock and Zamparelli 2005:233)). Sauerland's 2003 assumptions are also corroborated by the data discussed in (van Eijck 1983:99), (Hoeksema 1987:30f), (ii): If there were no number head above the DP, the semantic contrast in (ii) could not be reflected syntactically by number-marking on $T^0$ (with the exception of Dowty and Jacobson (1989), number features in the verbal domain are usually treated as uninterpretable, i.e. the result of syntactic agreement with the subject).

(i) a. */ # die Sonne und Sterne sind so schön!
the$_{pl/fem.sg}$ sun$_{sg}$ and stars$_{pl}$ are so beautiful
b. */ # die Sonne oder Sterne sind so schön!
the$_{pl/fem.sg}$ sun$_{sg}$ or stars$_{pl}$ are so beautiful

(ii) a. His aged servant and the subsequent editor of his collected papers was with him at his deathbed.
b. His aged servant and the subsequent editor of his collected papers were with him at his deathbed.

One might point out that the claim (may) falsily lead(s) us to expect that plural agreement on NP is fine if there are only two individuals in total, as in the rather bad (iiia), where we are talking about a plurality of two, containing one German and one Frenchman. Note, however, that (iiib) is significantly worse.

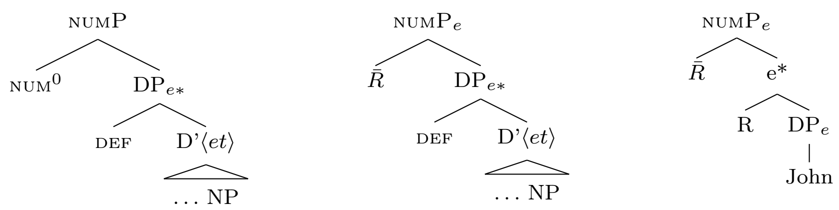
(iii) a. ??Zwei Deutsche und Franzosen sind am Schneeberg abgestürzt.
two German$_{pl}$ and Frenchman$_{pl}$ are at-the Schneeberg fallen

DP is morpho-syntactically singular, as in (10a), this is indicative of the application of $\bar{R}$, as in the middle tree in (11) and if it is plural, this is indicative that $\bar{R}$ being absent (i.e. I assume that, following Sauerland (2003), the morpho-syntactic plural feature is semantically vacuous, possibly simply the identity function). Obviously, this does not straightforwardly extend to proper names as in (10b) – they, too, can trigger singular agreement, but there is no reason to assume that they should be objects of type $e*$ rather than $e$. However, as we will see below, I assume that R can be inserted optionally, hence I assume that SG ($= \bar{R}$) in these cases, requires previous application of $R$, as illustrated by the rightmost tree in (11) (sloppily put, any singular embeds a plural).[4] Returning to definite DPs, according to (9) above, all such objects denote objects in $\mathcal{R}$, if a DP has singular morphology, it means that its extension has (successfully) be mapped to an extension in $D_e$.[5]

(10) a. Der Dichter ist dumm.
The$_{sg}$ poet$_{sg}$ be$_{sg}$ stupid

b. Adalbert ist dumm.
Adalbert be$_{sg}$ stupid

(11)




b. *Zwei Deutscher und Franzose sind am Schneeberg abgestürzt.
two German$_{sg}$ and Frenchman$_{sg}$ are at-the Schneeberg fallen

[4]This might seem counterintuitive considering the morphological properties of languages like English and German, however, other languages, such as Welsh, reverse the pattern (cf. Haspelmath (2006) for discussion). It is, obviously, generally questionable to what extend morphological complexity reflects syntactic complexity. Note further that in the case of proper names, which, syntactically, behave like DPs, one could argue, against Longobardi (1994), that the proper name stays in NP and that the silent $D^0$ head is filled by the operator R. However, As I need to assume optional insertion of R for phrases of all syntactic and semantic categories, this would add a touch of elegance only to this one specific case.

[5]We could also assume, following Sauerland (2003), that ⟦sg⟧ is the identity function, which imposes a presupposition on its argument (after the general treatment of nominal features in Cooper (1983)). Given the present system, this could have any of the forms in (i). According to (ia), ⟦sg⟧ will map any element to itself if it is either an element of $AT_e$ or $D_e$. I.e. this covers the two cases in (8) but is, of course, a disjunctive restriction. According to (ib), ⟦sg⟧ will map any element to itself in case in is an element of $D_e$. Accordingly, (ib) should not apply to definite DPs, which have denotations in $\mathcal{R}_e$ – unless, of course, $\bar{R}$ applies before ⟦sg⟧. But this seems awkward– after all, we cannot let $\bar{R}$ apply to all DPs, because for all those where the NP doesn't denote a singleton set, it will not yield a value (i.e. there should be no DPs denoting pluralities). Finally, according to (ic), the identity function could map any element to itself that is a member of $AT_e$. Just as $\bar{R}$, it applies directly to definite DPs, but not to proper names. The difference to $\bar{R}$ is that (ic) is the identity function which will yield an object of type $e*$, whereas $\bar{R}$ is a mapping from the plural to the singular domain, which will yield an object of type $e$.

(i) a. $[\![\text{SG}]\!]^{M,g} = \lambda x : x \in D_e \cup AT_e.x$
b. $[\![\text{SG}]\!]^{M,g} = \lambda x : x \in D_e.x$
c. $[\![\text{SG}]\!]^{M,g} = \lambda x : x \in AT_e$

Accordingly, all definite DPs involve the application of one partial function ($\rho$) and singular definite DPs the application of two partial functions ($\rho, \bar{R}$). Consider first $\rho$: $\rho$ maps objects from the singular domain $D$ to objects in the plural domain $\mathcal{R}$. As $\rho_a$ is defined only for $D_a^+$, it will not be defined for those cases, where the NP-extension is empty. In other words, there is no plural value for this particular extension in $D$. $\bar{R}$, on the other hand, maps objects from the plural domain $\mathcal{R}$ to the singular domain $D$. In case the object is not an atom in $\mathcal{R}$, there will be no value singular value for it – no value in $D$ – hence $\bar{R}$ is not defined for non-atomic objects in $\mathcal{R}$. For the simple reason of comprehensiveness, I introduce a (rather non-sensical) terminological distinction, referring to those cases where a function $f : D \rightarrow \mathcal{R}$ is to combine with an element $\mathcal{X} \notin dom(f)$ *undefined*, and those cases, where $g : \mathcal{R} \rightarrow D$ is to combine with an element $\mathcal{X} \notin dom(g)$ *unvalued*. (12a) illustrates the former, (12b) the latter.[6]

(12) a. Die scheiß Einhörner haben den Garten zerstört.
The fucking unicorns destroyed the garden. (undefined)

b. SCENARIO *Six CDU-delegates each gave a speech. I tell my friend, who wasn't present, afterwards.*
Es war langweilig. Der Abgeordnete der CDU hat eine öde Rede gehalten.
It was boring. The CDU-delegated gave a boring speech. (unvalued)

How do we embed partial functions into the present system? As my main focus here will be on unvalued sentences, and not on unvalued intermediary nodes (such as could be produced by application of DEF or SG), I take the easy way out and assume that $[\![\bullet]\!]$ is a partial function itself. Let us assume that the syntax in SYNTAX remains intact, but that, generally, if an argument $x$ is not in the domain of a function $f$, $f(x) = \phi$, such that $\phi \notin D \cup \mathcal{R}$ and such that there is no function $f$, $\phi \in dom(f)$ and, finally, no argument $x$ such that $x \in dom(\phi)$.[7] Then the most general rule we would require would be the one in (13) (which already relates

[6] I don't know whether there is empirical difference between the two. There a of number differences which are due to independent factors, concerning accommodation or possibly covert restriction in the case of definite DPs in general, not limited to the singular, cf. Heim (1982), Heusinger (1997), Schlenker (2004). Because of this complication, it is also hard to evaluate Fintel's 2004 findings w.r.t. unvalued cases.

[7] A very sloppy formulation, which is not properly rooted in the ontology and should be understood in terms of a description of what the embedding of the partial function $\rho$ should yield, rather than an stepwise derivation of these results, is given in (i). (ia) is a primitive, (ib) and (ic) are stipulations which do not follow from anything so far.

(i) a. for any $\alpha$ of type $a$, if $[\![\alpha]\!]^{M,g} = \emptyset$, $\rho([\![\alpha]\!]^{M,g}) = \phi$.
b. for any $\alpha$ of type $a$, if $[\![\alpha]\!]^{M,g} = \phi$, $\rho([\![\alpha]\!]^{M,g}) = \phi$.
c. for any $\alpha$ of type $b*$, $[\![\alpha]\!]^{M,g} + \phi = \phi$.

Given (i), we can derive (ii).

(ii) a. for any $\alpha$ of type $a$,
1) if $[\![\alpha]\!]^{M,g} \in D_a$, $[\![\mathrm{R}\ \alpha]\!]^{M,g} = \rho(\{[\![\alpha]\!]^{M,g}\}$
2) if $[\![\alpha]\!]^{M,g} = \phi$, $[\![\mathrm{R}\ \alpha]\!]^{M,g} = \phi$

b. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a'$, then
1) if $[\![\beta]\!]^{M,g} \in \mathcal{R}_a$ $[\![\gamma]\!]^{M,g} \in \mathcal{R}_a$, $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} + [\![\gamma]\!]^{M,g}$
2) if $[\![\beta]\!]^{M,g}$ or $[\![\gamma]\!]^{M,g} = \phi$, $[\![\alpha]\!]^{M,g} = \phi$

to the set $T^*$ introduced in the next section) and the proper generalization of mapping of typed expressions to semantic domains would be the one in (14). I know that this is far from the desideratum of a proper implementation of partial functions into the language and yields all kinds of problems, (cf. in particular Lepage (1992)), but, given my narrow focus here, I don't want to dwell on this issue.

(13) a. Let $\alpha$ be binary branching node with daughters $\beta, \gamma$, where $\beta$ is an interpretable expression of type $\langle a, b\rangle \in T \cup T^*$ and $\gamma$ an interpretable expression of type $a \in T \cup T^*$, then $\alpha$ is an interpretable expression of type $b \in T \cup T^*$.

b. Let $\alpha$ be binary branching node with daughters $\beta, \gamma$, where $\beta$ is an interpretable expression of type $\langle a, b\rangle \in T \cup T^*$, and $\gamma$ an interpretable expression of type $a \in T \cup T^*$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g}([\![\gamma]\!]^{M,g})$, where $[\![\beta]\!]^{M,g}([\![\gamma]\!]^{M,g}) \in D_b$ if $[\![\gamma]\!]^{M,g} \in dom([\![\alpha]\!]^{M,g})$, $\phi$ otherwise.

(14) For any interpretable expression $\alpha$ of type $a \in T$, $[\![\alpha]\!]^{M,g} \in D_a \cup \{\phi\}$. For any interpretable expression $\alpha$ of type $a \in T^*$, $[\![\alpha]\!]^{M,g} \in \mathcal{R}_a \cup \{\phi\}$.

As a final point, let me point out that in the present treatment, the definite determiner is the only direct realization of $\rho$ in the language. A more thorough investigation of other constructions, in particular, embedded questions and propositions (cf. in particular Lahiri (2002), Beck and Sharvit (2002)) or conditionals (cf. Schlenker (2004) or possibly even of extensional expressions of higher types, might suggest that this view is too narrow. I leave

---

The syntax and the semantics for DEF is given (iii) (added to SYNTAX and SEMANTICS)

(iii) a. If $\alpha$ is a branching node with sisters $d-$, $\beta$, where $\beta$ is an interpretable expression of type $\langle et\rangle$, then, $\alpha$ is an interpretable expression of type $e*$.

b. If $\alpha$ is a branching node with sisters $d-$, $\beta$, where $\beta$ is an interpretable expression of type $\langle et\rangle$, then, if $\{y_e | [\![\beta]\!]^{M,g}(y) = 1\} \neq \emptyset$, $[\![\alpha]\!]^{M,g} = \rho([\![\beta]\!]^{M,g})$ and $\phi$ otherwise.

The following stipulations are required to prevent the structures discussed in the subsequent sections from becoming uninterpretable once an intermediate node has the value $\phi$. They are not sufficient (cf. Lepage (1992)), but will do for my present purposes. Note that we do not need to add the domain restriction for the plural cases, as the functions are evaluated on the level of atoms.

(iv) a. If $\alpha$ is a branching node with sisters $\gamma$, $\beta$ and $\beta$ is an interpretable expression of type $\langle a, b\rangle$ and $\gamma$ is an interpretable expression of type $a$, then
1) if $[\![\gamma]\!]^{M,g} \in dom([\![\beta]\!]^{M,g})$, $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g}\ ([\![\gamma]\!]^{M,g})$
2) if $[\![\gamma]\!]^{M,g} \in D_a \& [\![\gamma]\!]^{M,g} \notin dom([\![\beta]\!]^{M,g})$, $[\![\alpha]\!]^{M,g} = \phi$
3) if $[\![\gamma]\!]^{M,g} = \phi$, or $[\![\beta]\!]^{M,g} = \phi$, $[\![\alpha]\!]^{M,g} = \phi$

b. If $\alpha$ is a branching node with sisters $*n$, $\beta$ and $\beta$ is an interpretable expression of type $\langle a_1 \langle \ldots \langle a_n, t\rangle\rangle\rangle$, $1 \leq n$, $\gamma$ is an interpretable expression of type $a$, then
1) if $[\![\beta]\!]^{M,g} \in D_{\langle a_1 \langle \ldots \langle a_n, t\rangle\rangle\rangle}$, $[\![\alpha]\!]^{M,g} =$ (as above)
2) if $[\![\beta]\!]^{M,g} = \phi$, $[\![\alpha]\!]^{M,g} = \phi$

c. If $\alpha$ is a branching node with sisters $\beta, \gamma$, where $\beta$ is an interpretable expression of type $\langle a_1 \langle \ldots \langle a_n, t\rangle\rangle\rangle inT^*$, $1 \leq n$, and $\gamma$ an interpretable expression of type $a_1 \in T^*$, then
1) if $[\![\beta]\!]^{M,g} \in D_{\langle a_1 \langle \ldots \langle a_n, t\rangle\rangle\rangle}$, $[\![\gamma]\!]^{M,g}$ in $\mathcal{R}_a$, $[\![\alpha]\!]^{M,g} =$ (as above)
2) if $[\![\beta]\!]^{M,g} = \phi$ or$[\![\gamma]\!]^{M,g} = \phi$, $[\![\alpha]\!]^{M,g} = \phi$

this to future research.[8]

### 4.1.3 ACs as pluralities

I propose that all ACs have their extensions in $\mathcal{R}$, i.e. ACs with conjuncts of type $a'$ denote the sums of the conjunct denotations.

I take the strongest syntactic stance here (in terms of both LF- syntax and pre-LF-syntax), arguing that *and* is simply the phonological reflection of a particular structural configuration – parallel syntactic structures of identical plural types (as also suggested in the (otherwise completely distinct) treatments of ACs by Jackendoff (1977), Winter (1995, 1998)).

[8]The language above does not contain any plural variables. We usually associate variables with both silent as well as phonologically realized material: I.e. we have bound and free variables corresponding to silent material: Traces, PRO, etc. on the one hand, cover variables (cf. Schwarzschild (1996)), *pro* in reciprocals (cf. Heim et al. (1991b,a)) etc. on the other. We further have Bound and free variables corresponding to phonological strings: Bound pronouns on the one hand (cf. Reinhart (1983)), free pronouns on the other. In the following sections, the only variable I will be discussing are traces. I briefly point out some of the problems that might arise for the system concerning those cases I don't discuss.

Kamp and Reyle (1993), Reinhart (1997) argue that pronouns can be bound by pluralities, as illustrated in the examples in (i): (ia) has a construal were the porters broke a table that they carried collectively, (ib) (modelled after examples in Heim (2008)) a construal where the boys, as a group and the girls, as a group were a assigned a homework and where the group of boys did theirs but the group of girls didn't. (ic), finally, is self-explanatory. There is no straightforward derivation of these facts in the present system (but see my discussion in section 5.1).

(i) a. The / Three porters broke a table they carried. (Reinhart 1997:(86))
b. Only the boys did their homework.
c. Only the boys believe that they will meet in the bar.

Free pronouns can be assigned pluralities, as shown in (ii). Whether this is compatible with the present system depends on our analysis of pronouns: Proposals which attribute complex DP- structures to pronouns (as in Elbourne (2005)) or (hypothetical) proposals where a pronoun could correspond to syntactically complex object involving *AC* of variables would render an implementation possible. This extends to silent free pronouns in reciprocal constructions.

(ii) a. The children were happy. They smoked and danced all evening.
b. John, Peter and Sue were happy. They smoked and danced all evening.

Finally, I raise the question of whether there are free plural variables of type other than $e$. (iiia) might be analyzed as a free plural pronoun of type $\langle et \rangle$ – but alternative accounts exists (cf. in particular Chierchia and Turner (1988)). Further, some have argued that VP-ellipsis involves a silent pronoun of the type of the elided constituent (cf. Hankamer and Sag (1976), Hankamer (1978), Fiengo and May (1994) a.o. for discussion). If this analysis should turn out to be correct and if this pronoun is free rather than bound (cf. in particular Haïk (1987) for a related discussion). Both (iiia) and (iiib) allow for weak construals which would be mean that the variable is assigned a plurality (see below). The final case concerns Schwarzschild's 1996 cover variable and the question of whether it should range over sets of objects other than those of type $e$. Wagner (2010) (cf. also Winter (2007)) shows that that prosodic segmentation has an impact on the available construals of plural sentences, (iiic) and that this impact can be found for prosodic segmentation of ACs of all types, (iiid). If these data are explained by appealing to pragmatic covers, then we need we require covers for pluralities of all types.

(iii) a. The boys actually did *that* – sing and dance.
b. The boys sang and danced. The girls did, too.
c. John | and Mary ||and Sue danced and smoked, respectively.
d. John and Mary danced | and smoked || and sang, respectively..

(15) a. SYNTAX + If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expression of type $a \in T^{0*}$ then $\alpha$ is an interpretable expression of type $a$.

b. SEMANTICS + If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a \in T^{0*}$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} + [\![\gamma]\!]^{M,g}$

Given (15), both $\beta$ and $\gamma$ must either be branching nodes with daughters $R$ and a daughter $C$ which is an interpretable expression of type $a$, (16), or themselves be ACs. Note that $R$ here can be seen as the semantic counterpart of abstract plural morphology on the individual conjuncts.[9] The structures in (16) correspond to the strings *John and Mary*, *sing and dance* and *hit and molest*.

(16) a. $[\![\text{R(John) R(Mary) }]\!] \in \mathcal{R}_e = \rho(\{j'\}) + \rho(\{m'\})$

b. $[\![\text{R(sing) R(dance)}]\!] \in \mathcal{R}_{\langle et\rangle} = \rho(\{\lambda x.S'(x)\}) + \rho(\{\lambda x.D'(x)\})$

c. $[\![\text{R(hit ) R(molest)}]\!] \in \mathcal{R}_{\langle et\rangle} = \rho(\{\lambda x.\lambda y.H'(x)(y)\}) + \rho(\{\lambda x.\lambda y.M'(x)(y)\})$

Before I turn to the obvious question, namely, how to interpret such a plural object in the context of other expressions, I very briefly the empirical status of (15): Its general compatibility with (pre-LF) syntactic considerations - after all (15) rids *and / or* of their status as a morpheme – and the question whether (15) is underspecified. The most crucial question – the status of OCs – is postponed to section 5.2 below. Note that a conception of *and* in terms of a polymorphous operator would also be compatible with the main goals in this chapter, but I believe (15) to be a more interesting formulation.

In particular, it is syntactically plausible. First, it allows for coordinate structures to be truly symmetric, which is the (implicit or explicit) desideratum of several syntactic theories aiming to derive the particular syntactic properties of coordinations from their specific syntactic status as parallel structures or at least develop their analysis on the basis of such a structure (cf. Jackendoff (1977), Williams (1978), Goodall (1987), Moltmann (1992) a.o.).[10]

Second, it rids us of the obligation to assign a particular syntactic role to the coordinating

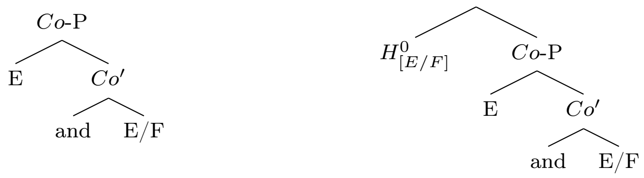
[9] This might be compatible with syntactic theories such as McKinney-Bock and Vergnaud's 2010, Prinzhorn and Vergnaud's 2010 where coordinates have a particular feature that indicates them as the syntactic parts of a coordinate structure. There is some question whether we expect this feature to be realized by overt morphology, and whether languages exhibit bisyndectic coordination (as discussed in Haspelmath (2007)) could be seen as doing just that, but since I am unclear about the actual status of this feature, any speculation here would be useless.

Bisyndetic coordination in otherwise monosyndetic languages such as French where doubling of the coordinating element seems to emphazise a particular reading of the coordinate structure, Ross (1967) *John et Pierre sont arrivés* (John and Pierre arrived) vs. *Et Jean et Pierre sont arrivés* (Both Jean and Pierre arrived), or *Jean ou Pierre vais m'appeler.* (Jean or Pierre will call me) vs. *Ou Jean ou Pierre vais m'appeler* (Either Jean or Pierre will call me) is probably an unrelated phenomenon, see my discussion of stressed *and* in chapter 3 above.

[10] Some of the phenomena that Ross (1967) considers distinctive of coordinate structures are also found in other constructions: We find ATB-movement in copular clauses , Heycock and Kroch (1999), Moro (1997) and possibly in other structures, Huybregts and Riemsdijk (1985), further (I don't think this has been noted so far) we find right-node-raising in copular clauses, as in (ib) from German, and also, as pointed out to me by Henk van Riemsdijk, in other structures, (ic). I leave open what this could mean for the syntactic analysis of such structures (cf. in particular Huybregts and Riemsdijk (1985)).

element itself. In most accounts that do not assume parallel structures, *and* is treated as a syntactic head which, at least in a subset of such analyses, projects to the top node of the coordinate structure (as in the tree on the left in (17), cf. Zoerner (1995) Johannessen (1998) a.o.). Therefore, any coordinate structure, irrespective of the syntactic category of the coordinates, is a syntactic object of a different category which I here term *Co*-P. This, however, is incompatible with the fact that a coordinate structure with conjuncts of category *E* or categories *E* and *F* is licensed in exactly the same syntactic contexts where *E* or both *E* and *F* are licensed. Further, if *and* / *or* are syntactic heads, they should *c*-select the coordinates as their complement, and (depending on the theory of course) the specifier. Again this seems implausible, as *and* / *or* prove to be completely transparent concerning selection, which means that if there is higher syntactic head *H*, which selects the coordinate structure as such, the possible category of these conjuncts depends completely upon the selection properties of *H* (see the tree on the right in (17)).

(17)




If *and* is not a head and does not select, and the category of the coordinates must simply meet the c-selectional requirements of the embedding head, we can account for Ross's 1967 observations that the coordinates have to be of the same syntactic category and that this generalization can be violated (as long, of course, as the semantic category is identical): If the embedding head *H* only selects for category *E*, then, if it embeds a coordinate structure, all coordinates have to be of that category. $D^0$ in (18a) (from German) *c*-selects for NP only (arguably, cf. Kayne (1994) for a different position), hence a (predicative) PP of type $\langle et \rangle$ (omitting reference to plural types here) cannot be conjoined with an NP of type $\langle et \rangle$ (but see below for the assumption that PPs are of type $\langle et \rangle$). On the other hand, if there is no embedding head *H* with *c*-selectional requirements, any two phrases can be conjoined, as long as they are of the same semantic category: following Partee (1986), *be* does not impose any c-selectional requirements, accordingly, a predicative adjective and an NP can be conjoined in (18b) (again from German). Similarly, if *H* selects for both categories *E* and *F*, *E* and *F* may be conjoined (if of the same type). Possibly, (18c) can count as an example for this latter case.

---

(i) a. [Which city]$_i$ is your opinion of $t_i$ my opinion of $t_i$? (Heycock and Kroch 1999:378 (fn.9))
b. Welche Aktion gegen ___ ist eigentlich eine geheime Hilfeleistung für Romney?
which action against is in-fact a secret help for Romney
'Which action against is actually an action for Romney?'
c. Der Mann neben ___ erschoss den Mann hinter dem Auto.
the man next-to shot the man behind the car
'The man next to the car shot the man behind it.'

(18) a. *Ein [[$_{NP}$ Faschist] und [$_{PP}$ aus München]] kam rein.
A fascist and from Munich came in
'* A fascist and from Munich came in.'

b. Hans ist [[$_{NP}$ Faschist] und [$_{PP}$ aus München]].
Hans is fascist and from Munich
'Hans is a fascist and from Munich'

c. They revealed [[$_{DP}$ the winner of the contest] and [$_{CP}$ that the President of the association would hand out the prize in person]].

(Roelofsen and Aloni 2008:(12))

Note that even if *and* is not treated as a head that selects both a complement and a specifier (as in Munn (1993), Kayne (1994)) and hence does not necessarily project to the top node of the coordinate structure (as in Munn (1993)), it will introduce an asymmetry between the conjuncts which is incompatible with what I just stated above and with the examples in (18): For a coordinate structure *E and F* such a view predicts that a higher head *H* will either exclusively target the category *E* or exclusively the category *F* (which one, depends on the particular formulation of this view).[11]

Obviously, proponents of any of these asymmetric theories might reply that the alternative I propose here, or, similarly, the proposals by Jackendoff (1977), Winter (1995, 1998), have a crucial weakness: the statement that *and* is a phonologically reflection of a particular syntactic configuration is completely opaque and obviously neither I, nor Jackendoff, nor Winter can say what exactly is meant by it. I do not worry about this too much, however, for a simple reason: as far as I am aware, noone has yet offered a satisfactory explanation of even the most basic facts about coordinating elements– such as optional deletion of these elements between all conjuncts but the last (cf. Ross (1967), see Winter (2007), Wagner (2010) for the distributional restrictions on *and/ or*-deletion).[12]

(19) John (and) Peter and Mary were crying.

Concerning underspecification, a problem with (15) arises only in those proposals (cf. in particular Heim and Kratzer (1998)) where restrictive modifiers or at least a subset thereof are taken to have the same logical type as the expression they modify ("modifier" is used as

[11] Johannessen's 1998 proposal, where the coordinating elements selects both a complement and a specifier ends up being very similar to such a claim, as this head does not properly project, so that the category of the first conjunct ends up being the category of the entire structure. Munn (1993) argues that (i) corroborates this claim, however, I have serious doubts about the generality of these examples, in fact I doubt that they are coordinate structures at all, as they look a lot like specificational constructions (for the latter cf. Higgins (1972)): in German *und* can be replaced by *und zwar*, in English *and* by *namely* or *in particular*, the second conjunct must contain a pronoun co-referring with the DP in the first conjunct and *and* cannot be replaced with *or*.

(i) a. You can depend on [ [$_{DP}$ my assistant] and [$_{CP}$ that he will be on time] ]. (Munn 1993:(2.87b))
b. *You can depend on [$_{CP}$ that my assistant will be on time]. (Munn 1993:(2.88b))

[12] Optional complete deletion of these elements in extraposed or adjunct position, Hartmann (to appear), is another unexplained fact.

a syntactic term here, it refers to an adjunct or specifier of a lexical head or its extended projection). The adjective, relative clause and PP in (20) could be taken to denote expressions of type $\langle et \rangle$, just as the expression denoted by *man*. Therefore, one would expect these structures be to interpreted according to (15) above, i.e. to denote a sum (of $(\rho(\{[\![\text{old}]\!]\}) + \rho(\{[\![\text{man}]\!]\})$ etc.) and thus, following the general line of argument in this chapter, to behave like a plurality – which they clearly don't, as the contrasts in (20) and (21) show.[13] In other words, the problem which arises from such a view is that coordinate structures and modifier structures, although certainly distinct in terms of pre-LF-syntax (cf. in particular Prinzhorn and Vergnaud (2010),McKinney-Bock and Vergnaud (2010)), are indistinguishable at LF.[14]

(20) a. An old man entered the room.
b. A man that I vaguely knew entered the room.
c. A man from Dinslaken entered the room.

(21) a. Every man and woman died of scurvy. # The (young) men survived.
b. Every young man died of scurvy. The old men survived.
c. Every man that I knew died of scurvy. The ones I didn't know survived.

(22) a. All the evil and mediocre men died of scurvy. # The evil geniuses survived.
b. All the evil, mediocre men died of scurvy. The evil geniuses survived.

There are two equally plausible ways out of this potential problem. The choice of which one is to serve as an explanation hinges on one's preferred view of the semantic analysis of modifiers.

On the one hand, one could simply refute the assumption that modifiers have the same type as the expression they modify, but rather, that for any expression $a$, the modifier is an expression $\langle a, a \rangle$ (which corresponds to the semantic notion of a modifier). Such a position is more or less standard for adjectives (cf. Montague (1970b), Kamp (1975), but cf. Partee (in press)) and is also the one taken by (Montague 1970b:393f) for restrictive relative clauses. Arguably, it could be extended to attributive PPs.[15]

If, on the other hand, type identity is not ruled out, one could assume that the difference between coordinate structures and modifier structures has to do with the difference

[13] Another difference is that restrictions on linear order and / or hierarchical ordering are found in modifier, but not in coordinate structures. This particularly evident in the case of adjectives, which are known to display strange ordering restrictions, Riemsdijk (1989)), (i).

(i) a. This big red car ? The red big car
b. This big and red car This red and big car

[14] One could assume this syntactic difference, whatever it turns out to be, makes the two constructions LF-distinct, which would probably mean that the LF-syntax must be more articulate. I do not pursue this possibility here, as I have not found sensible syntactic implementation of the above-mentioned authors' intuition that in coordinate structures, none of the sisters projects, while in all other structures, one sister projects while the other doesn't.

[15] As pointed out to me by Ede Zimmermann, Montague does not only view relative clauses, but also PPs, as semantic modifiers, however, his discussion in Montague (1970a) is limited to PPs that occur, syntactically, as complements of verbs.

between pluralities and singularities: whereas modifier structures involve coordinates of the same singular type, *and*- coordinations involve coordinates of the same plural type, and this distinction is indicated by the absence / presence of *and*. The rule for the singular – i.e. for modifier structures, which would then have to involve simply standard intersective conjunction, (23), where $\sqcap$ is defined as in chapter 3 above (which Heim and Kratzer's 1998 predicate modification is, of course, a special instance of), whereas the rule for the plural is (15) above.

(23) a. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta, \gamma$ are both interpretable expressions of type $a \in TC$, then $\alpha$ is an interpretable expression of type $a$.

b. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta, \gamma$ are both interpretable expressions of type $a \in TC$, $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} \sqcap [\![\gamma]\!]^{M,g}$.

### 4.1.4 Interim summary

I set up a language where plural and singular expressions have their denotations in different semantic domains, the plural domain acting as a kind of shadow domain, mirroring the layers of our standard ontology. Plural expressions are syntactically derived expressions and plural denotations are derived semantic objects. So far, I identified two types of plural expressions, i.e. expressions with a denotation in the plural domain: Definite DPs and ACs. In the following, I turn to the question of how they are actually interpreted.

## 4.2 Cumulativity

Consider first sentential AC. According to (15) above, (24) denotes an object in $\mathcal{R}_t$.

(24) John is a pervert and Mary is a fascist.

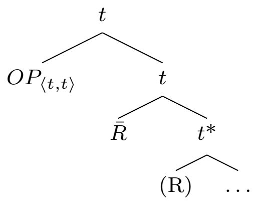
$D_t$ contains two objects, called here 1 and 0. $\mathcal{R}_t$ is isomorphic to $\wp(D_t)\backslash\{\emptyset\}$, hence isomorphic to $\{\{1\},\{0\},\{1,0\}\}$.[16] Now assume, as a first approximation, that any *matrix* CP containing a plural (or, for English possibly $TP$) has, as its highest element (below sentential operators, see below) the operator $\bar{R}$ (a slight revision is given below). There are two possibilities how to implement this stipulations: Either $\bar{R}$ is obligatory, in this case, we require optional insertion of $R$ in all those cases, where its complement (matrix CP) is of type $t$ rather than $t*$.[17] Or else, $\bar{R}$ is optional, applying to all nodes of type $t*$. For the moment, I remain undecided.[18]

[16]Belnap's 1977 four-valued logic has all four elements of $\wp(D_t)$: *true* ($\{1\}$), *false* ($\{0\}$), *none* ($\emptyset$), *both* ($\{0,1\}$), i.e. his so called "approximation lattice", as opposed to $\mathcal{R}_t$ above has a 0-element. Note, however, that Belnap's 1977 logic is not ontic, but rather epistemic (and dynamic): the value of a proposition $p$ correspond to an epistemic or informational state about $p$, hence Belnap' $p$ is assigned *true* in case (all) the information available is that $p$ is true, *false* in case (all) the information available is that $p$ is false, *both* in case the information is inconsistent and *none* if there is no information.

[17]This would make CPs analogous to DPs, which could seem desirable if CPs and DPs are indeed parallel (cf. Szabolcsi (1984) a.o.). Except, of course, that CPs must be singular, whereas DPs can be singular.

[18]Note that the asymmetry between matrix $S$ and embedded $S$ is annoying, but not unheard of. Many syntactic theories (and particular derivational ones, as in Chomsky (2001)) must assume such an asymmetry.

(25)




$\bar{R}$ yields a value in $D_t$ for the two objects in $AT_t \subseteq \mathcal{R}_t$, but no value in $D_t$ for the bi-atomic sum that is the image under $\rho$ of $\{0,1\}$.[19] Accordingly, sentences that denote a non-atomic plurality in $\mathcal{R}_t$ don't have truth-value – they are, so to speak, irreducibly plural, or, using the terminology from above, unvalued. For sentential AC, this derives what I subsumed under the broader notion of homogeneity in chapter 3 above: If both conjuncts are true, we obtain $\bar{R}(R(1) + R(1)) = 1$, if both conjuncts are false, $\bar{R}(R(1) + R(1)) = 1$, and if one conjunction is true and the other false, we obtain the plurality $R(1) + R(0)$, and $\bar{R}(R(1) + R(0)) = \phi$.

As the next step, consider embedded pluralities. I schematically represent the observed truth-conditions for sentences with one plurality, (26), (27) and for a sentence with two pluralities, (28)

(26) a is P and Q

a. 1 if $P'(a') = 1 \wedge Q'(a') = 1$

b. 0 if $(P'(a') = 0 \wedge Q'(a') = 0$

c. unvalued otherwise.

(27) a and b are P

a. 1 if $P'(a') = 1 \wedge P'(b') = 1$

b. 0 if $(P'(a') = 0 \wedge P'(b') = 0 \wedge Q'(a') = 0 \wedge Q'(b') = 0)$

c. unvalued otherwise.

(28) a and b are P and Q

a. 1 if $(P'(a') = 1 \wedge Q'(b') = 1) \vee (Q'(a') = 1 \wedge P'(b') = 1)$

b. 0 if $(P'(a') = 0 \wedge P'(b') = 0 \wedge Q'(a') = 0 \wedge Q'(b') = 0)$

c. unvalued otherwise.

In the following I derive these truth-conditions by generalizing the notion of cumulativity, as discussed in chapter 2, and implementing it in the present system. Recall that cumulativity refers to the observation that properties of parts of a plurality are inherited by the plurality itself and, likewise, properties of $n$-tuples of parts of pluralities are inherited by the $n$-tuple of pluralities themselves (see chapter 2 above and cf. Link (1983), Krifka (1986), Sternefeld (1998)). In a way, this is just what I want for the cases above – except that we are now dealing with all kinds of objects – and, further, with a system where the plural domain is distinct from the functional, i.e. the singular domain.

[19] In order to avoid confusion, I should stress that sums here are not arithmetic sums.

I extend the basic notion of cumulativity to pluralities of all types by proposing that all pluralities – i.e. all standard plurals and all ACs, occur as arguments of (higher-order) $n$-ary relations. These predicates are derived syntactically by an operation which, first of all, must be ordered after all other syntactic operations and second, violates all standard syntactic constraints on movement and constituency. I admit that the assumption of such an operation is questionable, but emphasize that both properties – operations violating constraints on movement and operations violating constituency – can be observed independently when considering plurals and AC. Concerning locality, recall that section 2.3 showed that we find cumulative construals for predicates that aren't the denotations of lexical heads but rather seem to correspond to denotations of derived constituents and that further the derivation of these constituents does not adhere to standard locality restrictions. However, as the subsequent section 4.3 will show, the syntax of plurals does indeed adhere some locality restrictions albeit they are not amongst the ones we find in standard overt and covert syntax.

Concerning constituency, the operation I propose here will have to target non-constituents such as *came before and left after* in (29). However, all instances where such non-constituents are targeted involve *right-node-raising* (RNR) and it seems to me (as it has to others, partially different reasons, cf. in particular Perlmutter and Ross (1970), Jackendoff (1977), McCawley (1988), Wilder (1999)) that RNR-structures can simply not be accounted for by our standard view of constituency. None of the cases in (30) from German and English (the latter similar to examples discussed by Jackendoff (1977)) can be analyzed by assuming that material in italics is simply phonologically elided in the first conjunct or has moved from all coordinates ATB – which would be the only two mechanisms by means of which the discontinuous surfaces structure could be tracked back to a structure with standard constituency.[20]

(29) John [$_?$ came before and left after] [Sue and Mary] (respectively).

(30)
a. Strangely enough, Peter worked for and was paid by *different agencies.*
b. Der Hans ist ein Schwein. Er schreibt an und knutscht mit *verschiedenen Frauen.*
   the Hans is a pig. he writes to an makes-out with different women
   'Hans is a bastard. He writes to and makes out with different women.
c. Hans, der alte Opportunist, arbeitet für und lobbyiert gegen *die gleiche Firma.*
   Hans this old opportunist works for any lobbies against the same company.
   'Hans, this old opportunist, works for and lobbies against the same company.'
d. John is engaged to and Fred is dating *their respective high-school sweethearts.* (Gawron and Kehler 2002:(5b))

[20] An ellipsis analysis for RNR is proposed by Hartmann (2000), an analysis in terms of RNR by Sabbagh (2007). For more discussion of *different* and *respective* cf. Beck (2001) and Gawron and Kehler (2002). A connected problem might be plural agreement in such configurations as addressed in Postal (1998), Yatabe (2003), Grosz (2009).

I see no way around having to posit this syntax at the present stage: A more elegant solution, where we do not view all pluralities as arguments and accordingly do not have to derive (higher-order) $n$-ary relations, but where pluralities of functions occurring as functors remain functors eludes me.[21]

Concerning the implementation of our basic notion of cumulativity into the language outlined in the previous section, recall that the implementation of cumulativity *qua* the * (or $*^n$)-operator that I discussed in chapter 2 rested on the assumption that pluralities are part of the functional structure: In light of a more general notion of plurality, this means that any functional domain $D_{\langle a,t\rangle}$ corresponds to the set $\wp(*D_a)$, where $*D_a$ is the set of all atoms of type $a$ closed under sum. Applying the *-operator to a predicate with an extension $S \subseteq *D_a$ meant mapping $S$ to the smallest set $S' \subseteq D_a$, such that $S \subseteq S'$ and for every $a, b \in S', a \oplus b \in S'$. Accordingly, the *-operator (and also the r $*^n$-operator) are defined on

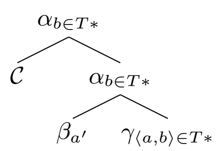
[21] This is how we would have to proceed: Any sister of a plural is shifted to plural type by application of $R$. Combining a functor plurality with an argument plurality will yield yet another plurality, combination must be w.r.t. a contextually provided set introduced by a variable $\mathcal{C}$, which restricts the possible values of the mother node and, crucially, encodes cumulativity.(An related alternative would be an adaptation of Gawron and Kehler's 2004 analysis for *respectively* and its silent correlate RESP in terms of a compositional rule, where both pluralities of are mapped to sequences of atoms (by some contextually provided mapping) and the $i$-th member of the first sequences combines with the $i$-th member of the second sequence.) If encoded in the compositional rule, as in (ii), $\mathcal{C}$, however, is not an expression of the object language, hence its status is unclear.

(i) a. Let $\alpha$ be a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a'$ and $\gamma$ is an interpretable expression of type $\langle a,b\rangle'$, then $\alpha$ is an interpretable expression of type $b'$.

b. Let $\alpha$ be a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a'$ and $\gamma$ is an interpretable expression of type $\langle a,b\rangle'$, then $[\![\alpha]\!]^{M,g} = +\{f(x)\} : \rho(f) \leq_{AT} [\![\gamma]\!]^{M,g}, \rho(\{x\}) \leq_{AT} [\![\beta]\!]^{M,g} \wedge \langle f,x\rangle \in \mathcal{C}, \mathcal{C} \subseteq D_{\langle a,b\rangle} \times D_a \wedge \{y | \exists g[\rho(\{g\}) \leq_{AT} [\![\gamma]\!]^{M,g} \wedge \langle g,y\rangle \in \mathcal{C}\} \subseteq \rho^{-1}([\![\beta]\!]^{M,g}) \wedge \{g | \exists y[\rho(\{g\}) \leq_{AT} [\![\beta]\!]^{M,g} \wedge \langle g,y\rangle \in \mathcal{C}\} \subseteq \rho^{-1}([\![\gamma]\!]^{M,g})$

If represented in the object language, (ii), $\mathcal{C}$ is a standard variable which is either free (in which case it is strongly reminiscent of Schwarzschild's 1996 *paired covers* and a plural sentence would be multiply referentially ambiguous) or existentially bound, most probably at the sentential level. Both is strongly reminiscent of pragmatic weakening, as discussed in chapter 3. The downside of such a proposal is that once we we introduce a plurality in the derivation, every subsequent derivational step will require such a variable $\mathcal{C}$ (and most of these values will range over different sets). Note further that the desired strict compositionality isn't achieved here, either: first, we need to employ variables, and second, the required make-up of these variables cannot be derived locally, as becomes evident in (iiib).

(ii)




(iii) a. Let $\alpha$ be a binary-branching node with daughters $\beta, \gamma$, where $\beta$ is an interpretable expression of type $a \in T^0*$ and $\gamma$ is an interpretable expression of type $\langle a,b\rangle \in T^0*$, then $[\![\alpha]\!]^{M,g} = +\rho(\{f(x)\}) : \rho(f) \leq_{AT} [\![\gamma]\!]^{M,g}$

b. Let $\alpha$ be a branching node with daughters $\mathcal{C}$, $\beta$, where $\beta$ is an interpretable expression of type $b \in T^0*$ and where $\beta$ is a binary-branching node with daughters $\gamma, \delta$, where $\gamma$ is an interpretable expression of type $a \in T^0*$ and $\delta$ is an interpretable expression of type $\langle a,b\rangle \in T^0*$ and $g(\mathcal{C})$ is a set $S \subseteq D_{\langle a,b\rangle} \times D_a$, then $[\![\alpha]\!]^{M,g} = \rho(\{m(y) | \langle m,y\rangle \in \mathcal{C}\} \cap \{\rho^{-1}(X) | \rho(\{X\} \leq_{AT} [\![\beta]\!]^{M,g} \})$

the basis of the plural structure of the argument domain – every starred extension is a sub-(semi)-lattice of the semi-lattice $*D_a$. In the language above, on the other hand, pluralities are not part of the singular ontology , but live in a shadow domain. What I propose here, informally speaking, is that we simulate properties of pluralities by adding together the values that the function yields for every atom of the plurality. I.e. for every atom, we check whether it has the property in question, if so, the value is 1, if not, the value is 0, and adding all these values together will either yield an atomic truth value-plurality (corresponding to 1, if every atom in the plurality has the property in question, corresponding to 0 no atom has the property) or a non-atomic truth-value plurality (if some atoms have the property and some don't), which means that the sentence is unvalued. For $n$-ary relations P, with $n > 1$, where $P \subseteq D_{a1} \times \ldots \times D_{an}$, $D_{a1}, \ldots D_{an} \subseteq D$, we consider the P as relativized to $D'_{a1} \times \ldots \times D'_{an}$, where $D'_i = \rho^-(X_i)$, such that $X_i$ is the denotation of the $i$-th plural argument (or the $i$-th coordinate) of $P$ (with $1 \leq i \leq n$), we then check for each atom $Y$ of each plurality $X_i$ occurring as the $i$-th argument whether $Y_i$ occurs in the $i$-the coordinate of some element of P relativized to $P \subseteq D'_{a1} \times \ldots \times D'_{an}$. We map it to 1 if it does and to 0 if it doesn't, and eventually add up all the values. This yields 1 as a sum just in case for every $X_i$, every atom $Y$ of $X_i$ is in the relation in question with some atomic elements of the other pluralities, 0 if, for every $X_i$, no atom of $X_i$ is in the relation in question with any atomic elements of the other pluralities, and unvalued otherwise. The effect of all of this is, of course, not that different from standard cumulation. The only changes are (i) that the notion of plurality and therefore cumulativity is extended to all domains and (ii) that homogeneity is built into the system.

In the following, I outline of the proposal. I give the rules for deriving sentences with $n$-many pluralities in them ($1 \leq n$), but my actual discussion is mainly limited to sentences with at most two pluralities. I then discuss the issue of embedded pluralities.

### 4.2.1 The basic cases

As stated above, all pluralities $X$ from $\mathcal{R}_a$ are treated as arguments. I first discuss the nature of the function they occur as an argument of and then the question how the required LF-constituents are derived. To ease the exposition, I write $a - n$ to indicate that the $n$-th argument of a function is of type $a - n$, where $a - n \in T \cup T^{0*}$ , further, I assume that $a - i, a - j, i \neq j, 1 \leq i, j \leq n$ will correspond to different arguments of a function, but not necessarily to different objects in $T \cup T^{0*}$. I shorten complex types of functions with $n$-many arguments to $\langle a - 1 \langle \ldots \langle a - n, b \rangle \rangle$, analogously so when characterizing the semantic domain of a function with $n$-many arguments, which I shorten to $f : D_{a-1} \to \ldots \to [D_{a-n} \to t]$.

The basic idea in extending functions $f$ with a co-domain in $D_t$ to plural arguments is that the value of such an extended function is the sum of the singular function applying to the atoms of the plurality. I propose that this is done for every $n$, $n$ the number of arguments of a function with a co-domain in $D_t$, by an polymorphous operator I call $*n$. In analogy to what I discussed in chapter 2 w.r.t. standard cumulation (cf. in particular Sternefeld

(1998)), for every $i, j$, $i \neq j, 1 \leq i, j$, $i* \neq j*$. Consider first functions with a single argument, i.e. functions $f : \mathcal{D}_a \rightarrow \mathcal{D}_t$. These are shifted by 1* to functions $g : \mathcal{R}_a \rightarrow \mathcal{R}_t$, as shown in (33). The set of types $T^{0}*$ is extended to $T^*$, as are the plural domains, (31), the required extension of the syntax and the semantics of the language is given in (32).[22](33b) states that we sum up the values of the function applying to the atoms of the plurality. As shown above, that sum is reducible to a value in $D_t$ only if all atomic parts of the plurality are mapped to 1 or all the atomic parts of the plurality are mapped to 0.

(31) a. The set of types $T^*$ is the smallest set such that if $a$ is a member of $T$, $a*$ is a member of $T^*$ and, for any $a \in T, b \in T*$, $\langle a*, b\rangle \in T^*$.
b. $\mathcal{R}_a$ is the set of all pluralities $X$, such that for all $Y \leq_{AT} X \downarrow (\rho^{-}(Y) \in D_a)$. $\mathcal{R}_a \times \mathcal{R}_b$ is the set of all functions from $\mathcal{R}_a$ to $\mathcal{R}_b$.

(32) a. If $\alpha$ is a branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T \cup T^*$ and $\gamma$ is an interpretable expression of type $\langle a, b\rangle \in T \cup T^*$, then $\alpha$ is an interpretable expression of type $b \in T \cup T^*$.
b. If $\alpha$ is a branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T \cup T^*$ and $\gamma$ is an interpretable expression of type $\langle a, b\rangle \in T \cup T^*$, then $[\![\alpha]\!]^{M,g} = [\![\gamma]\!]^{M,g}([\![\beta]\!]^{M,g})$.

(33) a. If $\alpha$ is a branching node with daughters 1*, $\beta$, where $\beta$ is an interpretable expression of type $\langle a, t\rangle$, then $\alpha$ is an interpretable expression of type $\langle a*, t*\rangle$.
b. If $\alpha$ is a branching node with daughters 1*, $\beta$, where $\beta$ is an interpretable expression of type $\langle a, t\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function $f : \mathcal{R}_a \rightarrow \mathcal{R}_t$ such that for any $X \in D_a, f(X) = +\rho(\{f(Y)\}) : \rho\{Y\} \leq_{AT} X$.

If a sentence contains $n$-many pluralities of type $a-1, \ldots a-n \in T^*$, the required basic function corresponds to a relation with elements from $D_{b-1} \times \ldots \times D_{b-n}$, with $a - 1 = b-1*, \ldots a-n = b-*n$ i.e. a function $f : D_{b-1} \rightarrow\rightarrow \ldots \rightarrow [D_{b-n} \rightarrow D_t]]$. Each function with $n$-many arguments is shifted by the corresponding operator $n^*$. For illustration consider first $2*$ which turns a function $f : D_{a-1} \rightarrow [D_{a-2} \rightarrow D_t]$ into a function $g : \mathcal{R}_{a-1} \rightarrow [\mathcal{R}_{a-2} \rightarrow \mathcal{R}_t]$, (34). Here, we form the sum of singular relations: we check for every atom in plurality 1 whether there is an atom in plurality 2 such that the relation holds of these atoms, mapping that atom to 1 if there is and to 0 if not, and, analogously *vice versa*, adding the values together. As the function value, this yields a sum reducible to 1 if for every atom of plurality I there is such an atom of plurality II and vice versa, a sum reducible to 0 if for no atom of

[22] An alternative strategy, which does not require an extension of the set $T^*$ is the syncategorematic rule, (i). However, this strategy cannot be extended to functions with more than one argument.

(i) a. If $\alpha$ is a branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a'$ and $\gamma$ is an interpretable is an interpretable expression of type $\langle a, t\rangle$, then $\alpha$ is an interpretable expression of type $t'$.
b. If $\alpha$ is a branching node with daughters $\beta$, $\gamma$ where $\beta$ is an interpretable expression of type $a'$ and $\gamma$ is an interpretable expression of type $\langle a, t\rangle$, then $[\![\alpha]\!]^{M,g} = +\rho(\{[\![\gamma]\!]^{M,g}(Y)\}) : \rho\{Y\} \leq_{AT} [\![\beta]\!]^{M,g}$.

plurality I there is such an atom of plurality II and vice versa and unvalued otherwise. The same strategy can be extended to $n$-place relations (functions with $n$-many arguments), as given in (35). Both (34) and (35) are added to the syntax and the semantics we have so far.

(34) a. If $\alpha$ is a branching node with daughters 2* and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle a-2,t\rangle\rangle$, then $\alpha$ is an interpretable expression of type $\langle a-1*\langle a-2*,t*\rangle\rangle$.

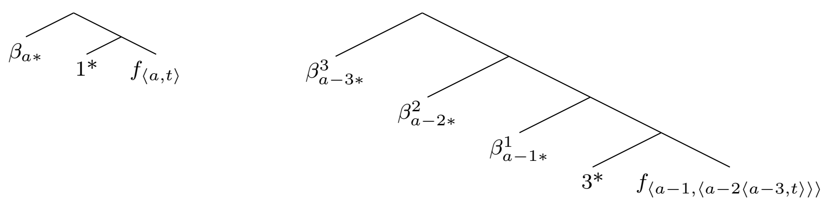
b. If $\alpha$ is a branching node with daughters 2* and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle a-2t\rangle\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function $f:\mathcal{R}_{a-1}\rightarrow[\mathcal{R}_{a-2}\rightarrow\mathcal{R}_t]]$, such that for any $X\in\mathcal{R}_{a-1}, Y\in\mathcal{R}_{a-2}$, $f(X)(X)=(+\rho(\{g(X_i))\}:\rho(\{X_i\})\leq_{AT}X, g=\lambda Z^1_{a-1}.\exists Y_i[\rho(\{Y_i\})\leq_{AT}Y\wedge[\![\beta]\!]^{M,g}(Z^1)(Y_i)+$
$(+\rho(\{g(Y_i)\}):\rho(\{Y_i\})\leq_{AT}Y, g=\lambda Z^2_{a-2}.\exists X_i[\rho(\{X_i\})\leq_{AT}X\wedge[\![\beta]\!]^{M,g}(X_i)(Z^2))$.

(35) a. If $\alpha$ is a branching node with daughters *n and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle\ldots\langle a-n,t\rangle\rangle\rangle$, then $\alpha$ is an interpretable expression of type $\langle a-1*\langle\ldots\langle a-*n,t*\rangle\rangle\rangle$.

b. If $\alpha$ is a branching node with daughters *n and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle\ldots\langle a-n,t\rangle\rangle\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function
$f:\mathcal{R}_{a-1}\rightarrow\ldots\rightarrow[\mathcal{R}_{a-n}\rightarrow\mathcal{R}_t]]$, such that for any $X_1\in\mathcal{R}_{a-1},\ldots,X_n\in\mathcal{R}_{a-n}$
$f(X_1)\ldots(X_n)=$
$=+(\rho(\{g(X^i_1)\})|\rho(\{X^i_1\})\leq_{AT}X_1, g=\lambda Z^1_{a-1}.\exists X^i_2,\ldots,X^i_n[\rho(\{X^i_2\})\leq_{AT}X_2,\ldots$
$\rho(\{X^i_{n\}})\leq_{AT}X_n\wedge[\![\beta]\!]^{M,g}(Z^1)(X^i_2)\ldots(X^i_n))+\ldots+$
$+(\rho(\{g(X^i_n\}))|\rho(\{X^i_n\})\leq_{AT}X^i_n, g=\lambda Z^n_{a-n}.\exists X^i_1,\ldots,X^i_{n-1}[\rho(\{X^i_1\})\leq_{AT}X_1,\ldots$
$\rho(\{X^i_{n-1}\})\leq_{AT}X_{n-1}\wedge[\![\beta]\!]^{M,g}(X^i_1)\ldots(X^i_{n-1})(Z^n))$.

The underlying structural assumptions are the following: For sentences with a single plural expression $\beta$, with $\beta$ is of type $a$*, $\beta$'s sister immediately dominates 1* and an expression of type $\langle a,t\rangle$, likewise, for sentences with $n$-many plural expressions $\beta_1,\ldots\beta_n$, with $\beta_1,\ldots\beta_n$ of types $a-1*\ldots a-*n$, $\beta_1,\ldots\beta_n$ occur in direct hierarchical succession, i.e. the highest plural expression $\beta_n$ is the sister of a node that immediately dominates the second highest plural expression $\beta_{n-1}$ and a node which immediately dominates the third-highest plural expression $\beta_{n-w}$ and so forth and the lowest plural expression $\beta_1$ is the sister of a node that immediately dominates *$n$ and a function of type $\langle a-1\langle\ldots\langle a-n,t\rangle\rangle\rangle$, (36) (I here use superscripts on $\beta$ to avoid a mix-up with the types).

(36)




The next question is how these LFs are derived from the surface structure. (37) and (38) give some simple examples on the left-hand side and the required basic functions (i.e. functions that form the input to $*n$) on the right-hand side.

(37) a. $[_{DP}$ John and Mary] left. $\Longrightarrow \lambda x_e$[left'(x)].
b. John is $[_{AP}$ old and stupid] $\Longrightarrow \lambda P_{\langle et \rangle}$ [is' (P)(John)]
c. John $[_V$ molested and insulted] Mary. $\Longrightarrow \lambda P_{\langle e \langle et \rangle \rangle}$ [P(Mary')(John') ]
d. John saw $[_{DP}$ every collector and every artist] $\Longrightarrow$
$\lambda \mathcal{P}_{\langle \langle et \rangle t \rangle}$ [$\mathcal{P}$ ($\lambda x$ [John' saw' $x$ ]) ]

(38) a. $[_{DP}$ John and Mary] hit $[_{DP}$ Bill and Sue] $\Longrightarrow \lambda x_e . \lambda y_e$[hit'(x)(y)].
b. $[_{DP}$ John and Mary] are $[_{AP}$ old and stupid] $\Longrightarrow \lambda P_{\langle et \rangle} . \lambda x_e$.[x is P]
c. $[_{DP}$ John and Mary] saw $[_{DP}$ every collector and every artist] $\Longrightarrow$
$\lambda \mathcal{P}_{\langle \langle et \rangle t \rangle} \lambda y_e$[$\mathcal{P}$ ($\lambda x$ [y' saw' $x$ ]) ]

Following Beck and Sauerland's 2000 treatment of standard plurals, I suggest that these constituents are derived by the standard syntactic operation of movement. Clearly, the required function does not always correspond to lexical elements, (39), furthermore *and* -coordinations occur with elements of any category, at any position in the clause. In other words, any operation that derives this predicate directly from surface structure will need (at least) the same number of stipulations.

(39) *Mary and Sue* said that Bill had *cried and cursed* (respectively).

The syntactic rule required must move a plurality to a position where it attaches to a sentential node (specified below) and leaves a variable of the type of the atoms in the position, which is subsequently abstracted over. Before introducing all else, I assume the following mapping between the pre-LF-syntactic operation movement and LF-configurations. (40a) is underspecified, as of yet, as I have not defined the relation of $c$ to the type of the moved element – it simply states that traces are interpreted as variables. (40b) introduces the *syntactic* correlate of abstraction, as induced by movement (cf. Heim and Kratzer (1998)). According to the syntactic rules given in section 4.1 above, $\beta$ in (40b) is interpretable expression.[23]

(40) a. Let $\alpha$ be a binary branching node with sisters $\alpha$, $\beta$, with $\gamma$ an interpretable expression of type $a \in T \cup T*$ and $\beta$ an interpretable expression of type $b \in T \cup T*$, then, if $\beta$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $c \in T$ and $\gamma$.
b. Let $\alpha$ be an interpretable expression of type $a \in T \cup T^*$, then, if $\alpha$ has moved from a constituent $\gamma$ to a position where it is the sister of node $\beta$, $\beta$ is branching

[23] I do not consider the question whether all types of syntactic movement are visible to LF. I do not think that there is any agreement about this in the syntactic literature (cf. for instance Williams (2003), Bobaljik and Wurmbrand (to appear) for discussion). Note that the rule, as stated, might derive the first clause of the CSC, i.e. that in a coordinate structure, no coordinate may move from this coordinate structure: if the variable left by movement is always a member of $T$, and never of $T*$, (15) cannot apply in such configurations. It does not derive the second clause, that in coordinate structure no element may move *from within* a coordinate, unless it moves from all coordinates.

node with daughters $\gamma$ and a tuple $\langle n, c\rangle$ where $n \in \mathbb{N}$ and $a$ is the type of the variable in the original position of $\alpha$.

As stated above the syntactic rule I am after here is blind to (standard) syntactic constituency: it targets any AC (as well as any standard plural) and therefore targets *came before and left after* in (41), which is not a constituent. It is furthermore blind to locality, i.e. restrictions on movement: deriving the required predicate for (42) will involve a serious (adjunct) island violation.

(41) John [$_?$ came before and left after] [Sue and Mary] (respectively).

(42) [John and Mary] are desperate because Sue [got married and moved to the US], respectively. $\Longrightarrow \lambda P_{\langle et\rangle}.\lambda x_e.$ $x$ is desperate because Sue $P$.

Further, the syntactic rule required must be distinct from and, crucially, bleed other types of movement, in particular, QR– another parallel to what I observed in chapter 2 w.r.t. standard plurals. Assume that $\mathcal{X}$ is a plurality of type $\langle\langle et\rangle t\rangle *$. Then, if $\mathcal{X}$ occurs in a surface position where objects of type $\langle\langle et\rangle t\rangle$ cannot be interpreted, it must first move to a position where they can. QR must leave a trace that is interpreted as a variable of type $e$. It cannot leave a trace that it is interpreted as a variable of type $\langle\langle et\rangle t\rangle$. If so, it could not be the correct representation of (38c) and would falsely predict (43) to only have an inverse-scope reading (assuming, in both cases, that the logical type of the verb is and remains $\langle e\langle et\rangle\rangle$). As a second step, $\mathcal{X}$ must move from its scope position, leaving a trace interpreted as a variable of type $\langle\langle et\rangle t\rangle$.

(43) Every cat and every dog chased some little animal.

Finally, the syntactic rule required must be such that all sentential operators that have scope over the position of the highest plural are external to the predicate we form. In other words, the predicates we derive must not include sentential operators that have scope over their highest argument. This is particularly relevant in the case of sentential negation, (44).

(44) $[\![\text{not}]\!]_{\langle t,t\rangle} = \lambda p_t.\neg(p)$.

These complication require a slight revision of the architecture I implicitly assumed above. I here give a pre-final version, which will be relativized to cycles in section 4.3. The language will still consist of LFs, i.e. binary branching structures where every node is an interpretable expression of the language. The changes in the system concern the question how, or rather, in how many steps, these LFs are derived. I now require two distinct levels where syntactic well-formedness is checked and where semantic categories, i.e. logical types, are visible: a level L1 where all nodes are considered w.r.t. the type of their atoms (and which, accordingly, is blind to the singular-plural distinction) and a level L2, strictly ordered after L1, which is sensitive to the plural-singular distinction. It is level L2 where expressions are assigned a meaning. In other words: L1 is simply a syntactic level of representation where we separate grammatical from ungrammatical structures, while L2 is the language, i.e. every L2-interpretable expression is an expression of the language. Note that this splitting up into levels seems tedious but patterns with theories that represent rule-ordering as a mapping between levels of representations (cf. Williams (1974, 2003)): each level L' has a set of well-formedness conditions (or constraints) and for any two levels L', L", where L" is ordered after L' (i.e. the rules corresponding to L" bleed the rules corresponding to L'), L" cannot introduce any well-formedness conditions that directly contradict those of L' (albeit not any structure that meet those conditions for L' meets those of L"). For the sake of brevity, I state the set of expressions that are both L1-well-formed and L2-interpretable only once, in (45). The set of L1-well-formed expressions, in addition to those in (45), is given in (46), the set of L2-interpretable expressions, in addition to those in (45), is given in (47).

(45) *Set of L1-well-formed and L2-interpretable expressions*

a. If $\alpha$ is a constant or variable of type $a \in T$, $\alpha$ is an L1-well-formed expression of type $a$.

b. If $\alpha$ a non-branching node and its daughter is an L1-well-formed expression type $a \in T$, then $\alpha$ is an L1-well-formed and L2-interpretable expression of type $a$.

c. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta$ is an L1-well-formed and L2-interpretable expression of type $a \in T$ and $\gamma$ an L1-well-formed expression of type $\langle a, b\rangle \in T$, then $\alpha$ is an L1- well-formed expression of type $b \in T$.

d. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ an L1-well-formed expression of type $b \in T$, then $\alpha$ is an L1-well-formed and L2-interpretable expression of type $\langle a, b\rangle$.

e. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $R$ and $\gamma$ an L1-well-formed and L2-interpretable expression of type $a \in T$, then $\alpha$ is an L1-well-formed expression of type $a$*

f. If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $\bar{R}$ and $\gamma$ an L1-well-formed and and L2-interpretable expression of type $b \in T*$, then $\alpha$ is an L1-well-formed expression of type $a \in T$, such that $b = a*$.

g. If $\alpha$ is a binary branching node with daughters DEF, $\beta$, where $\beta$ is an L1-well-formed and L2-interpretable expression of type $\langle et\rangle$, then $\alpha$ is an $L - 1$ well-formed expression of type $e$*.

h. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are L1-well-formed and L2-interpretable expressions of type $a \in T$*, then $\alpha$ is an L1-well-formed expression of type $a$.

(46) *Set of L1-well-formed expressions (+ (46))*

a. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\gamma$ is an L1-well-formed expression of type $a, b \in T$, and $\beta$ is an L1-well-formed expression of type $a*$, then $\alpha$ is an L1-well-formed expression of type $b \in T$.

b. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an L1-well-formed expression of type $a \in T$ and $\gamma$ is an L1-well-formed expression of type $\langle a, b\rangle*$, then $\alpha$ is an L1 interpretable expression of type $b \in T$.

(47) *Set of L2-interpretable expressions (+ (46))*

a. If $\alpha$ is a binary branching node with daughters *n and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle \ldots \langle a-n, t\rangle\rangle\rangle$, then $\alpha$ is an L2-interpretable expression of type $\langle a-1*\langle \ldots \langle a-nt*\rangle\rangle\rangle$.

b. If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T*$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle \in T*$, then $\alpha$ is an interpretable expression of type $b$.

Importantly, the two L1-well-formed expressions which involve in (46) which involve composition of plural expressions with singular expressions are not L2-interpretable, which means that further syntactic rules must apply in order to generate L2.

These rules will keep the type-assignment to the mother node $\alpha$ stable: If $\alpha$ immediately dominates $\beta$ and $\gamma$ at L1, with $\beta$ of type $a*$ and $\gamma$ of type $a, b$ at L1, it is an L1 expression of type $b$. $\alpha$ will also be an L2 expression of type $b$, but it will now immediately dominate $\gamma$ and the trace of $\beta$, which is a variable of type $a$ (see (48)). Likewise, if $\alpha$ dominates a $\beta$ and $\gamma$ $\beta$ of type $\langle a, b\rangle*$ and $\gamma$ of type $a$ at L1, it is an L1 expression of type $b$. It will also be an L2 expression of type $b$, but it will now dominate $\gamma$ and the trace of $\beta$, the latter being a variable of type $\langle a, b\rangle$. In order to derive this result, we must give the syntactic rules that derive L1 from the lexicon (L), and the rules that derive L2 from L1. Most crucially, I assume that both involve movement (as in (40) above) and that the difference between movement rules taking place in the mapping from L to L1 and the movement rules taking place in the mapping from L1 to L2 is the interpretation of the, (48), i.e. the reflection of that particular operation on L1 and L2, respectively. As the only type of movement in the mapping from L to L1 that is of interest to me here, is QR, I restrict the discussion to this one case. Quite obviously, the set could be enriched.

(48) a. *mapping from L to L1 – traces*

Let $\alpha$ be a binary branching node with sisters $\alpha$, $\beta$, with $\gamma$ an interpretable expression of type $\langle\langle et\rangle t\rangle$ or $\langle\langle et\rangle t\rangle*$ and $\beta$ an interpretable expression of type $b \in T \cup T*$, then, if $\beta$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $e \in T$ and $\gamma$.

b. *mapping from L1 to L2 – traces*

Let $\alpha$ be a binary branching node with sisters $\alpha$, $\beta$, with $\gamma$ an interpretable expression of type $a \in T^*$ and $\beta$ an interpretable expression of type $b \in T \cup T*$, then, if $\beta$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $b \in T, b* = a$ and $\gamma$.

c. *general – abstraction*
Let $\alpha$ be an interpretable expression of type $a \in T \cup T^*$, then, if $\alpha$ has moved from a constituent $\gamma$ to a position where it is the sister of node $\beta$, $\beta$ is branching node with daughters $\gamma$ and a tuple $\langle n, c\rangle$ where $n \in \mathbb{N}$ and $c$ is the type of the variable in the position of $\alpha$ where that variable is the $n$-th occurrence of a variable of type $c$.

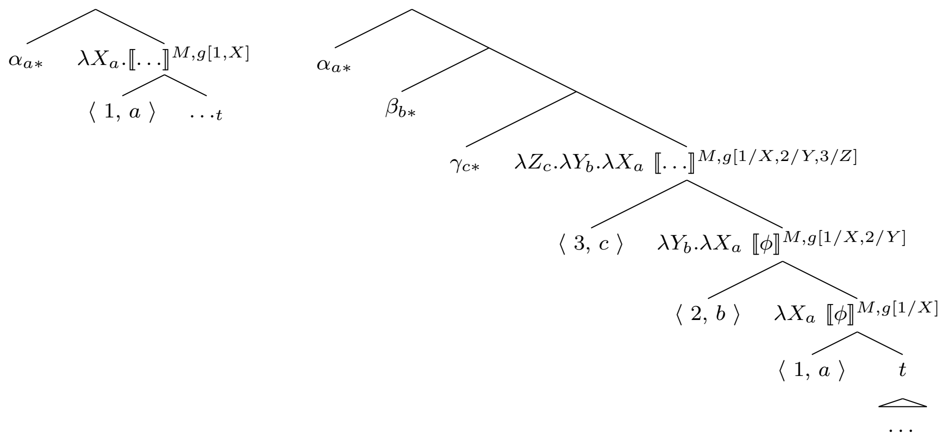
As the next step, we need the movement rule itself, i.e. how and when movement proceeds. Concerning the mapping from L to L1, I remain agnostic: either, the rules that this mapping consists of are blind to semantic categories, and can thus derive a number of structures for a set in L, only some of which are L1-well-formed, or the semantic categories are transparent, in which case only L1-well-formed structures are derived. What is relevant is the mapping from L1 to L2, which is given in (49). (49) sounds complicated, but it is nothing other than tucking-in-movement (as discussed in chapter 2, see Beck and Sauerland (2000) and Richards (1997)), as it involves a version of centre-embedding, it must be formulated disjunctively. It is crucial that movement proceeds top-down: It is essential that the first plural that moves first targets the *closest* node of type $t$,[24] as we require the derived predicate and its arguments to be *below* sentential operators. However, this closest type $t$ must be above the L1-position of the highest plural expression. Therefore, it must be the highest plural that moves first, because movement of lower plurals could result in them moving to intermediate positions of type $t$ which occur below the L1-position of the highest plural. For all other plurals, the order of movement does not matter, because their landing site will be determined by the position that the first plural moved to. At this point, we obtain the structures in (50) for a sentence with one and with three plural expressions respectively. As $a, b, c$ could be identical types, I numbered them as though they were.

(49) *mapping from L1 to L2*
If $\alpha$ is an expression of type $a \in T^*$ on L1, move $\alpha$ to a position where $\alpha$ is immediately dominated by a node $\kappa$, such that $\kappa$ is the sister of a node $\gamma$ where $\gamma$ is of type $b \in T^*$ and where $\alpha$ is the sister of $\delta$, such that $\delta$ immediately dominates a tuple $\langle n, b\rangle$, where $n \in \mathbb{N}$ and a node $\theta$ of type $b \in TC$. If there is no such position, move $\alpha$ to the *closest node* of type $t$. Start with the highest expression with a type in $T^*$.

24

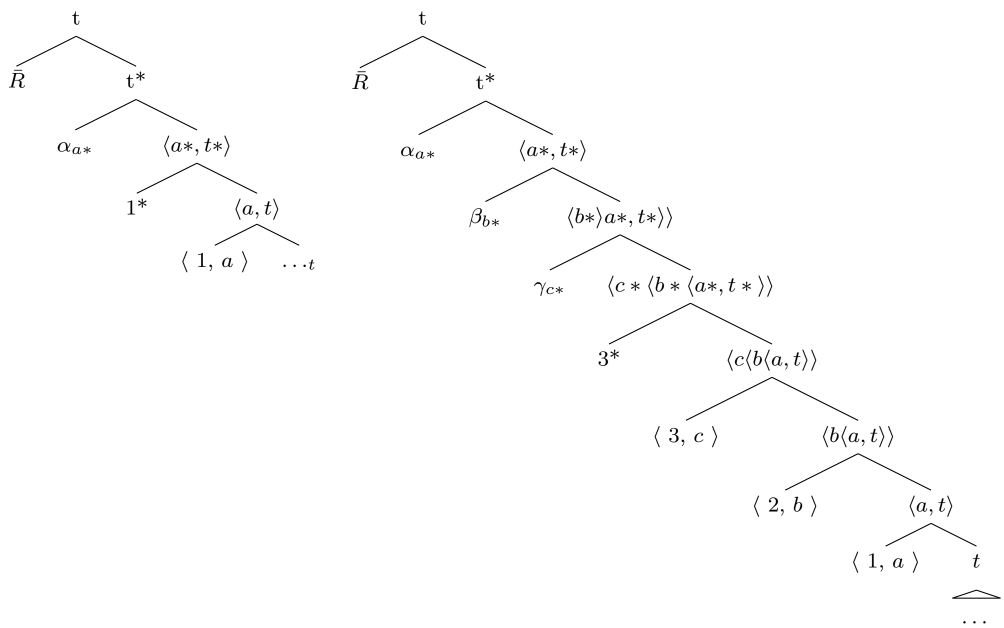
(i) Relative to a node $\gamma$, immediately dominated by a node $\gamma'$, a node $\alpha$ is *closer* than a node $\beta$ iff both $\alpha$ and $\beta$ dominate $\gamma$ and $|\{d|\alpha \text{ dominates } d\} \setminus \{d'|\gamma' \text{ dominates } d'\}| > |\{d|\beta \text{ dominates } d\} \setminus \{d'|\gamma' \text{ dominates } d'\}|$.

(50)

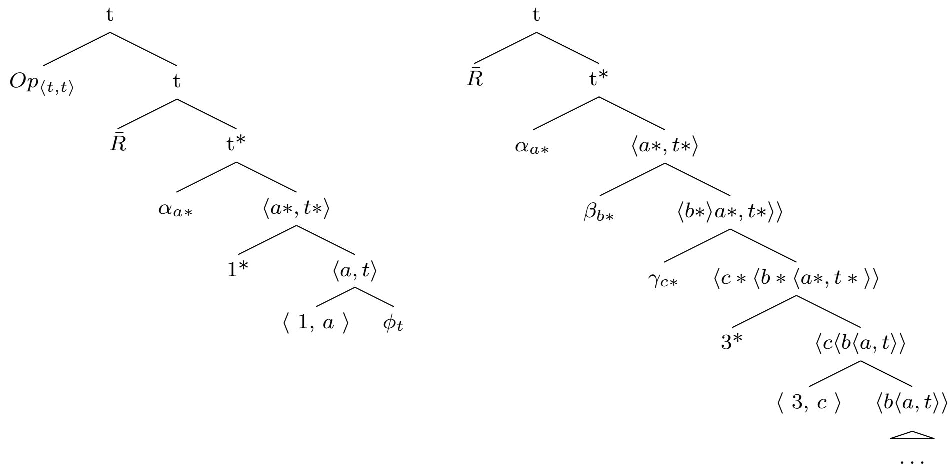



Finally, the last step in the mapping from L1 and L2 is the insertion of the *n operators. The insertion of this operator is (quite obviously) counter-cyclic (it is inserted after L1, again this is analogous to what I discussed w.r.t. standard plural sentences in section 2.3). I further add the assumption (revised from above) that $\bar{R}$ attaches to any node of type $t$*(again, a slight revision will be required below), we obtain the structures in (51). If there is a sentential operator present that has scope over that node of type $t$ that dominates the highest plural expression at L1, we obtain the structures in (52).

(51)



(52)



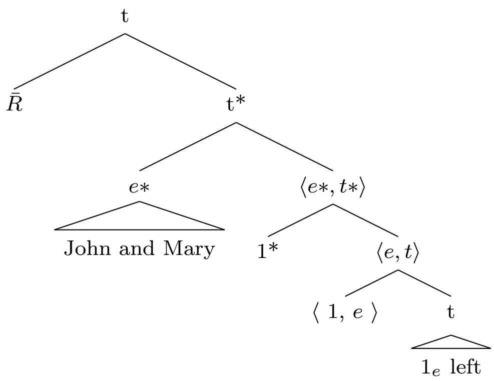

We can now derive all the examples I gave above. For the sake of brevity, I contract some of the rules, unless confusion is likely to arise. In particular, I leave out the level of L1 if nothing interesting happens there. In order to keep variables apart, I number them differently, even if they are of different types.

#### Sentences with one plural expression

The following examples give the derivations for sentences with one plural expressions. As we sum up the function values for each atom, the sentence is true if the predicate holds of all atoms, false if it holds of none, and unvalued otherwise. For example, the sentence in (54) is true is John is both old and stupid, false if he is neither and unvalued otherwise.

(53) $[_{DP}$ John and Mary] left.

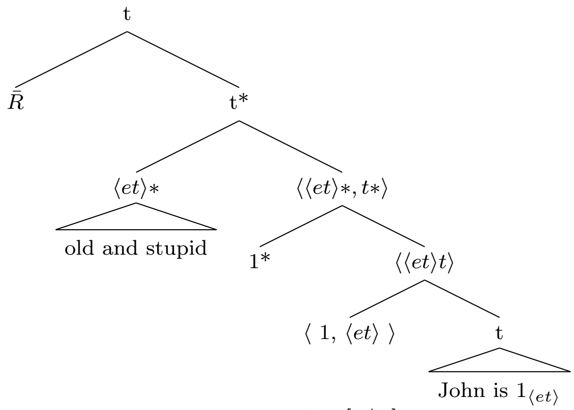
a. L2:




b. $[\![(53a)]\!]^{M,g} = \downarrow (\rho^{-1}(+\rho(\{\lambda x_e.[\![1 \text{ left}]\!]^{M,g[1/x]}(y)\}) :$
$\rho(\{y\}) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\} + \rho\{[\![\text{Mary}]\!]^{M,g}\}\ ))$

(54) John is $[_{AP}$ old and stupid]

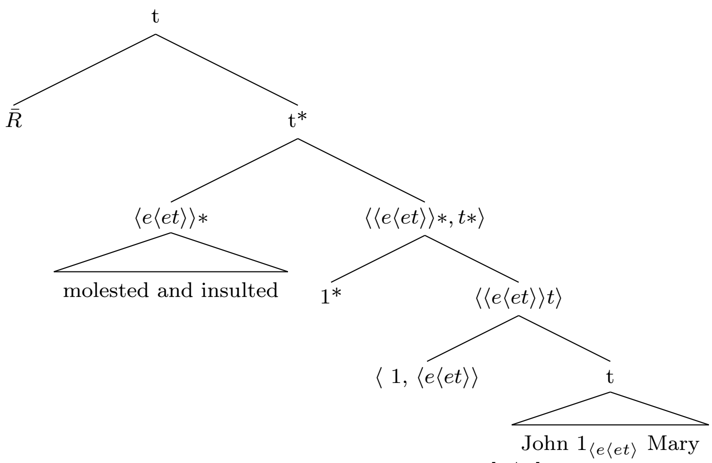
a. L2:




b. $[\![(54a)]\!]^{M,g} = \downarrow(\rho^{-1}(+\rho(\{\lambda P_{\langle et\rangle}.[\![\text{John is 1}]\!]^{M,g[1/P]}(Q)\}) :$
$\rho(\{Q\}) \leq_{AT} \rho(\{[\![\text{old}]\!]^{M,g}\} + \rho\{[\![\text{stupid}]\!]^{M,g}\}))$

(55) John [$_V$ molested and insulted] Mary

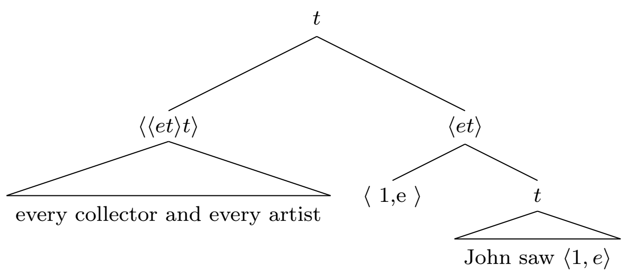
a. L2:



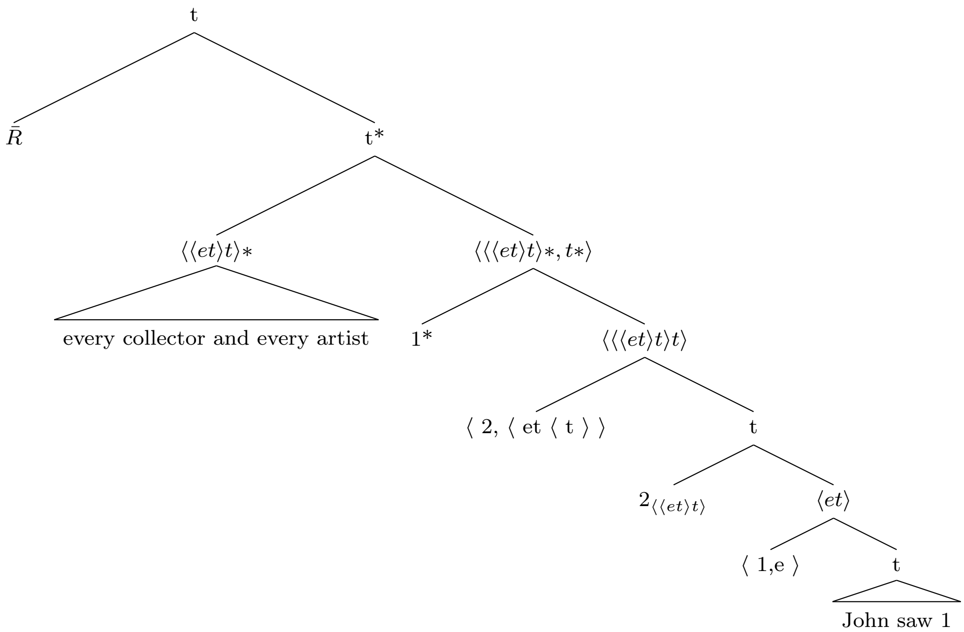

b. $[\![(54a)]\!]^{M,g} = \downarrow(\rho^{-1}(+\rho(\{\lambda P_{\langle e\langle et\rangle\rangle}.[\![\text{John 1 Mary}]\!]^{M,g[1/P]}(Q)\}) :$
$\rho(\{Q\}) \leq_{AT} \rho(\{[\![\text{molested}]\!]^{M,g}\} + \rho\{[\![\text{insulted}]\!]^{M,g}\}))$

(56) John saw [$_{DP}$ every collector and every artist]

a. L1:



b. L2:

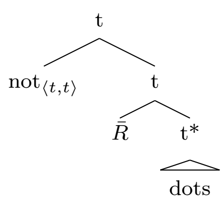



c. $[\![(56b)]\!]^{M,g} = \downarrow(\rho^{-1}(+\rho(\{\lambda\mathcal{P}_{\langle\langle et\rangle t\rangle}.[\![2\ [\text{John saw } 1]]\!]^{M,g[2/P]}(\mathcal{Q})\}) :$
$\rho(\{\mathcal{Q}\}) \leq_{AT} \rho(\{[\![\text{every artist}]\!]^{M,g}\} + \rho\{[\![\text{every collector}]\!]^{M,g}\})) =$
$= \downarrow(\rho^{-1}(\rho\{\ [\![\text{every artist}]\!]^{M,g[2/P,1/x]}(\lambda x_e.[\![\text{John saw } 1]\!]^{M,g[2/P,1/x]}\ \}+$
$\rho\{\ [\![\text{every collector}]\!]^{M,g[2/P,1/x]}(\lambda x_e.[\![\text{John saw } 1]\!]^{M,g[2/P,1/x]}\ \}))$

If a sentential operator is present that has L1-scope over the highest plurality – as negation in any of the sentences in (57), its input will be the output of $\bar{R}$, as schematized in (58). If application of $\bar{R}$ yields 1, negation will yield 0. If application of $\bar{R}$ yields 0, negation will yield 1. And if application of $\bar{R}$ does not yield a value – i.e. $\phi$ – the negation will not yield a value – the sentence will be undefined because $\phi$ is not in the domain of negation. By this, we obtain the polar behavior of plural sentences under negation (i.e. the actual source of homogeneity effects). (57a) is true if neither John nor Mary left, false if both left and undefined otherwise. (57b) is true if John is neither old nor stupid, false if he is both and undefined otherwise. (57c) is true if John neither molested Mary nor insulted her, false if he did both and undefined otherwise. Finally, (57d) is true if John neither insulted every collector nor every artist, false if he did both and undefined otherwise.

(57) a. John and Mary didn't leave.
b. John isn't old and stupid.
c. John didn't molest and insult Mary.
d. John didn't insult every collector and every artist..

(58)

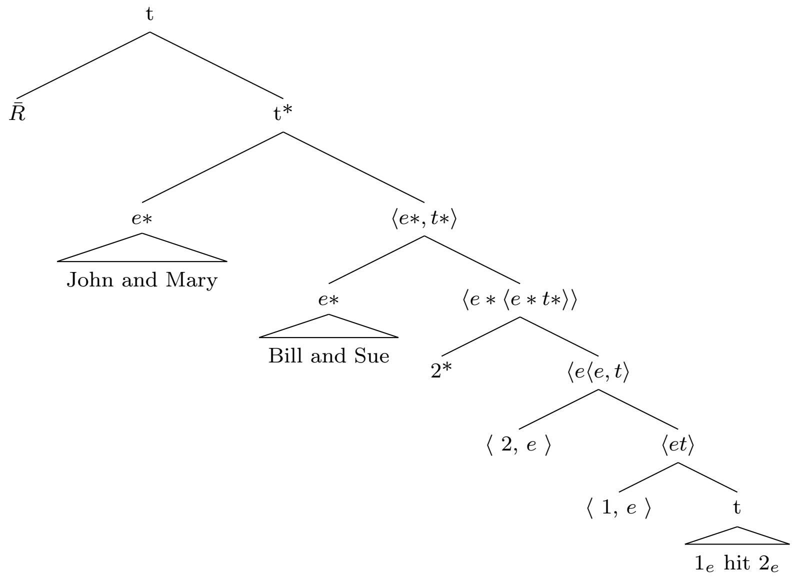


### Sentences with more than one plural expression

Below, I give the derivations for examples with more than one plurality. Here, we check for each atom whether there is an atom in the other plurality, such that the relation holds of the pair of these two atoms, mapping each atom to 1 if there is, to 0 if there isn't, and finally adding the sums for all atoms. For (60), for example, this derives the following result: the sentence is true if both John and Mary are either old or stupid and if both the property old and the property stupid hold of either John and Mary. The sentence is false if neither John nor Mary are old and neither John nor Mary are stupid. It is unvalued otherwise.

(59) $[_{DP}$ John and Mary] hit $[_{DP}$ Bill and Sue]

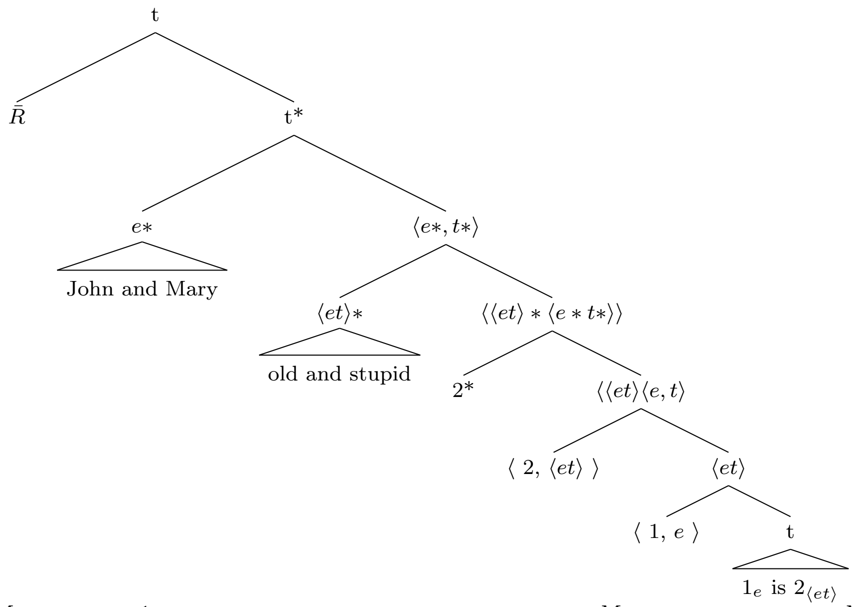
a. L2:




b. $\llbracket(59a)\rrbracket^{M,g} = \downarrow (\rho^{-1}(+(\rho(\{g(x^1\}))|\rho(\{x^1\}) \leq_{AT} \rho(\{\llbracket \text{Bill}\rrbracket^{M,g}\}) + \rho(\{\llbracket \text{Sue}\rrbracket^{M,g}),$
$g = \lambda z^1_e.\exists x^2[\rho(\{x^2\}) \leq_{AT} \rho(\{\llbracket \text{John}\rrbracket^{M,g}\}) + \rho(\{\llbracket \text{Mary}\rrbracket^{M,g}) \wedge \text{ hit' } (z^1)(x^2)])+$
$+(\rho(\{g(x^2\}))|\rho(x^2) \leq_{AT} \rho(\{\llbracket \text{John}\rrbracket^{M,g}\}) + \rho(\{\llbracket \text{Mary}\rrbracket^{M,g}),$
$g = \lambda z^2_e.\exists x^1[\rho(\{x^1\}) \leq_{AT} \rho(\{\llbracket \text{Bill}\rrbracket^{M,g}\}) + \rho(\{\llbracket \text{Sue}\rrbracket^{M,g}) \wedge \text{hit'}(x^1)(z^2)]))).$

(60) $[_{DP}$ John and Mary] are $[_{AP}$ old and stupid]

a. L2:




b. $\llbracket(18b)\rrbracket^{M,g} = \downarrow (\rho^{-1}(+(\rho(\{g(P)\}))|\rho(\{P\}) \leq_{AT} \rho(\{\llbracket\text{old}\rrbracket^{M,g}\}) + \rho(\{\llbracket\text{stupid}\rrbracket^{M,g}),$
$g = \lambda Q_{\langle et\rangle}.\exists x[\rho(\{x\}) \leq_{AT} \rho(\{\llbracket\text{John}\rrbracket^{M,g}\}) + \rho(\{\llbracket\text{Mary}\rrbracket^{M,g})\wedge \text{ is' } (Q)(x)])+$
$+(\rho(\{g(x)\}))|\rho(x) \leq_{AT} \rho(\{\llbracket\text{John}\rrbracket^{M,g}\})+\rho(\{\llbracket\text{Mary}\rrbracket^{M,g}), g = \lambda z_e.\exists P[\rho(\{P\}) \leq_{AT}$
$\rho(\{\llbracket\text{old}\rrbracket^{M,g}\}) + \rho(\{\llbracket\text{stupid}\rrbracket^{M,g})\wedge\text{is'}(P)(z))).$

Again, negation will target the output of $\bar{R}$. (61a) will be true if neither John nor Mary hit Bill or Sue, false if John saw Bill or Sue and Mary hit Bill or Sue and Bill and Sue were each hit by John or Mary, and undefined otherwise. (61b) will be true if neither John nor Sue are old or stupid, false if John is old or stupid and Mary is old or stupid and at least one of them is old and at least one of them is stupid and undefined otherwise.

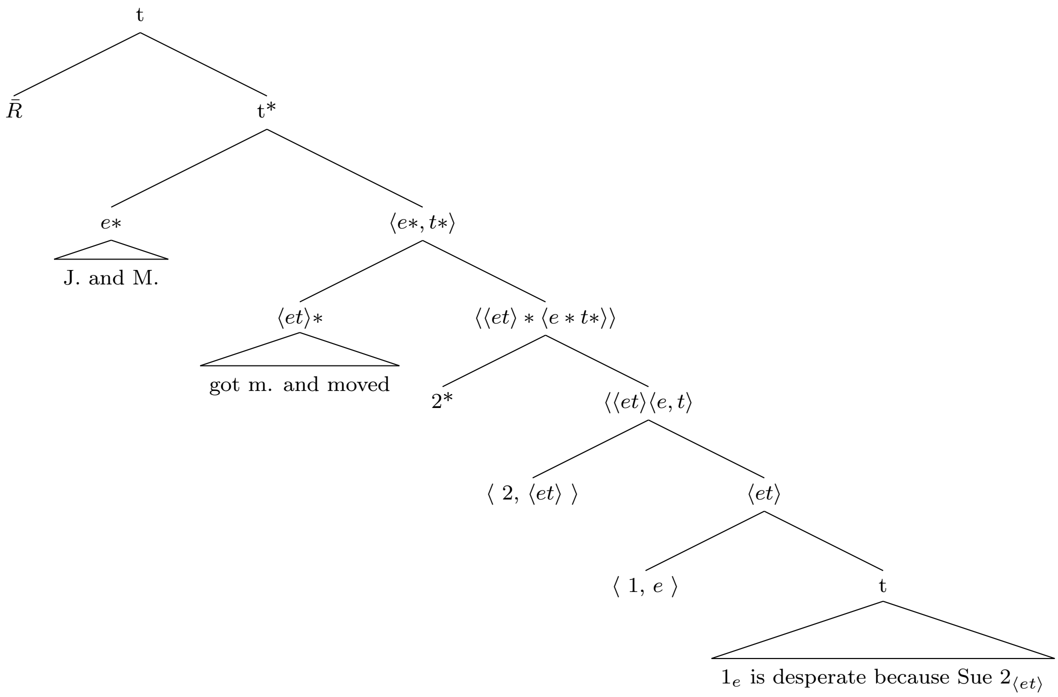
(61) a. John and Mary didn't hit Bill and Sue.
b. John and Mary aren't old and stupid.

Obviously, the same strategy can be extended to $n$-place relations, as in (62). I omit the derivation for reasons of space. Further, as there are no locality constraints in the mapping from L1 to L2, the relation created by this movement can correspond to large chunks of the sentence, as in (63), where I just give L2.

(62) [$_{DP}$ John and Mary] consider [$_{DP}$ Sue and Bill] [$_{VP}$ stupid and ugly], respectively.

(63) a. [$_{DP}$ John and Mary] are desperate because Sue [$_{VP}$ got married and moved to the US], respectively.

b. L2:

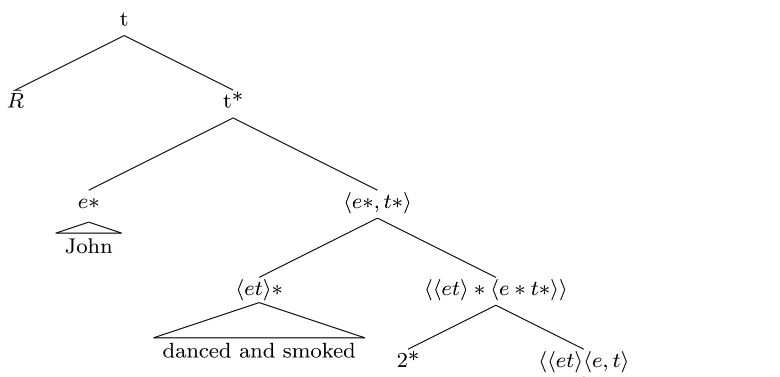



Finally, there are the special cases where there is no overt lexical material left in the derived predicate, as in any of the examples in (64). In this case, the affixing the derived predicate with *n will simply derive the sum of the functor variables applying to the argument variables. An atom is mapped to 1 if the functor maps it to 1, to 0 if the functor maps it to 0 and the values are summed up as above.[25]

[25]There is some question whether we could generalize this, so that for every sentence with $n$-many pluralities, we derive a predicate with $n+1$-many arguments, the additional argument being the remnant left by plural movement. I illustrate this for the simple sentence in (i). But this would require a rule that countercyclically inserts the $R$ operator above the remnant (i.e. the non-plural part of the sentence) and as there is no immediate gain from such an operation, I do not pursue this possibility any further.

(i) a. John danced and smoked.

b. L2:




c. $[\![(\text{ib})]\!]^{M,g} = +(\rho(\{g(x_1')\})|\rho(\{x_1'\}) \leq_{AT} \rho(\{[\![\text{old}]\!]^{M,g}\})+\rho(\{[\![\text{stupid}]\!]^{M,g}), g = \lambda z.\exists x_2'[\rho(\{x_2'\}) \leq_{AT}$

(64) a. John and Mary are smoking and dancing.
DERIVED PREDICATE = $\lambda P_{\langle et\rangle}.\lambda x_e.P(x)$
b. John and Mary molested and insulted Bill and Sue.
DERIVED PREDICATE = $\lambda y_e.\lambda P_{\langle e\langle et\rangle\rangle}.\lambda x_e.P(y)(x)$
c. John and Mary hurt and threatened every burglar and every rapist
DERIVED PREDICATE = $\lambda \mathcal{P}_{\langle\langle et\rangle t\rangle}.\lambda Q_{\langle e\langle et\rangle\rangle}.\lambda x_e.\mathcal{P}(\lambda z.Q(z)(y))$

### 4.2.2 Interim summary

The present version of cumulation as a general strategy for the interpretation derives the correct meaning for all basic structures involving one or more plural expressions, where all plural DPs and all AC with coordinates of any type count as plural expression. For sentences with just one plural expressions, we obtain a "distributive" meaning, whereas sentences with more than one plural expression are correctly predicted to have the weak meaning discussed in chapters 2 and 3 for standard plurals and AC. Projection is parasitic on the additional syntactic assumptions I make. Homogeneity is derived as well, as all intermediate cases– cases where some, but not all of the atoms have the property in question – yield a plural value for the sentence which cannot reduced to a singular value – i.e. to either 1 or 0.

## 4.3 Embedded pluralities

As a final point, consider embedded pluralities, as discussed in sections 2.5, 3.2 and 3.5 and exemplified again in (65). As shown in section 3.5, we cannot "cumulate" the relation across the intervening – that is, embedding – plural.

(65) a. The boys were stroking the cats and smoking.
b. The boys gave the bones to the dogs and smoked.
c. The boys stroked the cats and brushed the dogs.
d. The boys fed the cats and dogs (but not the poor squids).
e. The Turkish and Syrian cats and dogs entered the room.
f. The boys cleaned the toilets of the cats.

I discuss these examples w.r.t. extensions in (67)– Chuck and Peter are the only boys, Jimmy and Mörder the only cats and Wilma and Bea the only dogs (there are also some unnamed squids). Intuitively, all of the sentences in (66) are true in M.

(66) $[\![\text{boy}]\!]^{M,g} = \{c', p'\}$, $[\![\text{cat}]\!]^{M,g} = \{j', m'\}$, $[\![\text{dog}]\!]^{M,g} = \{w', b'\}$
$[\![\text{bones}]\!]^{M,g} = \{b_1, b_2\}$, $[\![\text{toilet of}]\!]^{M,g}$ $\{\langle t_1, j'\rangle, \langle t_2, j'\rangle, \langle t_3, m'\rangle\}$,
$[\![\text{smoke}]\!]^{M,g} = \{p'\}$, $[\![\text{stroke}]\!]^{M,g} = \{\langle j', c'\rangle, \langle m', p'\rangle\}$,

---

$\rho(\{[\![\text{John}]\!]^{M,g}\}))\wedge$ is' $(z)(x'_2)]\oplus$
$+(\rho(\{g(x'_2\}))|\rho(x'_2) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\}), g = \lambda v.\exists x'_1[\rho(\{x'_1\}) \leq_{AT} \rho(\{[\![\text{old}]\!]^{M,g}\}) +$
$\rho(\{[\![\text{stupid}]\!]^{M,g})\wedge$is'$(x'_1)(z) = 1)$.

$[\![\text{brush}]\!]^{M,g} = \{\langle b', p'\rangle, \langle w', p'\rangle\}$, $[\![\text{gave}]\!]^{M,g}$ $\{\langle b_1, b', c'\rangle, \langle b_2, w', p'\rangle\}$,
$[\![\text{cleaned}]\!]^{M,g} = \{\langle t_1, c'\rangle, \langle t_2, p'\rangle, \langle t_3, c\rangle\}$,
$[\![\text{feed}]\!]^{M,g} = \{\langle j', c'\rangle, \langle m', p'\rangle, \langle b', c'\rangle, \langle w', p'\rangle\}$
$[\![\text{Turkish}]\!]^{M,g} = \{\langle cat', j'\rangle, \langle dog', w'\rangle\}$
$[\![\text{Syrian}]\!]^{M,g} = \{\langle cat', m'\rangle, \langle dog', b'\rangle\}$

### 4.3.1 Cyclicity

In order to derive the correct results, we need to re-introduce what didn't seem to play a role so far, namely, syntactic cyclicity for the mapping from L1 to L2 (for the basic discussion of cyclicity cf. Williams (1974), Chomsky (2001) a.o.).[26] Informally speaking, what I propose here is that the syntactic rules for the generation of L2-structures from L1-structures apply cyclically and that the relevant notion of cyclicity is tied to the plural-singular distinction. Cycles and cyclic derivation are defined as in (67).

(67) a. A cycle $C$ is that part of an $L1$ structure such that the highest node $\gamma$ in $C$ is a node in of type $a \in T \cup T^*$ and $\gamma$ is immediately dominated by node $\beta$ of type $b \in T^*$ and $a \neq b$ or $\gamma$ is not dominated by any other node.

b. A cycle $C^i$ is *lower than* a cycle $C^j$ iff there is a node $\gamma$ in $C^j$ but not in $C^i$ such that $\gamma$ dominates $C^i$ (v.v. for *higher than*). A cycle $C^j$ contains all lower cycles $C^i$. $C^j - C^i$ is the material in $C^j$ *to the exclusion* of a lower cycle $C^i$.

c. Cycles $C^i$, $C^j$ are *parallel* iff there is no node $\gamma$ in both $C^j$ and $C^j$ and if there is no node $\beta$ in $C^i$ such that $\beta$ dominates $C^j$ and no node $\delta$ in $C^j$ such that $\delta$ dominates $C^i$ and the number of cycles higher than $C^i$, $C^j$ is identical.

d. A cycle $C^i$ is L2-relevant if it contains a node $\gamma$ of type $a \in T^*$ and if there is no cycle $C^j$ that is lower than $C^i$ and that contains $\gamma$. If a cylce is non-L2-relevant, it is added to the next highest cycle.

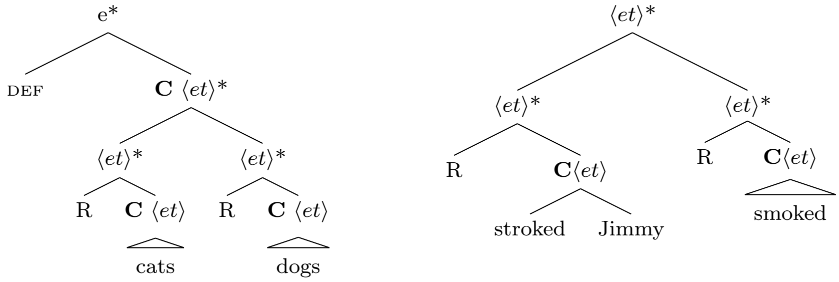
e. Mapping from L1 to L2 proceeds in a stepwise fashion, starting with the lowest L2-relevant cycles. For any L2-relevant cycle $C^i$, mapping is such that all material within $C^i$ is L2-interpretable after all rules have applied.

f. $\bar{R}$ only applies to nodes of type $t^*$ within the highest cycle.

(20a) defines the structural representation of a cycle. *Qua* (20a) the complements of DEF and $R$ are cycles, but the coordinates of an AC are not, as illustrated in (68), where I indicated the cylces by $C$. As always (cf. in particular Chomsky (2001) for discussion), we need a default cycle, which is the entire sentence. Further, as already indicated above, we must make application of $\bar{R}$ to nodes of type $t^*$ a matrix phenomenon.

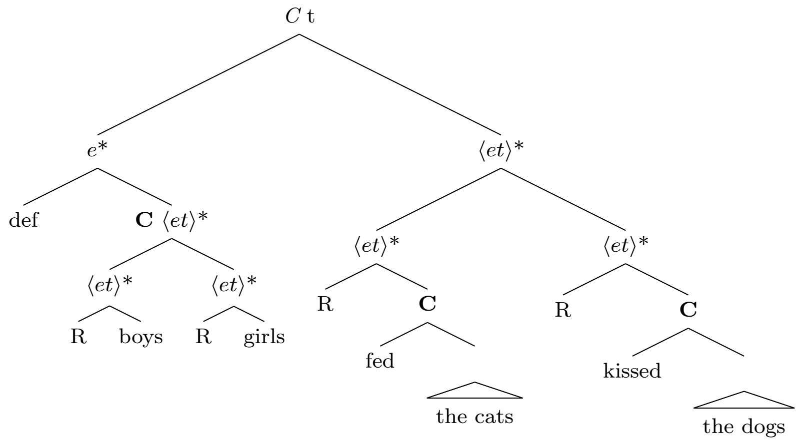
[26] What I state here is independent on whatever type of cylicity we take to matter in the derivation of L to L1.

(68)

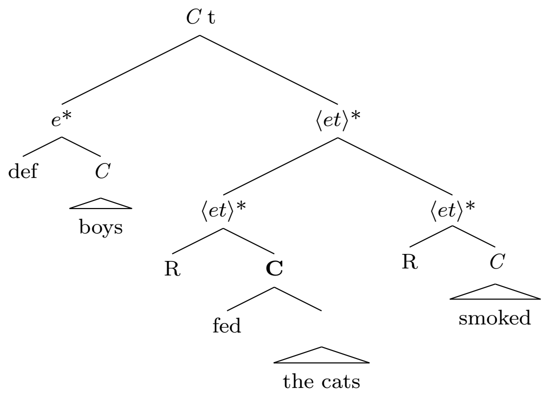



(20b) is straightforward. According to (20c), all the three cycles marked in boldface in (69a) are parallel (cycles irrelevant for the computation are left out). According to (20d), all the cycles marked in boldface in (69a) and (69b) are L2-relevant. In other words, a piece of structure only counts as a cycle, for all effects and purposes, if it contains a plural expression. The cycles marked in boldface in (69a) and (69b) are also the lowest L2-relevant cycles in the structure, therefore, in deriving L2 from L1 in a stepwise fashion, we would start with them.

(69) a.




b.




(70) and (22) state the syntactic derivation from L1 structures to L2 structures relativized to cycles (according to the definitions in (20) above). (70) extends movement of plural expressions, as part of the L1 to L2 mapping by (21a), according to which, if a plural expression moves to a position right above *R* or DEF, its movement index is stranded just below *R* or DEF. So far, plural expressions never moved to such a position, however, the revised mapping rules in (71) require that they do in case they do not occur in the highest L2-relevant cycle,

as stated in (22b). (22b) (just as (22a)) also involves *tucking-in*-movement, which, together with (68), yields the structures in (73). In sum, what the amendments require is that if a plural expression $\beta$ occurs in an L2-relevant cycle $C^i$, where $C^i$ is not the highest cycle in the sentence, $\beta$ must move to the node immediately dominating $C^i$ – i.e. to the next-highest node with a plural type – and strand its index below that node.[27]

(70) *Mapping from L1 to L2, traces and abstraction*

a. Let $\alpha$ be a binary branching node with daughters $\beta$, $\gamma$, with $\gamma$ an L1- well-formed expression of type $a \in T^*$ and $\beta$ an L1-well-formed expression of type $b \in T \cup T*$, then, if $\gamma$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $c \in T$, where $c* = a$, and $\beta$.

b. Let $\alpha$ be an L1-well-formed expression of type $a \in T^*$, then, if $\alpha$ has moved from a constituent $\gamma$ to a position where it is the sister of node $\beta$, then,

(i) if $\beta$ is an L1-well-formed expression of type $b \in T$, then $\beta$ is a branching node with daughters $\gamma$ and a tuple $\langle n, c \rangle \in \mathbb{N} \times T$, where $c$ is the type of the variable in the original position of $\alpha$.

(ii) if $\beta$ is an L1-well-formed expression of type $b \in T^*$, then $\beta$ is a branching node with daughters $R$ and $\gamma$, where $\gamma$ is a branching node immediately dominating a tuple $\langle n, c \rangle \in \mathbb{N} \times T$, where $c$ is the type of the variable in the original position of $\alpha$ or $\beta$ is a branching node with daughters $def$, $\gamma$, where $\gamma$ is a branching node which immediately dominates a tuple $\langle n, c \rangle \in \mathbb{N} \times T$ where $c$ is the type of the variable in the original position of $\alpha$.

(71) *Mapping from L1 to L2 relativized to cycles*

If $C_i$ is an L2-relevant cycle, $\beta$ and expression of type $a \in T^{0}*$ in $C_i$ then

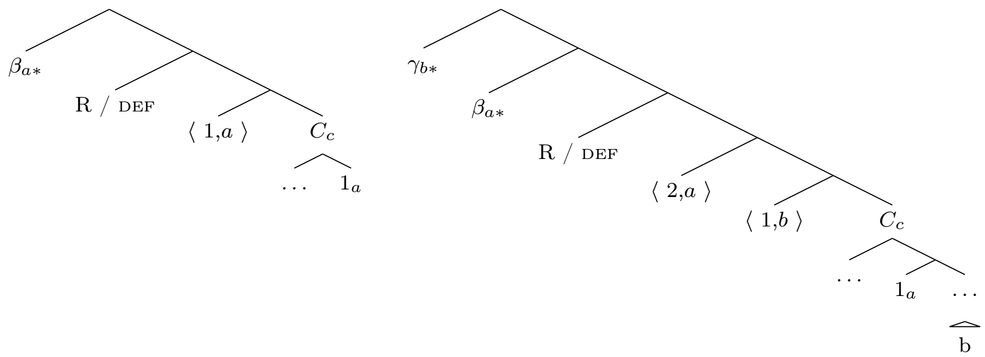
a. if there is no node $\alpha$ immediately dominating $C_i$,move $\beta$ to a position where $\beta$ is immediately dominated by $\kappa$, such that $\kappa$ is the sister of a $\gamma$ where $\gamma$ is of type $b \in T^*$ and where $\alpha$ is the sister of $\delta$, such that $\delta$ immediately dominates a tuple $\langle n, b \rangle \in \mathbb{N} \times T$ and a node $\theta$ of type $b \in TC$. If there is no such position, move $\beta$ to the highest node of type $t$. Start with the highest element that has type in $T^{0}*$.

b. if there is a node $\alpha$ immediately dominating $C_i$, move $\beta$ to a position where $\beta$ is the sister of $\delta$, such that $\delta$ immediately dominates $R$ or DEF.

[27] Note that there is one potential problem here: If $C^i$ contains a plural expression, the individual conjuncts of which are non-interpretable in their surface position and may take scope above the coordinate structure (which will not violate the CSC as long as the other coordinates contain pronouns that can be bound by this material, cf. Goodall (1987)), as in (i). This would require a re-ordering of operations within the cyclic derivation I give here.

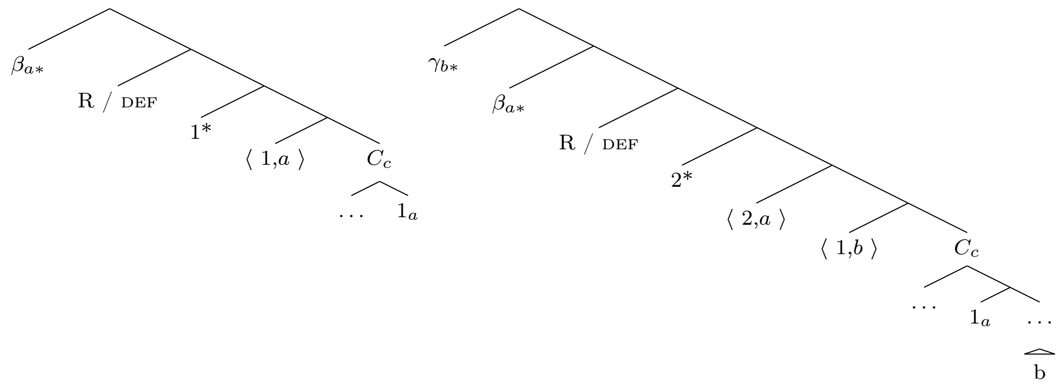
(i) John tortured every professor and every assistant and killed his wife.

(72)




Obviously, these expressions are neither L1-well-formed nor L2-interpretable so far. (24) and (23) extend the set of L1-interpretable and L2-well-formed expressions. Note that according to both, structures such as (72) are not part of the language, but the structures in (73) are, where we inserted the $n^*$ operator. Recall that insertion of this operator was taken to be available *ad libitum* anyway. Broadly speaking, we could state that it attaches to any predicate formed by plural movement out of a cycle.

(73)




Extending the set of L1-well-formed expression is crucial, as the L2-mapping of lower cycles would otherwise add material that is not L1-well-formed to the L1 of the next highest cycle. Note that these rules are not overly general, if the L2 derivations of each cycle proceed strictly along the lines laid out so far.

(74) *Extension of the set of L1-well-formed expressions*

a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L1-well-formed expression $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$, then $\alpha$ is an L1-well-formed expression of type $\langle a-1*\langle\ldots\langle a-*n,b*\rangle\rangle\rangle$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L1-well-formed expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle \in T \setminus T^{0}*$, then $\alpha$ is an L1-well-formed expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$.

(75) *Extension of the set of L2-interpretable expressions*

a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L2-interpretable expression $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$, then $\alpha$ is an L2-interpretable expression of type

$\langle a-1*\langle\ldots\langle a-*n,b*\rangle\rangle\rangle$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle \in T\setminus T^{0}*$, then $\alpha$ is an L2-well-formed expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$.

Finally, we need to interpret the L2-interpretable expressions. The semantics is extended as in (76). (76) is not strictly compositional, unfortunately. Note that what it actually states is that R or DEF – i.e. the operators that induce cyclicity and which map singular expressions to plural expressions, apply to each atom of the *function* derived by application of $n*$. If $n*$ is embedded under $R$, the result is not actually visible, because $[\![\text{R E}]\!] = \rho\{[\![\text{E}]\!]\}$. However, if $n*$ is embedded under DEF it is, because we now sum up objects formed by $\rho$ applying directly to the function value (recall that DEF is the syntactic counterpart of $\rho$). In both cases, the $n*$-operator again sums up the values, just that this time, the values are not (necessarily) objects in $D_t$, and, accordingly, the sum of values is not necessarily an object in $\mathcal{R}_t$.

(76) *Extension of the semantics*

a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L2-interpretable expression $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function $f:\mathcal{R}_{a-1}\rightarrow\ldots\rightarrow[\mathcal{R}_{a-n}\rightarrow\mathcal{R}_b]]$, such that for any $X_1\in\mathcal{R}_{a-1},\ldots,X_n\in\mathcal{R}_{a-n}$

(i) if $b=t$, $f(X_1)\ldots(X_n)=$
$= +(\rho(\{g(X^i_1)\})|\rho(\{X^i_1\}) \leq_{AT} X_1, g=\lambda Z^1_{a-1}.\exists X^i_2,\ldots,X^i_n[\rho(\{X^i_2\}) \leq_{AT} X_2,\ldots\rho(\{X^i_{n\}}) \leq_{AT} X_n \wedge [\![\beta]\!]^{M,g}(Z^1)(X^i_2)\ldots(X^i_n))] + \ldots +$
$+(\rho(\{g(X^i_n)\}))|\rho(\{X^i_n\}) \leq_{AT} X^i_n, g=\lambda Z^n_{a-n}.\exists X^i_1,\ldots,X^i_{n-1}[\rho(\{X^i_1\}) \leq_{AT} X_1,\ldots\rho(\{X^i_{n-1}\}) \leq_{AT} X_{n-1}\wedge[\![\beta]\!]^{M,g}(X^i_1)\ldots(X^i_{n-1})(Z^n))]$.

(ii) if $b=\langle c-1\langle\ldots\langle c-n,t\rangle$, $f(X_1)\ldots(X_n)=$
$= +(\rho(\{g(X^i_1)\})|\rho(\{X^i_1\}) \leq_{AT} X_1, g=\lambda Z^1_{a-1}.\lambda C^1_{c-1}.\ldots\lambda C^n_{c-n}.\exists X^i_2,\ldots,X^i_n$
$[\rho(\{X^i_2\}) \leq_{AT} X_2,\ldots\rho(\{X^i_{n\}}) \leq_{AT} X_n\wedge$
$[\![\beta]\!]^{M,g}(Z^1)(X^i_2)\ldots(X^i_n))(C^1_{c-1})\ldots(C^n_{c-n})] + \ldots$
$++(\rho(\{g(X^i_n)\}))|\rho(\{X^i_n\}) \leq_{AT} X^i_n, g=\lambda Z^n_{a-n}.\lambda C^1_{c-1}.\ldots\lambda C^n_{c-n}.$
$\exists X^i_1,\ldots,X^i_{n-1}[\rho(\{X^i_1\}) \leq_{AT} X_1,\ldots$
$\rho(\{X^i_{n-1}\}) \leq_{AT} X_{n-1}\wedge[\![\beta]\!]^{M,g}(X^i_1)\ldots(X^i_{n-1})(Z^n))(C^1_{c-1})\ldots(C^n_{c-n})]$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle \in T^*\setminus T^{0}*$, then $[\![\alpha]\!]=[\![\beta]\!]$.

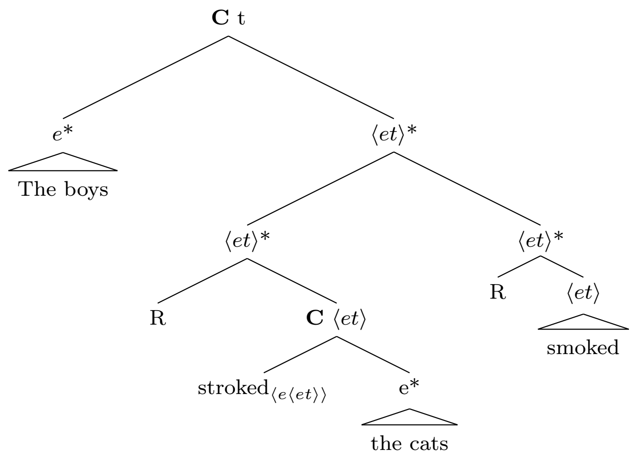
c. If $\alpha$ is a branching node with daughters DEF and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle\ldots\langle a-n,\langle et\rangle\rangle\rangle\rangle \in T^*\setminus T^{0}*$, then $[\![\alpha]\!]^{M,g}$ is that function $\mathcal{R}_{a-1}\rightarrow\ldots\rightarrow[\mathcal{R}_{a-n}\rightarrow\mathcal{R}_e]]$, such that for any $X_1\in\mathcal{R}_{a-1},\ldots,X_n\in\mathcal{R}_{a-n}$
$f(X_1)\ldots(X_n)=\rho(g(X^i_1))|\rho(\{X^i_1\}) \leq_{AT} X_1, g=\lambda Z^1_{a-1}.\lambda y_e.\exists X^i_2,\ldots,X^i_n[\rho(\{X^i_2\}) \leq_{AT} X_2,\ldots\rho(\{X^i_{n\}}) \leq_{AT} X_n\wedge[\![\beta]\!]^{M,g}(Z^1)(X^i_2)\ldots(X^i_n)(y))] + \ldots +$
$+(\rho(g(X^i_n))|\rho(\{X^i_n\}) \leq_{AT} X^i_n, g=\lambda Z^n_{a-n}.\lambda y_e.\exists X^i_1,\ldots,X^i_{n-1}[\rho(\{X^i_1\}) \leq_{AT} X_1,\ldots\rho(\{X^i_{n-1}\}) \leq_{AT} X_{n-1}\wedge[\![\beta]\!]^{M,g}(X^i_1)\ldots(X^i_{n-1})(Z^n)(y)]$

I illustrate how this is put to use by going through the examples in (65), relative to the model given above. I omit application of matrix $\bar{R}$ in order to keep the trees as small as possible. Consider first (65a), repeated in (77).

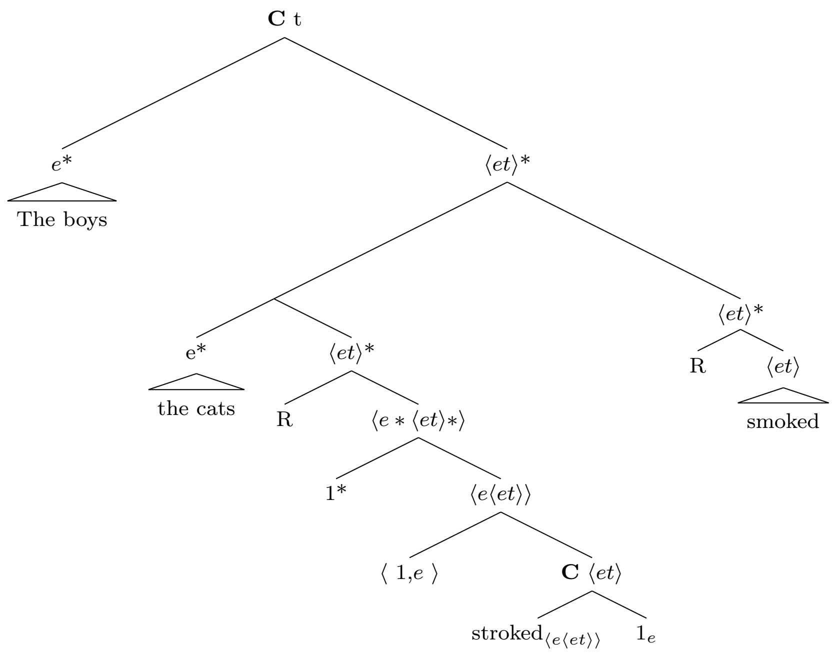
(77) The boys stroked the cats and smoked.

According to (20) above, the L1 representation of (77) has has two L2-relevant cycles: The first VP under $R$ and the entire sentence, (78a). Now we proceed according to (22), where movement happens according to (21) and insert the 1*-operator, (78b) Semantic categories are assigned w.r.t. (24) and (23). At this point, we are done with the lower cycle.

(78) a.

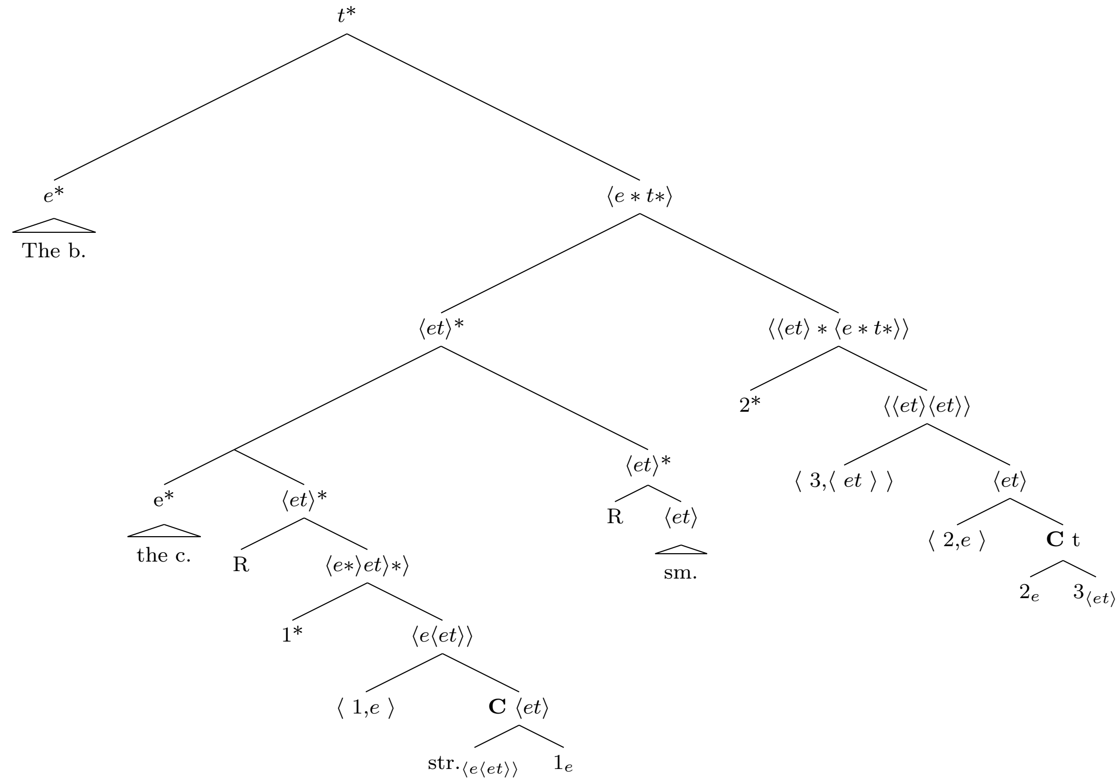



b.




We now proceed in the higher cycle, the sentence itself. For this cycle, (78b) is L1-well-formed, according to (24) above, but not L2-interpretable: It contains two expressions with types $a \in T^0$ which cannot combine with their sister nodes: The subject and the coordinate structure. We proceed as normal, according to (22), and insert the 2*-operator, which yields the structure in (79).

(79)




The structure is interpreted according to our semantic rules + (35). In order to make matters clear, I first give the extension of the embedded AC.

(80) $[\![\ [_{\langle et\rangle *}\ [_{\langle et\rangle *}\ [\text{c.}]_e\ [_{\langle e*\langle et\rangle *\rangle}\ \text{R}\ [_{\langle e*\langle et\rangle *\rangle}\ 1^*\ [_{\langle e\langle et\rangle\rangle}\ \langle 1,e\rangle\ [_{\langle et\rangle}\ \text{str.}\ 1_e\ ]]]]]\ [_{\langle et\rangle *}\ \text{R sm.}\ ]]\ ]\!]^{M,g} =$
$= +\rho(\{f(x)\} : \rho(\{x\}) \leq_{AT} [\![\text{the c.}]\!]^{M,g} \wedge f = \lambda y_e.\lambda z^1_e.z^1\text{str.'}y + \rho(\{\lambda z^2.z^2\ \text{sm.'}\ \}) =$
$= +\rho(\{f(x)\} : \rho(\{x\}) \leq_{AT} \rho(\{j'\}) + \rho(\{m'\})\wedge$
$f = \lambda y_e.\lambda z^1_e.z^1\text{str.'}y + \rho(\{\lambda z^2.z^2\text{sm.'}\}) =$
$= \rho(\{\lambda z^1_e.z^1\text{str.'}j'\}) + \rho(\{\lambda z^1_e.z^1\text{str.'}m'\}) + \rho(\{\lambda z^2_e.z^2\text{sm.}\})$

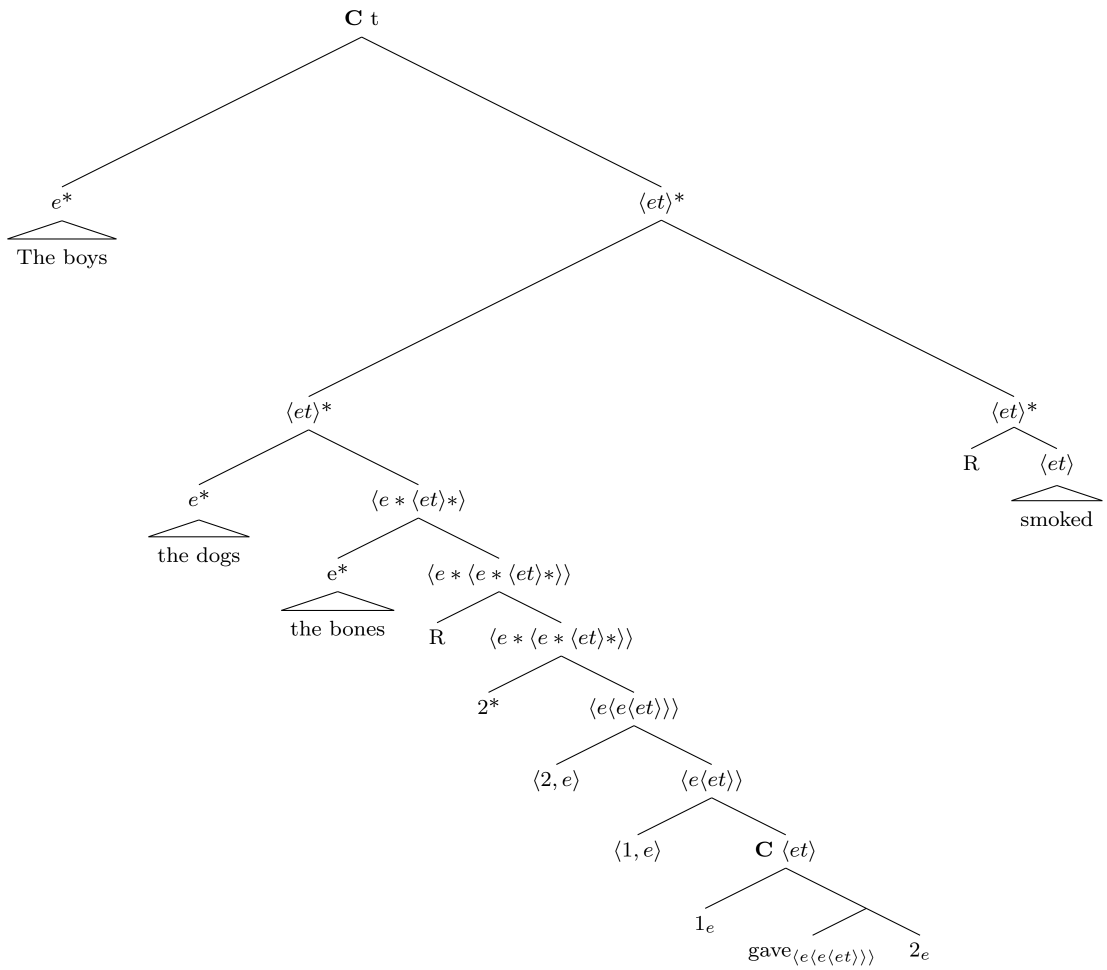
Considering the entire structure, we thus obtain (81). The sentence is true w.r.t. the model above. It would be true as long as Chuck or Peter smoked and each cat was stroked by Chuck and Peter and Chuck smoked or stroked a cat and Peter smoked or stroked a cat. It would be false if neither Chuck nor Peter stroked any cat and neither of them smoked and unvalued otherwise.

(81) $[\![(80)]\!]^{M,g} = +\rho(\{f(x)\} : \rho\{x\} \leq_{AT} \rho(\{c'\}) + \rho(\{p'\}) \wedge f = \lambda y_e.\exists P[\rho(\{P\}) \leq_{AT} \rho(\{\lambda z^1_e.z^1\text{str.'}j'\}) + \rho(\{\lambda z^1_e.z^1\text{str.'}m'\}) + \rho(\{\lambda z^2_e.z^2\text{sm.}\}) \wedge P(y)] + +\rho(\{g(Q)\} : \rho\{Q\} \leq_{AT} \rho(\{\lambda z^1_e.z^1\text{str.'}j'\}) + \rho(\{\lambda z^1_e.z^1\text{str.'}m'\}) + \rho(\{\lambda z^2_e.z^2\text{sm.}\}) \wedge g = \lambda P_{\langle et\rangle}.\exists y[\rho(\{y\}) \leq_{AT} \rho(\{c'\}) + \rho(\{p'\}) \wedge P(y)]$

I don't go trough the rest of the examples in detail, just remarking on where they differ from the derivation of (65a).

(65b) is similar to (65a) except that two plural expressions are moved, (82).

(82)

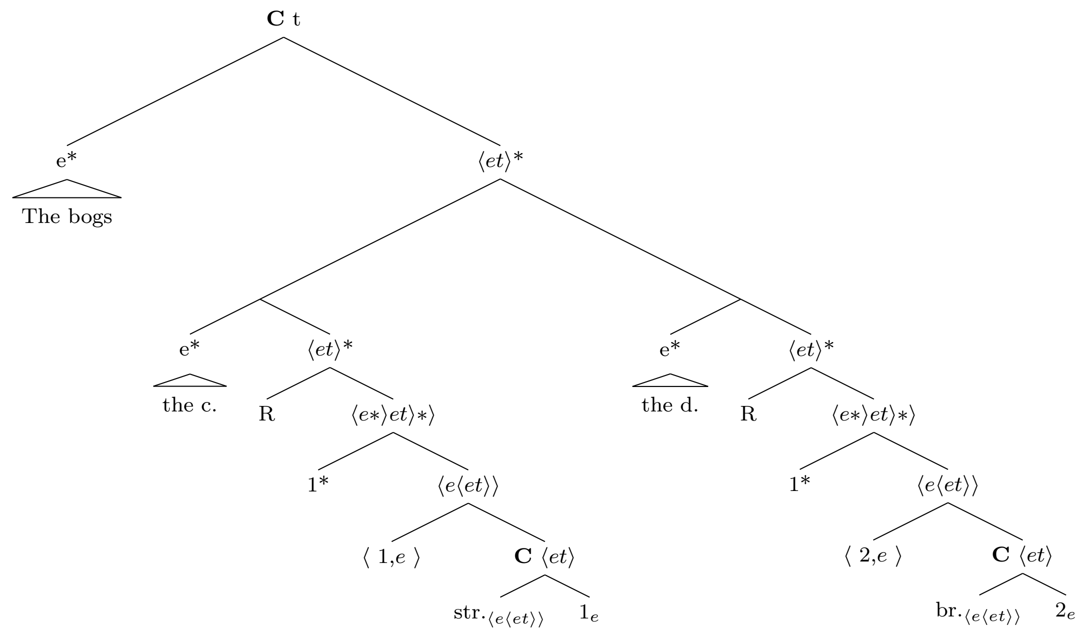



The meaning of the AC, relative to the model above, is the one in (83). Employing the subsequent steps, which are just as above, make the sentence true w.r.t. the model. It would be true as long as each Bea and Wilma were given bone 1 or bone 2 by Chuck or Peter, each bone was given to one of the dogs by one of the boys and each boy smoked or gave at least one bone to at least one dog. It will be false if neither Chuck nor Peter gave any bones to any dogs nor smoked and unvalued otherwise.

(83) $+\rho(\{f(x^1)\}) : \rho(\{x^1\}) \leq_{AT} [\![\text{the bones}]\!]^{M,g} \wedge f = \lambda y^1_e.\lambda z^2.\exists z^1[\rho(\{z^1\}) \leq_{AT} [\![\text{the dogs}]\!]^{M,g} \wedge z^2 \text{ gave' } (z^1)(y)] + +\rho(\{f(x^1)\}) : \rho(\{x^2\}) \leq_{AT} [\![\text{the dogs}]\!]^{M,g} \wedge f = \lambda y^2_e.\lambda z^2.\exists z^1[\rho(\{z^1\}) \leq_{AT} [\![\text{the bones}]\!]^{M,g} \wedge z^2 \text{ gave' } (y)(z^1)] + \rho(\{\lambda z^3_e.z^3 \text{ smoked' }\}) =$
$= \rho(\{\lambda z^2.\exists x[\rho(\{x\}) \leq_{AT} \rho(\{b'\}) + \rho(\{w'\}) \wedge z^2 \text{ gave' } x\ b_1)\})] + \rho(\{\lambda z^2.\exists x[\rho(\{x\}) \leq_{AT} \rho(\{b'\}) + \rho(\{w'\}) \wedge z^2 \text{ gave' } x\ b_2)\})] + \rho(\{\lambda z^2.\exists y[\rho(\{y\}) \leq_{AT} \rho(\{b_1\}) + \rho(\{b_2\}) \wedge z^2 \text{ gave' } b'\ y)\})] + \rho(\{\lambda z^2.\exists y[\rho(\{y\}) \leq_{AT} \rho(\{b'\}) + \rho(\{w'\}) \wedge z^2 \text{ gave' } w'\ y)\})].$

Finally, (65c) is similar to the cases above except that here we have two parallel cycles that we start with. The derivation of the first cycles is given in (84). The meaning of the AC, relative to the model above in (85). Applying the subsequent steps, the sentence is true w.r.t. the model. It would be true as long as each cat was stroked by one of the boys and each dog was brushed by one of the boys and if each boy stroked a cat or brushed a dog.

(84)

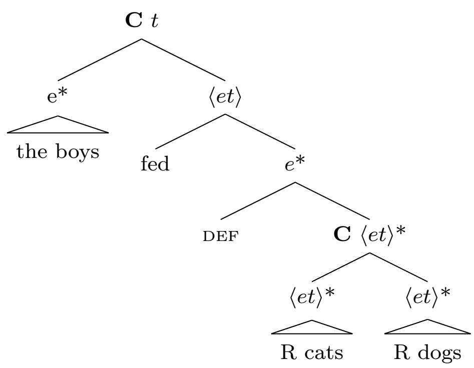



(85) $\rho(\{\lambda z^1_e.z^1\text{str.'}j'\}) + \rho(\{\lambda z^1_e.z^1\text{str.'}m'\}) + \rho(\{\lambda z^1_e.z^1\text{br.'}w'\}) + \rho(\{\lambda z^1_e.z^1\text{br.'}b'\})$

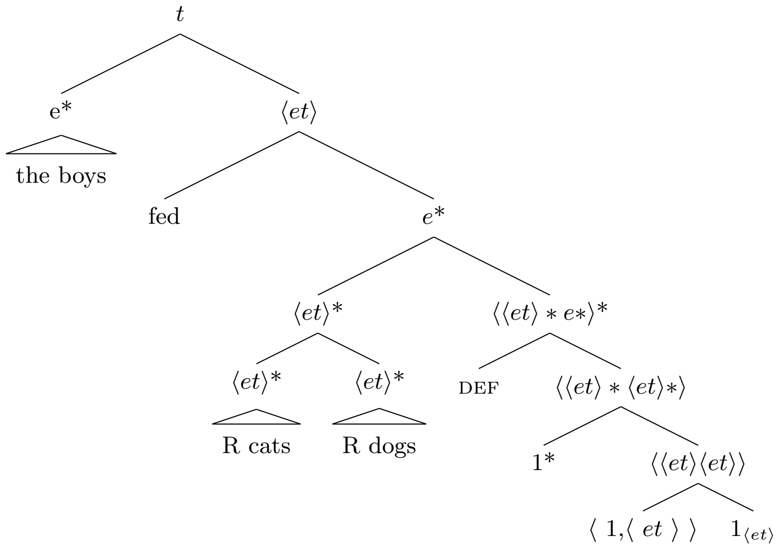
Now turn to (65d), repeated in (86). The L1-representation of the sentence contains two L2-relevant cycle, the entire sentence and the AC that is the complement of DEF, (86b). The derivation of the first cycle in (86c) and of the second cycle in (86d) proceeds according to the rules given above.

(86) a. The boys fed the cats and dogs (but not the poor squids).

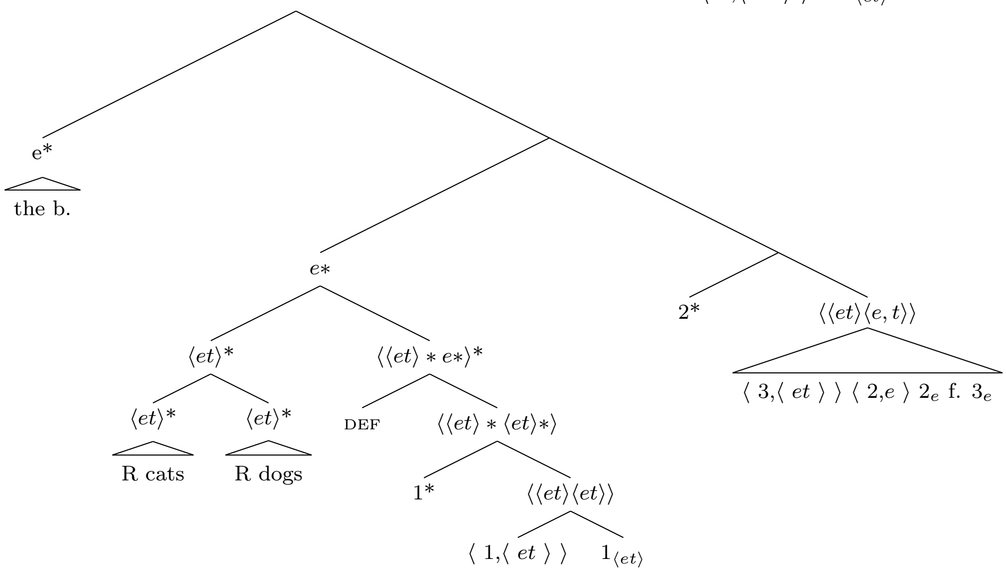
b.



c.




d.



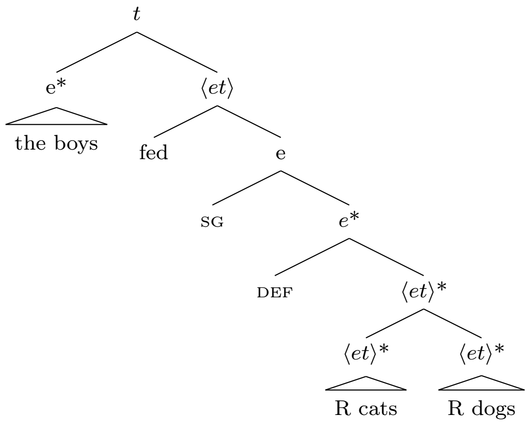

Consider the extension of the first cycle, relative to the model. It yields the plurality containing all individuals that are dogs or cats. Accordingly, the meaning of (86d) is such that the sentence is true w.r.t. the model given above, it would be true as long as Chuck and Peter each fed a dog or a cat and every cat was fed by Chuck or Peter and every dog was fed by Chuck or Peter. It would be false if neither Chuck nor Peter fed any dog or any cat and unvalued otherwise.

(87) $$+\rho(f(P)) : \rho(\{P\} \leq_{AT} \rho(\{\lambda x_e.\ \text{cat'}(x)\}) + \rho(\{\lambda x_e.\ \text{dog'}(x)\}) \wedge f = \lambda Q_{\langle et\rangle}.Q = \\ = \rho(\{\lambda x_e.\ \text{cat'}(x)\}) + \rho(\{\lambda x_e.\ \text{dog'}(x)\}) = \rho(\{j'\} + \rho(\{m'\}) + \rho(\{b'\})\rho(\{w'\}).$$

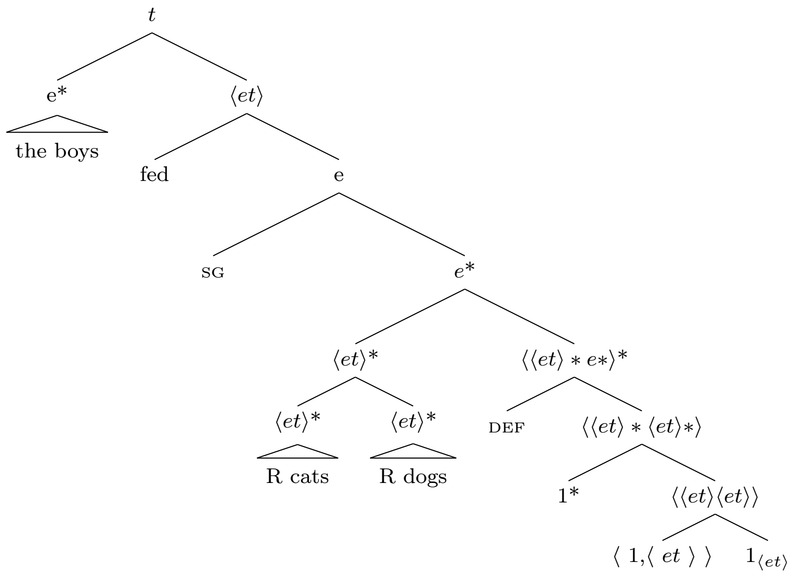
Note that given our assumptions about the singular in section 4.1 above, we can also derive the correct results for the singular, namely, that the DP in (88b) will denote the atomic individual that is the only salient individual that is a whale and the only salient individual that is a shark (the sentence is bad because there usually aren't any such individuals. According to the rules in (22) above, movement will be below SG ($= \bar{R}$), as in (88c), hence if there is no value in $D_e$ for the derived structure, the sentence comes out as unvalued.

(88) a. Peter hat den Wal und Hai gefüttert.
'Peter fed the whale and shark.'

b.



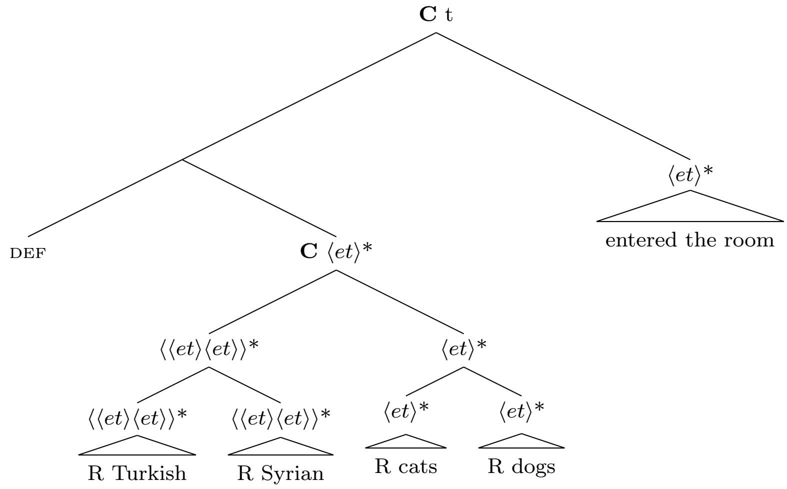

c.



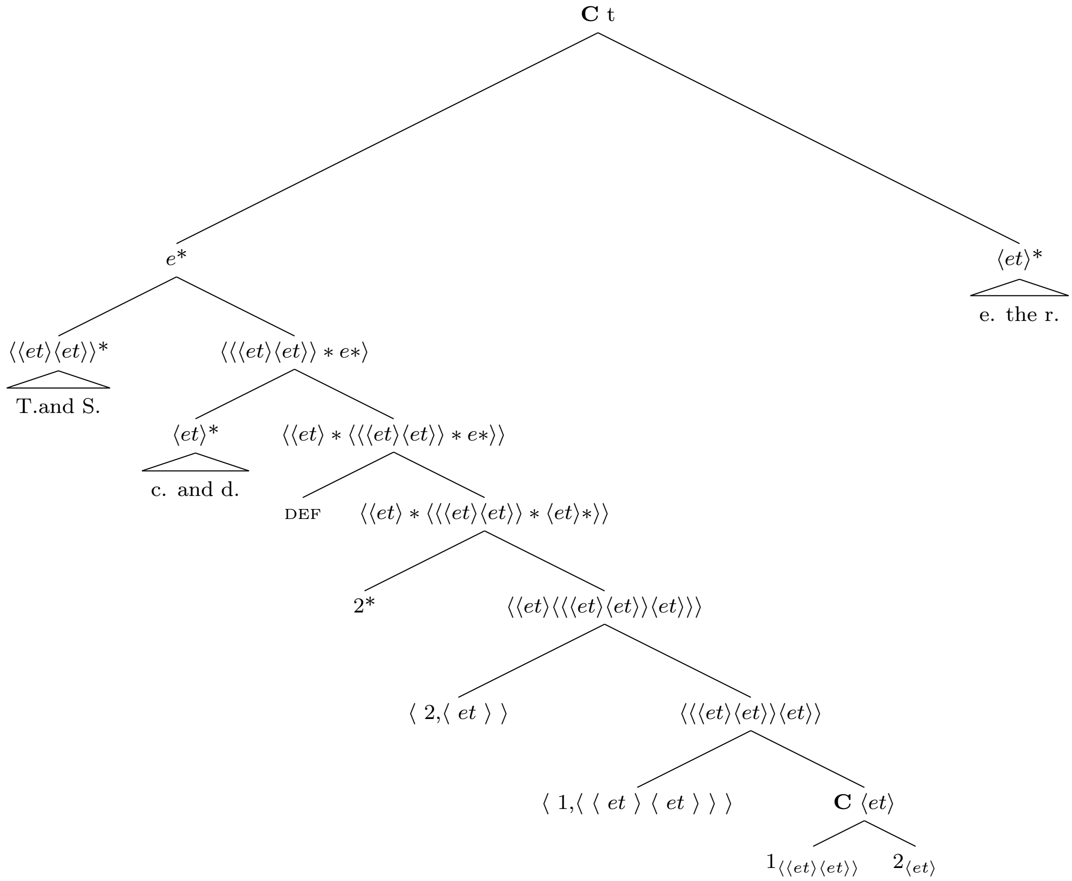

As the next step, consider more complex cases, such as (65e), repeated in (89). Its L1-representation in (89b) has two cycles, the complement of DEF and the entire sentence. The derivation of the first cycle is given in (89c), the derivation of the second cycle in (89d).

(89) a. The Turkish and Syrian cats and dogs entered the room.

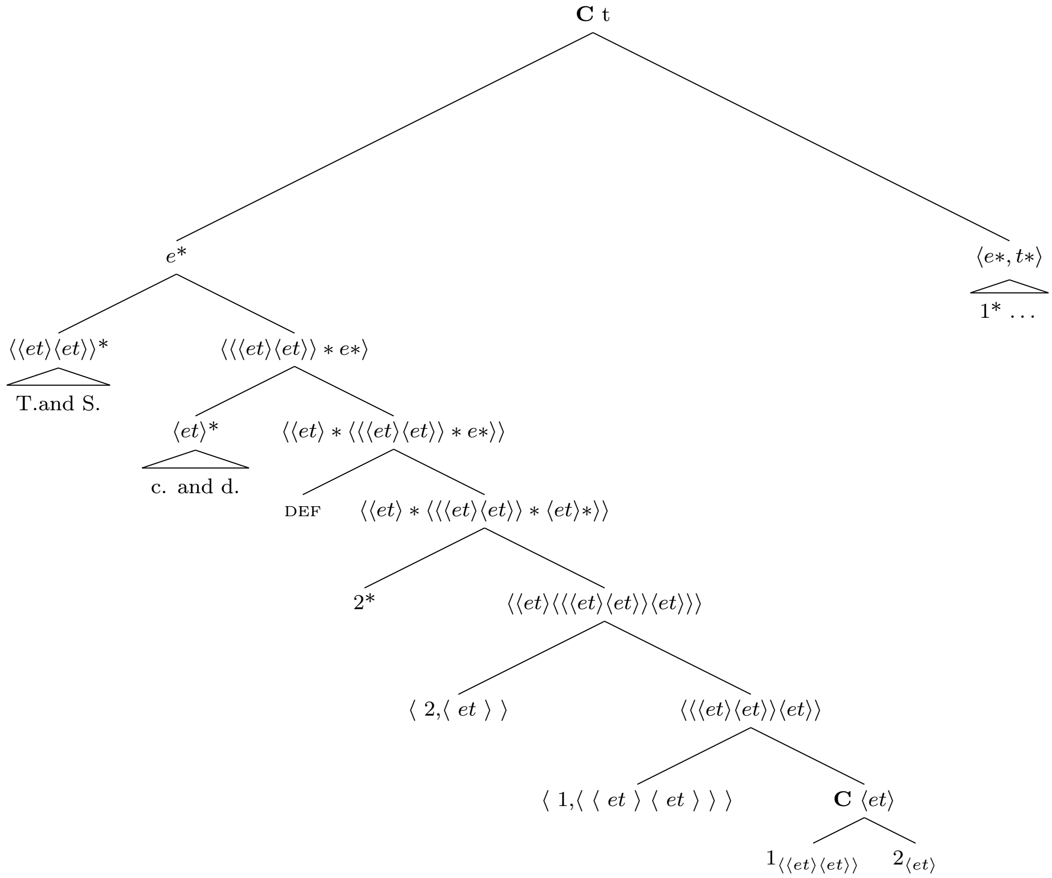
b.


C t
⟨et⟩*
entered the room
DEF
C ⟨et⟩*
⟨⟨et⟩⟨et⟩⟩*
⟨et⟩*
⟨⟨et⟩⟨et⟩⟩*
⟨⟨et⟩⟨et⟩⟩*
⟨et⟩*
⟨et⟩*
R Turkish
R Syrian
R cats
R dogs

c.


C t
e*
⟨et⟩*
e. the r.
⟨⟨et⟩⟨et⟩⟩*
⟨⟨⟨et⟩⟨et⟩⟩ ∗ e∗⟩
T.and S.
⟨et⟩*
⟨⟨et⟩ ∗ ⟨⟨⟨et⟩⟨et⟩⟩ ∗ e∗⟩⟩
c. and d.
DEF
⟨⟨et⟩ ∗ ⟨⟨⟨et⟩⟨et⟩⟩ ∗ ⟨et⟩∗⟩⟩
2*
⟨⟨et⟩⟨⟨⟨et⟩⟨et⟩⟩⟨et⟩⟩⟩
⟨ 2,⟨ et ⟩ ⟩
⟨⟨⟨et⟩⟨et⟩⟩⟨et⟩⟩
⟨ 1,⟨ ⟨ et ⟩ ⟨ et ⟩ ⟩ ⟩
C ⟨et⟩
1⟨⟨et⟩⟨et⟩⟩
2⟨et⟩

d.




Consider now what we derive as the meaning of the first cycle, (90): That plurality of individuals all atoms of which are either a cat or a dog and either Turkish or Syrian. This is the correct result. The entire sentence therefore is true if there are dogs and cats and all cats and dogs that are Turkish or Syrian and all dogs that are Turkish left the room. It is false if such individuals exists and none of them left and the room, unvalued if such individuals exist and some, but not all of them left the room and undefined, finally if there are no cats or dogs.

(90) $+\rho(f(P)) : \rho\{P\} \leq_{AT} \rho(\{\lambda x.\ \text{cat'}\ x\}) + \rho(\{\lambda x.\ \text{dog'}\ x\}) \wedge f = \lambda Q_{\langle et\rangle}.\lambda y_e.$
$\exists M[\rho(\{M\}) \leq_{AT} \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.\ \text{Turkish'}(R)(z)\}) + \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.\ \text{Syrian'}(R)(z)\}) \wedge$
$M(Q)(y)] + +\rho(g(N)) : \rho\{N\} \leq_{AT} \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.\ \text{Turkish'}(R)(z)\}) + \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.$
$\text{Syrian'}(R)(z)\}) \wedge g = \lambda M_{\langle\langle et\rangle\langle et\rangle\rangle}.\lambda y_e.$
$\exists Q[\rho(\{Q\}) \leq_{AT} \rho(\{\lambda x.\ \text{cat'}\ x\}) + \rho(\{\lambda x.\ \text{dog'}\ x\}) \wedge M(Q)(y)] =$
$= \rho(\lambda x.\exists M[\rho(M) \leq AT\rho(\{T'\}) + \rho(\{S'\}) \wedge M(x) \wedge C'(x)]) + \rho(\lambda x.\exists M[\rho(M) \leq$
$AT\rho(\{T'\}) + \rho(\{S'\}) \wedge M(x) \wedge D'(x)]) + \rho(\lambda x.\exists P[\rho(P) \leq AT\rho(\{C'\}) + \rho(\{D'\}) \wedge$
$T'(x) \wedge P(x)]) + \rho(\lambda x.\exists P[\rho(P) \leq AT\rho(\{C'\}) + \rho(\{D'\}) \wedge S'(x) \wedge P(x)])$

Note that we can also derive those examples that caused problems for Krifka's proposal in chapter 3 above, without having to assume cumulated extensions for singular NPs: Again, SG will apply above the result of the derivation of the first cycle, hence the resulting expression will only be defined if the sum can be mapped to an atom. I here only give the input to SG for (91a) in (91b).[28]

(91) a. The nice and intelligent actor entered the room.

b. $[_e$ SG $\beta]$, where $[\![\beta]\!]^{M,g} = +\rho(g(N)) : \rho\{N\} \leq_{AT} \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.$ nice'$(R)(z)\}) + \rho(\{\lambda R_{\langle et\rangle}\lambda z_e.$ intelligent'$(R)(z)\}) \wedge g = \lambda M_{\langle\langle et\rangle\langle et\rangle\rangle}.\lambda z_e.N([\![\text{man}]\!]^{M,g})(z)$

Finally, I simply give the meaning for the first cycle of (65f) above, repeated in (92a). This, also, is the desired result, namely, The plurality of individuals that contains all toilets of Jimmy and all toilets of Mörder.

(92) a. The boys cleaned the toilets of the cats.

b. $\rho(f(x) : x \leq_{AT} \rho(\{j'\}) + \rho(\{m'\}) \wedge f = \lambda y_e.\lambda z_e.[\![\text{toilet of}]\!]^{M,g}(y)(z)$

### 4.3.2 Interim summary

Up to this point, we were lacking an analysis for plural expressions embedded in plural expressions: Krifka's 1990 system was shown in section 3.5 to lack an extension to non-local configurations such as (93). I here proposed a derivation for embedded plurals that involves a cyclic L1-L2 mapping based on a set of rules that is an extension of the rules given in 4.2 above. A cycle for this part of the syntactic derivation was defined as the complement of one of the two syntactic representations of shifts from the singular to the plural domain: R and DEF. This derived all the basic cases. Further, examples such as (93) do not pose a problem anymore: The AC in denotes the sum of meeting Nicole, meeting Taylor, meeting Keith and meeting young Kennedy, and that sum is related qua $2 * \langle 2\langle et\rangle\rangle\langle 1\rangle$ *$1_e$ wants John* $2_{\langle et\rangle}$ to the sum of Mary and Sue – accordingly, the sentence is correctly predicted to be true in the scenario given.

a. SCENARIO: *Mary and Sue are matchmakers. Each wants to hook John up with a celebrity, unfortunately, most celebrities aren't single, so John's meeting them would also mean for him to get rid of his rival. Mary considers Nicole Kidman the most beautiful woman on Earth and wants John to meet her (but she doesn't know Taylor Swift and probably doesn't wouldn't want John to meet her) and, accordingly, to beat up Keith Urban, Sue wants John to meet Taylor Swift and beat up young Kennedy (she has no desire w.r.t. Nicole and her husband.)*
Mary and Sue want John to meet Nicole and Taylor and to beat up Keith and young Kennedy.

[28]The discussion in 5.1 shows that this also extends to Krifka's original examples.

## 4.4 Summary of chapter 4

In this chapter, I argued that the reason why standard plurals and AC exhibit the similar behavior witnessed in section 3.5 is that both standard plurals as well as all ACs denote pluralities. An AC with coordinates of type $a$ will, broadly speaking, denote a plurality with atoms of that type. Pluralities were introduced as hybrid objects which serve as arguments of derived predicates, the value of these predicates being the sum, i.e. the plurality of all the values of the singular predicate applying to the atoms of the argument plurality, or, in the case of sentences with more than one plurality, the sum of values derived by checking whether, for each atom of each plurality, there are atoms of other pluralities such that the tuple of these atoms has the property in question. In other words, the derived predicates that apply to pluralities are sums of predicates applying to atoms of pluralities. As a result, the correct truth-conditions were derived: sentences with one plurality as in (93) always have a "distributive" or "intersective" reading, while sentences with more than one plurality, as in (94), have a "cumulative" or "non-intersective" reading.

(93) John smoked and danced.

(94) John and Peter smoked and danced.

Further, since the value of a derived predicate applying to a plurality is always a sum of singular values, we obtain *homogeneity* effects for all sentences containing pluralities. A sentence only has a truth-value if the sum of values is can be mapped to singular value in $D_t$, accordingly, (93) is true if John both smoked and danced, false if he did neither and unvalued otherwise. (94) is true if John danced or smoked and Peter danced or smoked and one of the two danced and one of the two smoked, it is false if John did neither and, at the same time, Peter did neither and it is unvalued otherwise. These results are congruent with what I laid out to be the analytical desideratum in chapter 3. The impact of negation – negated sentences involving pluralities originally gave rise to the observation that there are homogeneity effects – is also as desired. Sentential operators that have scope over the highest plural expression target the value in $D_t$ that the sum of values obtained by application of the plural predicate to the pluralities is mapped to. Accordingly, (95) is true if (93) is mapped to 0, false if (93) is mapped to 1 and undefined if there is no value in $D_t$ for (93). Similarly for (96): It is true if (94) is mapped to 0, false if it is mapped to 1 and undefined if there is no value in $D_t$ for (94).

(95) John didn't smoke and dance.

(96) John and Peter didn't smoke and dance.

The chapter also introduced the a new syntactic level, which was required to deal with the observations termed *projection* and aspects of the set of observations termed *quantifiers* in the preceding chapters. In particular, I distinguished between a level of representation called

L1 (our "standard" LF) and a level L2. L2 is the level of representation where the plural / singular dichotomy is relevant. In the mapping from L1 to L2 – which we could call plural syntax – none of the otherwise observable syntactic constraints on movement apply, therefore the predicates that apply to pluralities can be formed syntactically by movement across clause-boundaries and syntactic islands. However, this lack of locality constraints is not completely general: I argued that embedded plurals, i.e. cases such as (97), require us to assume a special kind of cyclicity for plural syntax: A plural expression, so to speak, acts as a cyclic boundary for all plurals embedded within it.

(97) a. The boys stroked the cats and brushed the dogs.
b. The boys want to drink and smoke and hope to get laid.

A complete list of all the syntactic and semantic rules that I assumed above can be found in concluding chapter of this thesis. I now turn to the obvious problems of the proposal I laid out here.

# 5 Problems

The two main semantic claims I have made are repeated in (1). Although they are tied together in the proposal given above, they are independent of each other in principle.

a. ACs with coordinates of any type $a$ denote pluralities of objects of type $a$ and are subject to cumulative interpretation.

b. Pluralities are hybrid objects, i.e. there are no expressions that primitively denote properties of such objects.

In the following, I discuss two problems, each of which relates to one of the claims in isolation. While lacking a definitive answer on how they should be solved I show them to be of a more general nature, which means that they don't arise exclusively on behalf of the claim in question– and tentatively suggest in which direction a solution might be found.

The claim in (b) arose from the necessity to account for homogeneity. It states that pluralities can only be interpreted *qua* their atoms and that therefore there are no primitive properties of pluralities. This is in obvious conflict with the fact that languages have a number of collective predicates – some English examples are given in (1)–the hallmark of which is that they attribute properties to pluralities directly in the sense the property in question cannot be reduced to a property of the atomic parts of the plurality (cf. in particular Link (1983), Dowty (1986), Van der Does (1992, 1993)).

(1)
a. The girls *gathered* in the courtyard.
b. The men *outnumbered* the women.
c. The girls are a *good team.*
d. The streets are *parallel*, you can't miss them.
e. The boys *lifted the piano.*

At first sight, these data straightforwardly falsify (b) and require a re-formulation of the proposal without it. (This is feasible, although we lose the account of homogeneity, of course.[1])

[1]The following sketches what this would look like. *and* is given the status of a morpheme here for ease of exposition, this is not a necessary feature. $\uparrow$ basically fulfills the role of $R$. The *-rules given above would have to be revised accordingly so that we obtain a generalized form of standard cumulation as discussed in chapter 2.

(i) a. On the basis of a non-empty set $A$ of individuals,
$D_e = A \cup (\wp A \setminus \{\emptyset\})$
$D_t = \{0, 1\}$
$D_{\langle a,b\rangle} = S \cup (\wp(S) \setminus \emptyset)$, where $S$ is the set of all functions from $D_a$ to $D_b$.

However, this conclusion might be too hasty: I will show that collective and mixed predicates display homogeneity effects (cf. also Büring and Križ (2012)), which is unexpected if such predicates attribute properties to pluralities directly. Based on these findings, I give a very rough sketch of an alternative view of collectivity which views collective predicates as transitive predicates from $D \times D$, which are subsequently pluralized, i.e. affixed by the 2*-operator from above.

The claim in (a) was based on the observation that AC consistently behave like standard plurals. This, of course, raises the question of how the syntactic and semantic relation to *or*-coordinations. On the syntactic side, we must distinguish AC and OC sufficiently to derive the difference in meaning in (2).

(2) a. Yesterday, John married Sue and Judy.
    b. Yesterday, John married Sue or Judy.

On the semantic side, there is the question of whether OC, too, display any of the features exhibited by AC that have led to my claim that the latter denote pluralities. I briefly address both questions, but the discussion remains inconclusive.

## 5.1 Collectivity

Collective and mixed predicates, as in (3) and (4), seem to (be able to) express properties of pluralities that are not reducible to properties of the atomic parts of the plurality.

(3) a. The girls *met* in the courtyard.
    b. The two main streets are *parallel*.
    c. John *compared* the essays.
    d. The men *outnumbered* the women.
    e. The athletes *formed a pyramid.*
    f. These girls are a *good team.*

(4) a. The girls *are very heavy / light.*
    b. The girls *weigh exactly 500 pounds.*
    c. The girls *lifted the piano.*
    d. The girls *built a little shack.*

In chapter 4 pluralities were introduced as hybrid objects, accessible only via their atomic parts, accordingly expressions that primitively denote properties of such objects should not exist. Below, I very tentatively suggest that they don't.

---

b. $AT_a$ is the set of objects $x$ of type $a$, such that there is no $y$, $y \in D_a$ and $y \in x$ (may include the empty set).
c. $[\![\text{and}]\!]_{\langle\langle a,a\rangle a\rangle} = \lambda x : x \in D_a \setminus AT_a.\lambda y : y \in D_a \setminus AT_a.x \cup y$
d. $\uparrow_a = \lambda x_a : x \in AT_a.\{x\}$.

My discussion is limited in several respects. First, I only consider collective and mixed predicates and exclude what Schwarzschild (1996) refers to as *plurality seekers*, (5). Superficially, they could be thought to fall in the same class as collective predicates – after all, they must co-occur with plural expressions. However, as opposed to collective predicates, they do not denote a property of the plurality as such but rather, broadly speaking, seem to modify the plural relation or, possibly, the standard of precision (cf. Link (1983), Dowty (1986), Brisson (1998, 2000, 2003), Križ and Schmitt (2012a) for *all*, Dowty and Brodie (1984), Dowty (1986) for *each*, Schwarzschild (1996) for *both*, Stockwell et al. (1973), Link (1984), McCawley (1988), Dalrymple and Kehler (1995), Gawron and Kehler (2004) for *respectively*). The former property might also be used to characterize external construal of attributive *different, same, similar* (cf. Carlson (1987), Moltmann (1992), Beck (2000b), reciprocals (cf. Heim et al. (1991b,a), Beck (2001) (a.o.)), *respective* (cf. Gawron and Kehler (2002)) *together* (cf. Lasersohn (1990, 1995), Schwarzschild (1994)) and *between them.* Although I have employed these and related elements as diagnostics, and will continue to do so, I exclude them from the discussion as an object of analysis and therefore will not investigate their status w.r.t. the proposal given above. This is owed to the empirical complexity tied to each of these elements which I simply see myself unable to cover here.

(5) a. *All* (of) the boys ate an apple. The boys *all* ate an apple.
b. *Each* of the boys ate an apple. The boys *each* ate an apple.
c. *Both* (of) the boys ate an apple. The boys *both* ate an apple.
d. John and Bill hit Sue and Mary, *respectively.*
e. John and Bill danced and smoked, *respectively.*

(6) a. *Different / the same / similar* people molested John and Mary.
b. *Different / the same / similar* people molested and robbed John.
c. John and Mary ate an apple *together.*
d. John and Mary ate 80 sausages *between them.*
e. John and Mary despise *each other.*
f. Mary and Sue killed their *respective* husbands.

Second, I ignore collective / mixed attributive adjectives or such predicates embedded in modifiers, as in *the parallel lines*, *the lines that are parallel.* The proposal given above does not involve lexical cumulation, so the standard story, according to which the collective attributive adjective is a modifier of a set of pluralities cannot be employed. I am unsure about the status of this potential problem: In order for it to be one, we must establish that these items really allow for a restrictive construal (cf. Schwarzschild (2002, 2005, 2006) and Solt (2011a) for related discussion) and ascertain that these elements are indeed interpreted in their surface position, which, as long as there are objects such as Link's 1984 *hydras* is not indisputable.

Third, I only consider a subset of collective predicates which I refer to as "true collectives", this set being almost congruent to Dowty's 1986 *all*-type and Winter's 2001a *set*-type predicates (cf. also Taub (1989), Brisson (1998, 2003), Champollion (2010b)). These predicates obligatorily require a plural argument (some collective nouns may occur as arguments as well) – no matter how far-fetched and absurd the context may be: (7a) is to insinuate that Oliver doesn't have any friends, but the last sentence still seems incomplete. As opposed to this, "non-true" collectives can, in outlandish contexts, apply to atomic individuals: (7b), which is fine if uttered in a context of a soccer tournament among friends, where very good people can play on their own.

(7) a. Heute traf sich jeder mit seinem besten Freund. Diedrich und Martin haben sich getroffen. Franz und Karl haben sich getroffen. # Oliver hat sich getroffen.
'Everyone met with their best friends. Diedrich and Martin met. Franz and Karl met. # Oliver met.'

b. Sylvie, Summer und Viola waren eine ganz schlechte Mannschaft Diedrich, Daniel und Sissi waren eine mittelmäßige, Martha und Bernd waren ganz gut, aber der Florian war natürlich die beste Mannschaft.
'Sylvie, Summer and Viola were a bad team, Diedrich, Daniel and Sissi were a mediocre one, Bernd und Martha were ok, but Florian was the best team, of course.

Further, true collectives can be symptomatically distinguished from other collective predicates in that they do license the occurrence of *zusammen* (together), (8).[2]

(8) a. # Die Buben haben sich zusammen getroffen.
'#The boys met together.'

b. # Die Linien sind zusammen parallel.
'# The lines together are parallel.'

c. Die Buben sind zusammen eine gute Mannschaft.
'The boys are a good team together.'

In the following, I have nothing to say about "non-true" collectives, but I would assume they should have a treatment in the vein of mixed predicates below.[3]

[2]The reason why I do not employ existing categorizations is that I cannot reproduce the required minimal pairs in German. Dowty (1986) (cf. also Brisson (1998, 2003)) argues that collectives can be distinguished by whether or not they allow for the occurrence of (floated) *all* while maintaining their collective reading (hence the name). In German floated *alle* (all), when unstressed, can occur with pretty much any predicate, except for the German analogon of Dowty's *get thinner in the middle* as in *the trees get thinner in the middle* and (some) predicates that involve measurements of cardinality (*be a medium-sized group*). Taub (1989) argues the distribution of exceptives is generally parallel to that of all, as observed in Dowty (1986). The empirical facts here are difficult to ascertain: First, as discussed in von Fintel (1993), there seem to be different types of exceptives, and some seem to be compatible with all predicates. Second, as shown in Križ and Schmitt (2012a), the distribution of exceptives with plurals differs from that of exceptives with quantifiers, anyway.

[3]Various authors (including Winter (2001a), Champollion (2010b)) have argued that, as opposed to true collectives, non-true cillectives denote properties of *groups* (where a group is taken to be an internally opaque object – a different kind of atoms, so to speak, in Landman's 1989a sense), rather than pluralities. As indicated above, I would subscribe to an alternative treatment: "Non-true" collective predicates mostly

Finally, I exclude from my discussion of mixed predicates those where one of the (explicit or implicit) arguments is a degree. These cases are probably not limited to standard examples in (10), but should also incude predicates which relate to the degree of cardinality, (10) as well as predicates such as *surprise* (cf. Asher (1987), Lahiri (2000, 2002)), *(un)likely*, *probable* (cf. Lassiter (2011)) and *prefer*.

(9) a. John and Peter weigh 300 pounds.
b. John and Peter are very heavy.
c. John and Peter are the heaviest students.
d. The boys are heavier than the girls.

(10) The boys outnumbered the girls.

The account that I sketch below for mixed predicates as in (11) assumes that singular expressions can optionally be mapped to pluralities. In the latter case, we obtain a cumulative reading, so to speak, where every boy carried some part of the piano and every part of the piano was carried by some boy. In principle, this should be extendable to degrees: If degrees are part of our ontology, there should be pluralities of degrees (cf. also Fitzgibbons et al. (to appear)), accordingly, a singular expression should either denote an atomic degree or, optionally, a plurality thereof, accounting for the ambiguities in (9): If *300 pounds* is mapped to the plurality of its material parts, again degrees, John must weigh some of the parts and Peter must weigh the other parts, yielding the collective reading. The distributive reading, on the other hand, would arise whenever *300 pounds* simply denotes an atomic degree. Yet, as I can find no sensible definition of material parts within a treatment of degrees where the latter are identified with points on a scale I have to leave this matter to future research.[4]

(11) The boys carried the piano.

### 5.1.1 Collective predicates

True collective predicates are standardly assumed to express properties of pluralities. (12) gives an example for a model M within Link's 1983 treatment of plurality (cf. chapter 2).

(12) $[\![\text{meet}]\!]^{M,g} = \{a \oplus b, c \oplus d, f \oplus g \oplus h\}$

involve transitive structures where the object is a DP with a collective noun complement, as in (8c). Let us a assume that a collective verb is a singular expression which can be more easily mapped to a plurality (see my discussion below) because it has identifiable parts. Then we could also get a handle on why both mixed predicates and non-true collectives license *zusammen*. The difference that remains is that in non-true collectives, as opposed to mixed predicates, whenever they combine with a plural, no distributive construal is possible. Given what I say below, this would basically force me to state that DPs such as *the good team* etc. are singular expressions which are (almost) obligatorily mapped to pluralities.

[4]The discussion of monotonicity as a property of dimensions of measurement, as in Schwarzschild (2006), Champollion (2010b), Sassoon (2010) seems directly related, still, I see no plausible way to connect it to my aims in the present section.

Given this assumptions, homogeneity effects are not expected: If a collective predicate is attributed to a plurality $c \oplus d \oplus e$ and $c \oplus d \oplus e$ is not in its extension, then the sentence should be false and its negation true – after all, we are dealing with simple predication and there is no *prima facie* relation between a plurality and its parts.

The empirical situation contradicts this expectation. The sentences in (13) express that the boys under consideration all met somewhere. Their negations in (14), however, express that there was no meeting whats'o'ever between any of them. If Dick and Eric met and Chris didn't meet either of the two, the sentences should be true – after all, $c \oplus d \oplus e$ is not in the extension of *meet* – but I don't think they are (again, I ignore the possibility of imprecision). Rather, they seem to be unvalued, in analogy to what we observed for distributive predicates in section 2.4 above (related observations w.r.t. collective readings of mixed predicates are discussed in Büring and Križ (2012)). The same point can be made on behalf of the examples in (14), which each do not only deny that the collective predicate holds of the plurality in question, but also that it holds of any sub-plurality thereof.

(13) a. The boys met.
b. Chris, Dick and Eric met.

(14) a. The boys didn't meet.
b. It is not the case that the boys met.
c. Chris, Dick and Eric didn't meet.
d. It is not the case that Chris, Dick and Eric met.

(15) a. These lines aren't parallel.
b. John was lazy, he didn't compare the essays.
c. The workers didn't gather in the streets.

This is unexpected. Above, homogeneity was derived as a side effect of the hybrid status of plural predication. More standard accounts of cumulation, such as Schwarzschild's 1994, derive homogeneity as a side effect of cumulation (see section 2.4). If either of these takes is correct, then this suggests that standard collective predication is not simply the attribution of a property to a plurality, but involves cumulativity. Crucially, this must involve reference to atomic parts of the plurality – subtracting atomic parts from the plurality in question will yield an unvalued, rather than a true (or false) sentence in (14) above.

The most obvious hypothesis[5] is that intransitive collective predicates are derived from transitive predicates expressing relations between atoms, (16).[6] Within the present system,

[5]Which is different from **?**'s **?** proposal, as the latter does not involve pluralities of individuals.

[6]Should symmetric predicates contain a non-identity restriction as in (ia)? As opposed to the examples discussed above, (ib) is strange, but can still be used in the given context, insinuating that Oliver is a narcissist. It is certainly strange from the perspective taken above, but also from the standard view of collective predication, that (ic), as opposed to (ib) is bad, in particular, as it cannot be due to a condition-B-violation, as shown by the contrast with (id).

(i) a. $\lambda x_e.\lambda y_e : x \neq y.$ x met y this means that true collectives such as *meet* actually start off as binary relations between atoms and are subsequently affixed by the 2*-operator, (17).[7]

(16) a. $\lambda x_e.\lambda y_e$. x met y
b. Chris and Dick met ~~Chris and Dick~~

(17) a. [Chris and Dick] met$_{\langle e\langle e,t\rangle\rangle}$ [Chris and Dick]
b. [Chris and Dick] [Chris and Dick] [2* $\langle 1,e\rangle$ $\langle 2,e\rangle$ 2 met $1_{\langle e\langle e,t\rangle\rangle}]_{\langle e*\langle e*,t*\rangle\rangle}$

More precisely, I speculate that all true collectives are derived – somehow– from non-collective transitive structures, more specifically, comitative or pseudo-comitative (PP-)structures. This assumption is required since not all true collectives have a simple transitive counterpart (such as (18a) for *meet*), but all true collectives have a non-collective comitative or pseudo-comitative counterpart(such as *meet with*, *gather with*, cf. also Lakoff and Peters (1966)).[8] There are three pieces of circumstantial evidence for this more specific claim. First these comitative (and pseudocomitative) PPs can associate with subjects and direct objects, but never with indirect objects, at least in German, English and Greek (cf. McNally (1993) for Russian). At the same time, these languages seem to lack any verbs that are collective w.r.t.

b. Heute traf sich jeder mit seinem besten Freund. Diedrich und Martin haben sich getroffen. Franz und Karl haben sich getroffen. Oliver hat sich mit sich selbst getroffen.
'Everyone met with their best friends. Diedrich and Martin met. Franz and Karl haben sich getroffen. Oliver met with himself'

c. Heute traf sich jeder mit seinem besten Freund. Diedrich und Martin haben sich getroffen. Franz und Karl haben sich getroffen. #Oliver und er selbst haben / hat sich getroffen.
'Everyone met with their best friends. Diedrich and Martin met. Franz and Karl haben sich getroffen. ?Oliver and himself met'

d. Oliver$_i$ und ein Freund von ihm$_i$ haben sich getroffen.
Oliver and a friend of him have REFL met

[7] Hackl (2002) proposes that true collectives as in (i) are derived from the underlying transitive structure in (i) rather than (ia), but this is met with the difficulty of accounting for cases where the subject is a simple plurality, as in (ic). If we chose (ib), as I do above, however, we cannot explain why don't we find this structure overtly – (ib) is ill-formed and involves a condition-C violation. One could, or course, argue that one of the arguments is in fact elided, following Fiengo and May (1994), Sauerland (1998), Safir (1999) that ellipsis gives rise to so-called *vehicle-change*. What I do not discuss here is the obvious connection to reciprocals (cf. Hackl (2002).

(i) Chris and Dick met.
a. Chris met Dick.
b. # Chris and Dick met Chris and Dick.
c. The children met.
d. Chris and Dick met with each other.

[8] As opposed to the simple transitive counterparts, comitative structures are truly symmetric. In German, I can (if marginally) say (ia) but never (ib).

(i) a. Ich habe den Hans getroffen, aber er hat mich gar nicht bemerkt.
'I met Hans, but didn't even notice me.'
b. Ich habe mich mit dem Hans getroffen, aber er hat mich gar nicht bemerkt.
'I met with Hans, but didn't even notice me.'

Note that what I say above is limited to verbal collectives, but not to collective prepositions such as *between*. I have no proposal for the latter.

the indirect object.[9] Second, the hypothesis might give us a syntactic handle of why true collectives are limited to predicates of individuals and why we don't find collectivity for other types of pluralities: Comitatives can only embed DPs, accordingly, true collectives should only express properties of whatever can be the denotation of a DP. And third, the behavior of *zusammen* (together) with comitatives mimics that with true collectives – whereas the standard transitive case is fine, the comitative is bad (the adverbial is topicalized in order to prevent ambiguity).[10]

(18) a. Chris met$_{\langle e \langle e,t \rangle\rangle}$ Dick.
b. Chris [met with]$_{\langle e \langle e,t \rangle\rangle}$ Dick.

(19) a. Zusammen haben die Nonnen die Priester getroffen.
'The nuns, together, met the priests.'
b. # Zusammen haben sich die Nonnen mit den Priestern getroffen.
'The nuns, together, met with the priests.'

The meaning that would result if we re-analyze collective predicates as transitive structures is obviously much weaker than the standard construals of such sentences – (20) seems to express that all children met each other in the same place. We predict, however, that the sentence is true if Ann met Chris somewhere, Belle met Dick and Eric somewhere else. Is it? I think so, but it is certainly not the most prominent scenario that comes to mind. This could be due to independent factors, which I briefly touch upon below, having to do with the question of how much spatio-temporal distribution plural sentences require to be considered an appropriate utterance.[11]

(20) Anne, Bell, Chris, Dick and Eric met.

[9]I thank Elena Anagnostopolou (pc) for informing me about the situation in Greek.

[10]This latter factor, is, of course, nothing but a correlation – I have no analysis of *zusammen* to offer here. Schwarzschild's 1994 analysis might explain why it cannot combine with collective predicates under the standard view of predication – broadly speaking, its application would be vacuous.

[11]The meaning I predict is different from Van der Does's 1992 *neutral* reading of collective predication, paraphrased in (i) (with the underlying assumption that pluralities are *sets* of objects, as in Van der Does (1992)) – under the neutral reading, (iia) should be true if none of the 10 CEOs met any other CEO, as long as every CEP but was involved in some meeting (with other people). I do not think this *neutral* reading exists. Consider (iib), which should illustrate the neutral reading, because each CEO is involved in a meeting, but no meeting contains more than one CEO – I find the discourse in (iib) strange, to say the least. Further (iic) is non-contradictory (van der Does could counter this, of course, by claiming that it is non-contradictory under some other reading of the collective).

(i) *a is P* is true iff $a' \in \bigcup P'$

(ii) a. 10 CEOs met this afternoon.
b. 10 CEOs met this afternoon at the "Get to know the company"- party. # Burns met with the workforce, Johnson with the shareholders, Trautmannsdorf with the facilities management, ...
c. The CEOs didn't meet this afternoon at the "Get to know the company"- party. Rather, Burns met with the workforce, Johnson with the shareholders, Trautmannsdorf with the facilities management, ...

The hypothesis above might also solve the puzzle concerning cumulation I briefly raised at the end of chapter 2. In particular, we saw that if plurality $a$ has the collective property $P$ and plurality $b$ has the collective property $P$, then $a+b$ might not have that property, as exemplified in (21).

(21) Ann and Belle met. Chris and Dick and Eric met. (But) Ann and Belle did not meet with Chris, Dick and Eric, because Ann despises Eric.

Proponents of the standard view might venture to state that since collective and mixed predicates primitively denote properties of pluralities, there is no *prima facie* reason for cumulation (in the sense discussed in chapter 2) – i.e. a predicate such as *meet* only has a basic extension, (22a) and lacks a cumulated one, (22b) (again, I employ Link's 1983 system). Yet, this falsely predicts that sentences with collective predicates lack intermediate construals – but the examples in (23) are fine in the scenario given (cf. Schwarzschild (1996) for similar examples).

(22) a. $[\![\text{meet}]\!]^{M1} = \{a \oplus b, c \oplus d \oplus e, \ldots\}$
b. $[\![\text{meet*}]\!]^{M1} = \{a \oplus b, c \oplus d \oplus e, a \oplus b \oplus c \oplus d \oplus e, \ldots\}$

(23) SCENARIO: *In the evening, the girls met in the bar and the boys met on the playground. The girls did not meet with the boys.*
a. In the evening, the boys and the girls met.
b. In the evening, the children met.

According to the hypothesis above, (24a) underlyingly corresponds (24b) and is therefore analogous to (24c).[12]

(24) a. The girls met. The boys met. Therefore, the children met. .

[12] There are alternative ways to explain these data. Landman (1989a) (cf. also Löbner (2000), Champollion (2010b)) argues that plural DPs, such as *the boys* cannot only denote pluralities but also internally opaque objects– groups – and that collective predicates do not express properties of individuals, but rather, properties of groups. In other words, we change our view of what may count of an atom. Hence, the cumulativity problem above seems to corroborate his hypothesis. Perverting Landman's system for the purposes of this sketch, representing groups as sets of sums and assuming that the subject in (23a) above in effect denotes the sum of groups $\{a \oplus b\} + \{c \oplus d \oplus e\}$ (which means that '+' must be is extentable to groups), and that cumulation is closure under sum, this derives the correct result, (i).

(i) a. $[\![\text{meet}]\!]^{M1} = \{\{a \oplus b\}, \{c \oplus d \oplus e\}, \ldots\}$
b. $[\![\text{meet*}]\!]^{M1} = \{\{a \oplus b\}, \{c \oplus d \oplus e\}, \{a \oplus b\} + \{c \oplus d \oplus e\}, \ldots\}$

Schwarzschild (1996) shows that this view lacks generality. In order to avoid a random mapping from plural expressions to groups, Landman (1989a) must assume that groups are derived syntactically. In (23a) above, the denotation of the subject must be the sum $\{a \oplus b\} + \{c \oplus d \oplus e\}$ which corresponds to the sum of the two groups denoted by *the girls* and *the boys*. Let ↑ be group-formation operator, then denotation is derived by the syntactic structure in (ii). Yet, this means that Landman cannot account for (23b) above: since *the children* is syntactically simple, it can only involve one application of ↑, Accordingly, Landman falsely predicts that (23b) resists an intermediate construal.

(ii) [ [↑[ the girls]] and [↑ [the boys]]]

b. The girls met ~~with the girls~~. The boys met ~~with the boys~~.

c. The nuns met the girls (and never put their eyes on the boys). The priests met the boys (but never saw the girls). Therefore, the clerics met the children.

A final argument *for* the hypothesis is that we seem to find projection with collectives. This fact might escape the attention, as we obviously must consider pluralities with more than two atomic members. (25) can be true, for instance, if John believes that the boys met and Mary believes that the girls met, while having no beliefs about the boys.[13]

(25) John and Mary believe that the boys and the girls met last night, respectively.

In sum, homogeneity requires us to alter the assumptions about collective predication. I gave a sketch that viewed collective predicates as transitive relations between individuals that we subsequently affixed by the *2 operator. This sketch falls short of an actual analysis, due to various open questions I have not even addressed. Most importantly, it is completely mysterious how the actual surface structure of the sentences in question should be derived, i.e. how to derive the intransitive from the transitive case.[14]

---

As opposed to Landman (1989a), Schwarzschild argues that plural DPs uniformly denote plural individuals and that the basic extensions of collective predicates contain such plural individuals; in order to come to terms with the problem of cumulation above, he assumes, broadly speaking, that the extensions of complex predicates are contextually restricted (cf. also Beck (2000b), Beck (2000a)), by assuming that plural sentences are evaluated w.r.t. pragmatic covers (cf. also Gillon (1987)), (iii) (translated to the system in Chapter 2). Broadly speaking, this means that the extension of a predicate $P$, given a particular context $C$,can only be cumulated if the basic extension of $P$ if its basic extension meets the contextually determined restrictions (Schwarzschild (1996) actually employs a VP-distributivity operator that distributes the VP relative to the cover). The required cover for (23a) above is: $\{a \oplus b, c \oplus d \oplus e\}$

(iii) For any cover $Cov \subseteq D_e*$, plurality $S \in D_e*$, $Cov$ is a cover for $S$ iff

a. $Cov$ is a set of parts of $S$ (with $\emptyset \notin Cov$)

b. $\forall x[x \leq_{AT} S \rightarrow \exists Y[Y \in C \wedge x \leq_{AT} Y]$

[13] How the plurality is "split-up", so to speak, seems to be due to pragmatic or grammatical factors (cf. Schwarzschild (1996) and Beck (2000b) for the notion of grammatically induced covers.

[14] Of course, this raises a question concerning the data where a collective predicate licenses NPIs, as discussed in section 2.1, as NPI-licensing is not generally found for double plural structures and distributive predicates, (ia). The latter fact is to be expected, as cumulative relations are not *per se* DE functions.

(i) a. # Die Buben, die auch nur irgendeine Ahnung von Frauen haben, haben die ahnungslosen
The boys RP PRT PRT any clue of women have have the clueless
Mädchen verführt.
girls seduced.

b. Die Buben, die auch nur irgendeine Ahnung von Frauen haben, haben weniger als 5
The boys RP PRT PRT any clue of women have have less than 5
Mädchen verführt.
seduced.

Strangely enough, however, examples with reciprocals are generally better, (ii), which does not follow if the basic relation here is also cumulative, as suggested in Beck (2001). Further, it seems to me that the actual reading of the reciprocal (cf. Langendoen (1978), Dalrymple et al. (1998), Beck (2001)) does not matter: (ii) involves a strong and (iii) a weak reading, but there doesn't seem to be a big difference in the status (as concerns grammaticality) of the two.

### 5.1.2 Mixed predicates

A predicate such as *ate the pizza* can occur with both atom-denoting expressions and plurality-denoting expressions. Apart from an implausible distributive construal,[15] (26b) can express that the boys collaborated in eating the pizza. This construal does not license the inference that for any given atomic part $u$ of the plurality, *ate the pizza* holds. Accordingly, it qualifies as collective and *ate the pizza* thus seems to express a property that can hold both of atomic and plural individuals.[16]

(26) a. John ate the pizza.
b. The boys ate the pizza.

The collective construal, however, is such that we can specify what it means for an atomic individual $u$ to partake in *ate the pizza*: $u$ partakes iff $u$ ate a part of that pizza.

Above, I assumed that singular expressions of type $a$ denote objects in the singular domain (the elements corresponding to atoms). Here, I suggest that singular surface strings are ambiguous between singular expressions of type $a$ and plural expressions of type $a^*$: In the first case, they have their standard denotation, in the latter case they denote a plurality. This plurality is a standard plurality from $\mathcal{R}_a$, but for the sake of brevity I henceforth refer to as $m$-plurality (for "material" plurality).[17] In other words, the string *the pizza* in (26)

---

(ii) ?Die Buben, die auch nur irgendeine Ahnung von Computerspielen haben, hassen einander.
The boys RP PRT PRT any clue of computer-games have hate each-other.

(iii) ?Die Buben, die auch nur irgendeine Ahnung von Computerspielen haben, saßen natürlich nebeneinander.
The boys RP PRT PRT any clue of computer-games have sat of-course next-to-each-other.

[15] I ignore dependent readings that seem to be available for definites, i.e. readings where each boy the the pizza he was served / he bought. See Winter (2000) and Beck and Sauerland (2000).

[16] All mixed predicates involve transitive structures. The singular argument is mostly the object (see Taub (1989), Champollion (2010b)). For non-agentive subjects we find mixed predicates where the subject is a singular, (i). There is a general difference between subjects and objects. In non-DE-contexts, subjects never license an inference down to the atomic parts – we cannot infer from (26b) that every atomic boy ate the pizza, likewise, we cannot infer that every material part of the load of bread in (ia) feeds the farmers – objects always do: if the piano was carried by the boys, every atomic part of it was eaten, if the loaf of bread fed the farmers, it fed every atom of the farmers.

(i) a. Dieser Brotlaib sättige die hungrigen Bauersleute.
'This loaf of bread fed the hungry farmers.' (due to Manuel Križ, pc)
b. Die Decke bedeckte die Katzen.
'The blanket covered the cats.

[17] Link (1983) introduces a separate structure for *material* "sums". Recall that he enriches the standard model by imposing structure on $A$, i.e. $\langle A, \sqcup_i, \leq_i \rangle$ where $\sqcup_i$ is the mereological join ("sum", semantic counterpart of $+$,) and $\leq_i$ a partial ordering upon $A$ ("individual part of", semantic counterpart of $\Pi$). The set of atoms $AT$ is a subset of $A$. This structure is further enriched by the structure $\langle M, \sqcup, \leq \rangle$ and the function $h$. The set $M \subseteq AT$ contains all the material portions of matter in the model (where "matter" has to be taken with a grain of salt). $M$ is closed under $\sqcup$ (" material fusion", the semantic counterpart of what I indicate here by $\otimes$), so that for any two pieces of matter, the material fusion of these pieces is another piece of matter (whether not M is atomic is left open cf. Chierchia (1998) for more discussion). $M$ is partially ordered by $\leq$ ("material part of", the semantic counterpart of $m$). $h$ is a semi-lattice homomorphism $h : A \rightarrow M$,

either corresponds to a singular expression, denoting an individual $u$ in $A$ or a hybrid object, namely, a plurality $\rho(\{u^1\} + \rho(\{u^2\} + \ldots + \rho(\{u^n\} \in \mathcal{R}_e$, where $u^1, u^2, \ldots u^n$.[18] I tentatively posit an operator $\mu$, defined in (28), which can optionally be affixed to expressions of type $a$ and maps them to properties, the result then forming the complement of a (silent) DEF', the syntactic counterpart of $\rho$, (29). The "collective" reading of (27a) – made explicit by (27ai) – is then derived by the standard mechanism for structures with two plural expressions, (27c), while the "distributive" reading of (27a) – made prominent by (27aii) – is the effect of the singular string remaining a singular expression and the standard mechanism for structures with one plural expression, (27d).

(27) a. The boys carried piano.
(i) ... They couldn't have lifted it by themselves.

the "materialization function". It maps any $a \in A$ to the element in $M$ that *constitutes* $a$, i.e. it maps any element from $M$ to itself and any $a \in A \setminus M$ to that element in $M$ that constitutes it. $a$ and $h(a)$ might differ in their properties: Link (p.129) points out that a ring might be new, but the gold it is made out of might be old. Crucially for the discussion in the following paragraph, sums in $A$ can always be mapped to the material fusion of their atoms, i.e.$a + b \rightarrow h(a) \otimes h(b)$: forming the individual sum of $[\![\text{John}]\!]^{M,g}$ and $[\![\text{Mary}]\!]^{M,g}$ yields the plural individual $[\![\text{John}]\!]^{M,g} + [\![\text{Mary}]\!]^{M,g}$, $h([\![\text{John}]\!]^{M,g} + [\![\text{Mary}]\!]^{M,g})$ is the material fusion of the material constituting John and the material constituting Mary. The reverse does not hold: $a \otimes b, a, b \in M$ will still be a member of $AT$: fusing the material that constitutes John and the one that constitutes Mary will be a portion of matter. Hence, $h$ preserves $\leq_i$ on $A$ in $M$, as for any $a, b$, if $a \Pi b$ then $h(a) m h(b)$, but $h$ only imposes a reflexive and transitive pre-ordering $\leq_m$ on $a$: if a piece of matter (say, 20 pounds of flesh, some bones etc.) is a material part of $h([\![\text{John}]\!]^{M,g} + [\![\text{Mary}]\!]^{M,g})$, this does not mean that the object it constitutes (such as John's arm) is an individual part of $[\![\text{John}]\!]^{M,g} + [\![\text{Mary}]\!]^{M,g}$.

What I propose below differs from Link's treatment in that I do not introduce a separate structure corresponding to the set of material parts: The sum of material parts that "constitute" an atom $u$ are a plurality, rather than an atom in $A$.

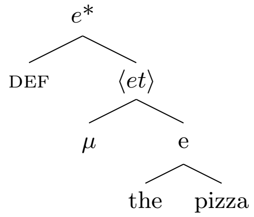
One might object that this should lead us to expect that singular DPs can combine with true collective predicates. Indeed, this seems to be marginally possible, but there is one interesting restriction: It must be clear, what exactly the atoms of the $m$-plurality are. I first illustrate this for collective nouns: The examples in (i) differ in their acceptability. I have the intuition that it is not the size of the collection in question (the army of San Marino is tiny) but what exactly counts as a relevant atom: For *the army*, that's less clear than for *the squad*. Something similar might be going on with standard singular expressions. If it is clear what the atoms could be, the use of collectives, including reciprocals, is easier. (ii) seems marginally possible – but only in a scenario such as the given one. (This suggests that Schwarzschild's 1996 claim that context "packages" pluralities (by means of pragmatic covers) is much more general. See also Rothstein (2010) for a partially related discussion.)

(i) a. Das Paar lag einander in den Armen.
the couple lay each-other in the arms
'The couple hugged each other.'
b. ?Die Mannschaft lag einander in den Armen.
the couple lay each-other in the arms
c. ??Die Truppe lag einander nach der Schlacht in den Armen.
the squad lay each-other after the battle in the arms
d. ??/# Die Armee von San Marino lag einander in den Armen.
the army of San Marino lay each-other in the arms

(ii) SCENARIO *The pizza is cut into 8 slices, which are stacked on top of each other for some opaque reason.*
?/?? Die Pizza wurde aufeinandergestapelt. Sauerei!
'?? / # The pizza was stacked on top of each other! Appalling!'

[18] For event-based analyses of mixed predicates cf. Schein (1986, 1993), Brisson (1998), Landman (2004) and Champollion (2010b).

(ii) ...It would have been easier, had they lifted it together.

b. 


c. [ [the boys]$_{e*}$ [ [DEF' [$\mu$ [the piano]]]$_{e*}$ 2* [ $\langle 2, e\rangle$ [ $\langle 1, e\rangle$ [1$_e$ carried 2$_e$]]]]]

d. [ [the boys]$_{e*}$ [ 1* [ $\langle 1, e\rangle$ [1$_e$ carried [the piano]$_e$ ]]]]

(28) Relative to the model $\mathcal{M} = \langle A, \mathcal{F}, \rho\rangle$, for any L2-interpretable expression $\alpha$ of type $a$, $[\mu\alpha]$ is an expression of type $\langle a, t\rangle$ and $[\![\mu(\alpha)]\!]^{M,g}$ is that function f: $D_a \rightarrow D_t$, such that

a. f($[\![\alpha]\!]^{M,g}$) = 0, and

b. for all constants $C$ of type $\langle at\rangle$, such that $\{Y|f(Y) = 1\} \subset (\{Y|\mathcal{F}(C)(Y) = 1\} \cup \{Y|\mathcal{F}(C)(Y) = \phi\})$ and $\{Y|f(Y) = 1\} \cap (\{Y|\mathcal{F}(C)(Y) = 1\} \neq \emptyset$, then $\mathcal{F}(C)(X) = 1$, and

c. for all functions $g : D_a \rightarrow D_t$ that meet (28a), and (28b), $\{Y|g(Y) = 1\} \subseteq \{Y|f(Y) = 1\}$.

(29) If $\alpha$ is an L2- interpretable expression of type $\langle a, t\rangle$, [DEF' $\alpha$] is an L2-interpretable expression of type $a$* and $[\![$[DEF' $\alpha$] $]\!]^{M,g} = \rho(\alpha)$.

The general idea that singular strings can denote pluralities (of some form) is by no means new – its foundations are found in Link (1983) (cf. also Chierchia (1998), Champollion (2010b) for related discussion) and it is taken for granted by Krifka (1990), who notes that the "non-intersective"-reading of ACs is not limited to cases where they co-occur with a morpho-syntactic plural or another conjunction – (30) expresses that one part of the flag is green and the other part is white.[19]

[19]Winter (2001b) argues that only color predicates and material predicates (as discussed in Lasersohn (1995)) allow for non-intersective conjunction, arguing that they are nominalized and denote individuals rather than properties. This claim is false, as shown by (i). (ia), (ib).

(i) *A*: *So you told the real estate agent you wanted a place with architectural elements of the 1940s. How did it go?*
*B*: *Well, I think she must consider me an idiot ...*

a. The house she showed me is from the 1930s and from the 1950s. Not a single part of it is from the 1940s.

b. The houses she showed me were from the 1930s and from the 1950s. None of them were from the 1940s.

Color predicates and material predicates, however, *are* special in another respect, as they seem to be partial properties of atoms (cf. Yoon (1996), Krifka (1996) for a discussion of partial predication). I show below that sentences with $m$-pluralities behave exactly like standard plural sentences w.r.t. imprecision: The sentence can be true if there are exceptions, but these exceptions cannot be made explicit, without additional formal devices. Therefore, the sentences in (ii) cannot involve $m$-pluralities but simply attribution of a partial property to an atom, as the "exception" can be made explicit without any further ado. This also explains the contrast between (iiia) and (iiib): In (iiia) we have real exceptions and therefore must employ the additional formal device *of course* – some atoms of the plurality simply don't have the partial

(30) The flag is green and white (Krifka 1990:(13))

It is corroborated by the observation that we find what seems to be quantification over the atomic elements of the plurality for both plural and singular expressions, as (31) and (32) from German illustrate (cf. also Schwarzschild (1996)).[20]

(31) a. Die Buben haben sich *größtenteils* geweigert zu kommen.
the boys have REFL for-the-most-part refused to come
'For the most part, the boys refused to come.'
⇝ 'Most individual boys refused to come.'

b. Das Haus besteht *größtenteils* aus Billigmaterialien.
the house consists for-the-most-part of cheap-materials
'For the most part, the house consists of cheap materials.'
⇝ 'Most parts of the house consist of cheap materials.'

(32) a. Die Buben haben sich *teilweise* geweigert zu kommen.
the boys have REFL partially refused to come
'The boys partially refused to come.'
⇝ 'Some individual boys refused to come.'

b. Das Haus besteht *teilweise* aus Billigmaterialien.
the house consists partially of cheap-materials

property, while in (iiib) all atoms of the plurality have the partial property, hence there are no exceptions and no additional formal device is required. *Being shaved* (as opposed to *being hairy*) might be another partial property of atoms, pointed out to me my Jan Köpping (pc). Whereas (iva) seems true only if all (or at least most) parts of Hans' body (where hair could potentially grow) are hairy, most people outside the porn-business will consider (ivb) true, if Hans has cut off his fACial hair, but not the rest of the excessive amount of hair on his body.

(ii) a. John's new car is red. (And) It has a white roof.
b. This table is glass. (And) It has wooden legs.
c. My new car isn't red. The roof is, but the rest is blue.

(iii) a. The cars I sell are red. The more expensive ones are white #(of course).
b. The cars I sell are red. Their roofs are white.

(iv) a. Hans ist ganz behaart.
'Hans is all hairy.'
b. Hans ist ganz rasiert.
'Hans ist all shaven.'

[20] These quantificational adverbs also occur with embedded questions as in (i) (the so-called *quantificational variability effects*, cf. Berman (1991), Lahiri (2002), Beck and Sharvit (2002)).

(i) a. Mary knows who cheated.
b. For most people who cheated, Mary knows that they cheated. (Beck and Sharvit 2002:1)

Lahiri (2002) argues that quantification is over atomic answers to the question, while Beck and Sharvit (2002), based on a number of observations that are incompatible with Lahiri's claim, contend that the adverb quantifies over sub-question of the questions and that questions denote, so to speak, pluralities of sub-questions. Do they do so primitively, i.e. are non-conjoined questions plural expressions, or not, i.e. are they singular expressions that can be mapped to pluralities? I don't know and, given that the only cases of quantificational adverbs that seem to be sensitive to this distinction – such as German *halb* (half) – cannot occur in these configurations, there is no way to tell.

'The house partially consists of cheap materials.'
⇝ 'Most parts of the house consist of cheap materials.'

More generally, the behavior of singulars is not as different from the behavior of plurals as one might think. First, we seem to find homogeneity: Both sentences in (33) convey that no part of the pizza was eaten. Here, however, one might object that we achieve the same result if *the pizza* simply denotes an atom. True, but note that we find the same effects concerning imprecision that we observed for sentences with plural expressions in section 2.4 (I owe this observation to Manuel Križ): The sentences in (26) above can be true if the crust was left over, but this fact cannot be made explicit without additional formal device.[21] Analogously, the sentences in (33) can be true if a slice got eaten by the boys or John, but again we require *of course* if we want to make this explicit.

(33) a. The boys didn't eat the pizza.
b. John didn't eat the pizza.

(34) a. John ate the pizza that Sue had prepared. He left the slices without cheese on them #(of course). He is a spoiled brat.
b. John didn't eat the pizza that Sue had prepared. He ate the two slices with artichokes on them #(of course). He is a spoiled brat.

Second, we find projection. (35) and analogous examples are at least marginally possible.

(35) ?John and Mary know that you and I built this house, but we could still surprise them if we showed it to them. Funnily, neither knows that it is already finished. John knows that I built the walls, but he doesn't know that the roof is already there, let alone that it was you who built it. And Mary knows that you were constructing a roof, but has no idea what for ...

Finally, we a narrow-scope construal of disjunction (see 5.2 below). Consider first an example with a standard plural: (36a) expresses that some of the children drank, some smoked tobacco and some smoked pot.[22] At first sight, singular expressions with count nouns, don't seem to

[21] Arguably, (ia) is better. As I point out below, this might be due to the fact that the object that represents the crust is not part of the *m*-plurality. This might be corroborated by the fact that (ib), which involves more salient parts, is much worse.

(i) a. John ate the pizza that Sue had prepared. (?) He left the crust.
b. John ate the pizza that Sue had prepared. # He left two slices.

[22] Collective nouns also seem to allow for such a construal, (ia) can express that some members of the team were on the field, and others at the press conference. For collective nouns, but also for plurals, the size of the group plays a role – the smaller the group, the less likely we are to use *or*. (ib) can express that one half of the couple smoked and the other half drank, (ic) cannot do so (here, the only FC-effect is one w.r.t. points in time).

(i) a. Vor dem Spiel war die Mannschaft auf dem Platz oder auf der Pressekonferenz, nur der Trainer befand sich auf der Tribüne.

allow for such a construal – (36b) cannot express, it seems, that some parts of the inn are smoky and others smell of urine (usually, the smell of smoke is taken to cover the smell or urine, so the two properties could be considered disjoint). However, once the parts are more explicit, as in (36c), I believe such a construal to be possible.

(36) a. Die Party verlief wunderbar: Die Kinder rauchten,tranken oder kifften und die Erwachsenen spielten ein Gesellschaftsspiel.
'The party went well: The children smoked tobacco, drank or smoked pot and the adults played a board game.'

b. Das Wirtshaus "Der fiese Schwan" ist verraucht oder riecht nach Pipi.
'The inn "The evil swan" is smoky or smells of urine.'

c. "Der fiese Schwan" hat fünf Räume: Zwei Nichtraucherräume neben dem Klo und drei Räume in denen man rauchen darf, bzw. soll. Ich kann da nicht rein. Das Wirtshaus ist verraucht oder stinkt nach Pipi.
"'The evil swan" has four rooms: Two non-smoking rooms next to the toilet and three rooms where smoking is not only allowed, but encouraged. I hate this place. The inn is smoky or smells of urine.'

There is, of course, the question of spatio-temporal proximity. (37a) can be true if the piano was taken apart and one of the boys carried one leg, another one the other leg, and so forth. But this certainly is not the most prominent scenario that comes to the hearer's mind: In most cases, one will take the sentence to express that the piano was lifted in one piece. The explanation for this fact might lie outside the realm of my investigation, as it touches upon the question of prototypical use of singular definite DPs, plural definite DP and plurals more generally (see section 5.2 below). Even sentences like (38) seem to involve spatio-temporal proximity: in most cases, upon hearing (38a), I will imagine a scenario where the killings took place at more or less the same time at the same place. This restriction is much loser in (38b) and in (38c) for plurals and also in (37b).

(37) a. The boys carried the piano.

b. Yesterday, we finally burnt the old piano in our three ovens.

(38) a. The boys killed the girls.

b. The soldiers killed the civilians.

c. The German halfway houses released 13 boys and 6 girls last year. Unfortunately,

---

'Before the game the team on the field or at the press conference, only the coach was on the bleachers.'

b. Die Party verlief wunderbar: Das Paar trank und rauchte und die Singles trafen sich zum Strippoker.
'The party went well: the couple drank and smoked and the singles played strip poker.'

c. Die Party verlief wunderbar: Das Paar trank oder rauchte und die Singles trafen sich zum Strippoker.
'The party went well: the couple drank or smoked and the singles played strip poker.'

this policy was not rewarded by the behavior of the delinquents, as the boys killed the girls. John killed Mary in Kaiserslautern, Bill killed Sue in Cologne...

In sum, I we can, at least tentatively, assume that singular strings can be mapped to plural expressions with plural denotations.

(27) – (29) represent only a first step in formalizing this mapping.[23] The present formulation is very weak, of course, as all it encodes is standard cumulativity: We derive the largest set of objects such that whenever all these objects have a particular property, so will the object denoted by the embedded singular expression. The fact that we only consider truth and also limit ourselves to properties that are denoted by syntactically simplex expressions (see (28b)) is owed to the existence of quantized predicates, such as *boy*.[24] In principle, the mechanism should apply to objects of all types, however, the higher the type the harder it is to find primitive expressions that denote properties of the objects in question and much depends on our assumptions about basic lexical entries and flexibility.[25]

What we aim to retrieve by this mechanism is some notion of material part, because what we are after is truth of the sentences in (39) in the scenarios indicated. However, the notion of "material parts" must be taken with a grain of salt; as already stressed by Link (1983), a material part does not have to be a piece of matter. In order for a boy $u$ to partake in composing the song in (40a), $u$ does not actually have to write a page of the music– it suffices for him to contribute a very abstract idea about which harmonies should be employed and I can utter (40b) if I dislike the first two minutes of the song and like the rest, but also if I dislike the basic harmonies of the song (while liking the soprano-part). (40c) makes the same point. Which parts are relevant basically depends on the predicate in question.

[23]As I concentrate on the question of which pluralities standard singular DPs with count noun complements can be mapped to, the discussion is only indirectly related to that in Link (1983), Chierchia (1998) and Rothstein (2010) (and also Champollion (2010b)). They focus on the question in how far the mass / count distinction in language corresponds to real-world-properties of the denoted elements.

[24]Following Krifka (1992, 1998), a predicate $P$ is *quantized* iff, for all $x$ in $P$'s extension, no proper part of $x$ is also in P. Standard examples involve count nouns (but not all count nouns are quantized), such as *boy*, *man* etc. The notion remains slippery, of course, as we are lacking a proper notion of what counts as a material part – and further, what counts as a proper material part. Even the linguistic evidence is not as straightforward as one might think, given the existence of sentences such as (i). Obviously, this could involve polysemy or a metaphorical use of *man*.

(i) Vondur ist nur teilweise ein Mann.
'Vondur is only partially a man.'
  a. He is a complete coward when it comes to spiders.
  b. (S)he has a penis, but also a placenta.

[25]For predicates of type $\langle et \rangle$, for instance, we would require terminals of type $\langle\langle et \rangle t\rangle$. If we assume, for the sake of the arguments, that symmetric determiners start off as such functions, there will be no $m-$pluralities that expressions of type $\langle et \rangle$ can be mapped to, given the (presumed) existence of non-monotone symmetric determiners. For quantifiers, i.e. expressions of type $\langle\langle et \rangle t\rangle$ it is even harder to find the constants required by (28b). If we allow more flexibility for our basic types, however, we could end up with some strange and undesired results, in particular that the $m$-plurality of a quantifier such as *some man* is the set of all logically stronger quantifiers, i.e. *most men*, *every man* etc.. Further, even for individuals it seems that (28) might not be very helpful: How many non-quantized, non-gradable (i.e. non-transitive) predicates are there?

(39) a. SCENARIO *Harro ate Peter's head, Hasso ate Peter's torso, Rex ate Peter's left leg ...*
The dogs ate Peter.
b. SCENARIO *Guido knows the Book of Genesis, Lanz knows the Book of Numbers, Teresa knows the book of kings ...*
The fanatics know the bible.

(40) a. Die Buben aus dem Musikkurs haben dieses Lied komponiert.
'The boys in the music course composed this song.'
b. Dieses Lied ist teilweise ziemlich schlecht.
'This song is partly / partially pretty bad.'
c. Die Mengentheorie ist teilweise ziemlich kompliziert.
'Set theory is partially rather complicated.'

The problem is, of course, that *qua* (28b), if we manage to retrieve material parts at all, then we eventually derive a plurality, that contains all individuals corresponding to material parts: For (41), this would mean that the plurality contains, amongst other things, the individuals corresponding to Peter's finger, Peter's finger-nail, Peter's thoughts, Peter's voice etc. Accordingly, the sentence should be true only if all dogs ate one one of these parts and each of these parts was eaten by one of the dogs – including Peter's voice.[26]

(41) The dogs ate Peter.

A further problem is that we allow for the plurality to contain individuals that represent overlapping material parts: I.e., for (41), the plurality will contain Peter's leg, excluding the foot and Peter's lower leg, including the foot. Some of the parts were not eaten by any dog, hence the sentence should not be true, even if no piece of Peter is left over (cf. in particular Rothstein (2010) for discussion of overlap).[27]

Finally, the syntactic implementation I gave makes the predictions that we cannot access the atoms of the denotations of definite plurals (such as *the chairs*) (because M only applies to expressions from $D$). Accordingly, (42) is predicted to be false, contrary to fact, if each

[26]Note that seemingly irrelevant parts also matter when we make exceptions explicit, (ia) however, *of course* in (ib) probably rather indicates a PS-failure.

(i) a. Fido ate John. He didn't eat his dandruff # (of course)
b. Fido ate John. He didn't eat his poetic mind, # (of course) – that will live on.

[27]Further, the temporal or local arrangement of parts might matter – as in (i). I am not sure that this should be part of the definition: Assume that John randomly arranged the verses, would we deny that he recited *Die Ballade von der sexuellen Hörigkeit*?

(i) a. John recited the first verse, starting with *Da ist nun einer schon der Satan selber ...*, and the second verse, starting with *So mancher Mann sah manchen Mann verrecken* and ....
b. John recited *Die Ballade von der sexuellen Hörigkeit.*

window is half painted.[28]

(42) The windows are half painted.

In sum, I tried to derive the collective readings of mixed predicates by assuming that the singular DP such structures tend to exhibit can be assigned a plural denotation and that therefore a sentence such as (43) involves a relation between individuals – *ate* – which is subsequently pluralized *qua* *2 and applies to two plural arguments.

(43) The boys ate the pizza.

I do not think that the particular implementation I gave of this basic idea is very plausible as it stands, however, if the basic idea itself is on the right track, then mixed predicates (or at least the subset considered here) do not represent a problem for the proposal given in chapter 4.

### 5.1.3 Interim summary

The preceding paragraphs tentatively suggested that the phenomenon of collectivity – as found with collective predicates and collective reading of mixed predicates – might be reduced to "cumulated" relations between atoms. As a first point, I showed homogeneity in collective predication, which suggested that collective predication is not the simple attribution of a

[28] It further runs into the classical problem for all analyses that assume ambiguity to be rooted in the DP (raised by Dowty (1986)), witnessed, if the girls collaborated in making the doll and each boy carried the entire doll.

(i) The doll was made by the girls and carried by the boys.

Another reason for worry is that we run into the danger of atoms becoming very elusive objects – and after all, when talking about pluralities, they should be the only concrete objects we have (cf. also Chierchia (1998) and Rothstein (2010) for discussion). Possibly, however, this elusiveness might be connected to a linguistic fact: We find that mixed predicates in general seem to allow for what seems to be imprecision even more excessively than distributive or collective predicates. I can say (iia) with only Hans being the proper owner and Peter being the owner of the sofa and the candles (and the two not being married, so that property rights are not automatically extended). However, in the same scenario, I cannot truthfully utter (iib).(The prerequisites for Lauer's 2011 *pragmatic slack* are not given in this context. I could use *hat* (has) instead of *besitzt*, which does not require Peter to be the owner.) However, this isn't really imprecison in the standard sense – after all, we can make the exceptions explicit here, which we cannot do otherwise – but rather seems to involve a mapping of *the house* to plurality of material parts, one or more parts of which are the sofa and the candles. What I tentatively suggest is that some of the apparent imprecision cases for mixed predicates – in particular those, where we can make the seeming exceptions explicit, as in (ii)– might be precise, in the standard sense, but could involve strange atoms or even a lack of knowledge about which individuals actually count as atoms of the plurality.

(ii) a. Hans und Peter besitzen dieses schöne Haus. Hans hat es gekauft. Peter hat das Sofa und die Kerzen erworben.
'Hans and Peter own this beautiful house. Hans bought it. Peter purchased the Sofa and the candles.'
b. Peter besitzt dieses schöne Haus.
'Peter owns this beautiful house.'

property of a plurality. As the second point, I suggested that the collective readings of mixed predicates involve a mapping of a singular string to a plural denotation, i.e. the mapping of *Peter* in (44) to a plurality consisting of atoms that happen to be the material parts of Peter. In both cases, I only sketched the outlines of a potential account, rather than attempting an actual analysis.

(44) The dogs ate Peter.

However, if the general line of thought is on the right track and if it can be extended to the cases I have not discussed here, the second claim inherent to the proposal in chapter 4– namely, that pluralities are hybrid objects which are never attributed properties directly – might, in fact, turn out to be correct.

## 5.2 *or*-coordinations

As a final point I address the implications of the claim in (a) – that AC denote pluralities – on our conception of the relation of AC and OC. I do so under the assumption that the standard conception of the meaning of *or* in (45) is correct ((45) is from (Partee and Rooth 1983:336), cf. also von Stechow (1974), Gazdar (1980), Partee and Rooth (1983), Keenan and Faltz (1984)). I then list some data (mainly from existing literature) that could suggest that (45) is not the correct view, but fail to draw any solid conclusions from this.[29]

[29] Above, I do not discuss the problems that arise for theories aiming to explain linguistic phenomena *qua* the logical relation between AC and OC in the standard analysis of AC and OC. The status of such theories, or rather, of the data they aim to explain, is unclear to me. The particular phenomenon I have in mind is exclusive *or*, (ia) and an explanation of the afore-mentioned kind of it one where we derive exclusive *or qua* (scalar) implicatures (cf. a.o. Horn (1972, 1984), Levinson (1983), Krifka (1999), Sauerland (2004), Fox (2006), Chierchia and Fox (2009), Chierchia et al. (to appear)). Roughly, the story goes as follows: We consider all expressions on the respective Horn-scale (introduced in Horn (1972) under a different name). Simplifying greatly, a Horn-scale is set $S$ of expressions that is ordered by informativity, which I here reduce to entailment $\rightarrow$, such that for any $a_i$, $a_j \in S$, $1 \leq i, j$ $a_i \rightarrow a_j \leftrightarrow i > j$. We assume that the speaker adheres to Gricean principles (cf. Grice (1975)), i.e. that the speaker utteres a sentence she considers true while aiming to be as as informative as possible. If she picks $q$, rather than $p$ and $p$ is higher on a Horn-scale, we infer that she does not know whether $p$ is true. We the strengthen this assumption (at least in some cases, cf. Sauerland (2004)) to the inference that she knows that $p$ is not true. The implicature of an utterance of $q$ is therefore $\neg[\![\text{p}]\!]$. For the case at hand, in the standard conception of *AC* and *OC*, if a speaker utters (ia), then the stronger (more informative) expression is (ic). As the speaker has not uttered (ic), we infer the negation (ic), which yields (id) and add this as implicature to the strict meaning of the sentence in (ib). This yields exclusive *or*.

(i)
a. In Colorado, John will fish or gamble. Or both.
b. (John will fish)' ∨ (John will gamble)'
c. In Colorado, John will fish and gamble.
d. ¬ (( John will fish)' ∧ ( John will gamble)') = ¬ (John will fish)' ∨ ¬ (John will fish)'.

If Horn-scales are simply established on the basis of sentences meanings, then the present approach will not stand in the way of such an analysis: If entailment is simply truth-preservance, so that an expression $A$ entails an expression $B$ iff, for all models $M$, assignments $g$, if $[\![\text{A}]\!]^{M,g} = 1$ then $[\![\text{B}]\!]^{M,g} = 1$, then any sentence $S$ with an occurrence of *and* will entail a sentence $S'$, which is just like $S$ except that *and* has been replaced by *or* (or rather, an AC by an OC with the same coordinates), as long as the AC does not occur in the scope of a DE-operator. If the AC / OC occur in the scope of such an operator, entailments

(45) $$X \sqcup Y = \begin{cases} X \vee Y & \text{if } X, Y \in D_t \\ \{\langle Z, X^1 \sqcup Y^1 \rangle | \langle Z, X^1 \rangle \in X \& \langle Z, Y^1 \rangle \in Y\}, & \text{if } X, Y \in D_{\langle a,b \rangle}, \langle a,b \rangle \in TC \end{cases}$$

Given the standard meaning of OC in (45), how are OC implemented in the present system? This question might seem particularly pressing given the strong syntactic position that I took above and the observation that AC and OC are syntactically indistinguishable on L1.[30] However, even if (46) is replaced by a weaker syntactic claim (where *and* is a standard

are reversed. The problem for reproducing the explanation sketched above within the present system occurs once we aim to form Horn-scales on a sub-sentential level (as proposed (partially implicitly) by Horn (1972), Levinson (1983) and (explicitly) by Krifka (1999), Chierchia and Fox (2009), Chierchia et al. (to appear))). More precisely, the afore-mentioned authors argue that Horn-scales are induced by scalar elements, for instance *and* and *or*. Sub-sentential entailment (cf. section 2.1) cannot be extended to AC / OC or *and*, *or* in the present system (or at least, I don't see how).

Let me briefly state why I am unsure whether this is a problem. First, while the strengthening of *the speaker does not know p* to *the speaker knows that not p* seems feasible in cases involving other scalar elements (*some / all*, for instance), I find it implausible when considering utterances involving OC (cf. also Sauerland (2004) for discussion). I find hardly any contexts where I would utter an OC while knowing that the corresponding sentence with an AC is false. In most cases, I am unsure whether the corresponding sentence with an AC is true or I don't care. If that is part of my linguistic behavior, then it is probably also part of my (possibly implicit) linguistic knowledge when I hear such utterances, hence there is the question whether I would really make the step from: *The speaker doesn't know that A and B* to *The speaker knows that not (A and B)*.

Second, I agree with (Kamp and Reyle 1993:191f) that it is unclear that there really needs to be a linguistic representation of exclusive *or*. In most cases where we allegedly find it, as in (ii), we could still paraphrase a sentence *p or q* as conveying that there are three possibilities: That *p* is true, that *q* is true, that both $p, q$ are true. It is just highly unlikely that the last possibility comes into being because of the state of the world etc., as for instance in (ii). In a way, what we consider part of the (enriched) meaning of *or* could just be our world knowledge or lexical knowledge intervening (similar, possibly, to what we find in reciprocals, see section 3.3 above). Clearly, if one were to maintain this hypothesis, it would require more specification than I can give here.

(ii) Romney or Obama will become president.

The one piece of data that stands in the way of such an hypothesis are, of course, sentences such as (iiia): If *or* is not exclusive, then the last disjunct is entailed *dance or sing*. (It would thus be a violation of *Hurford's constraint* (cf. Chierchia and Fox (2009), Katzir and Singh (2009)) and it should be noted that it also patterns with it, given the tendency to insert *even*.) I note that we can also construe the reverse case in (iiia). The enriched meaning of the OC i.e. the exclusive construal of *dance or smoke* should entail *(not (dance and smoke))*, hence it cannot be explained by why absolutely require *but* in these cases.

(iii) a. John will dance or sing or (even) both.
b. John will dance or smoke, but not both.

But if there is no exclusive *or*, how do we explain (iiia)? I don't know. (Kamp and Reyle 1993:192) speculate that it could arise because the two properties *dance* and *smoke* are simply considered unlikely to co-occur, I believe further results could be obtained if we were to understand the exact semantic role of *both*, which I already indicated to be rather opaque to me in section 3.5 above. And, of course, if we understand the meaning of *or*.

[30] As far as I have been able to establish, this seems to hold cross-linguistically, but I here rely on a small body of work: Apart from Payne (1985), Haspelmath (2007) have found no typological work that provides a helpful comparison of the syntactic properties of AC and OC. From these limited sources, I take it that if language employs a particular formal strategy to mark AC, it will use a similar formal strategy (possibly amongst others) to mark OC. I also seems that the CSC holds more or less cross-linguistically (but cf. Haspelmath (2007) for more discussion).

In some languages, there is a question whether comparing AC and OC as syntactic objects makes sense at all – or whether there is simply a single basic coordinate structure which can have different morpheme), the assumption that AC denote pluralities will yield problems for nested structures with plural expressions and OC, (47) and (48), where | is to indicate a slight prosodic boundary.[31]

(46) a. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expression of type $a \in T^{0}*$ then $\alpha$ is an interpretable expression of type $a$.

b. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a \in T^{0}*$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} + [\![\gamma]\!]^{M,g}$

(47) a. John saw the girls or the boys.

b. The cats attacked the girls or the boys.

c. John was smoking | or eating and drinking.

d. The boys were smoking | or eating and drinking.

(48) a. John and Peter | or Bill and Sue were making out with each other.

b. John or Bill | and Sue beat up the boys.

c. In Colorado, John will fish or hunt | and gamble.

d. In Colorado, the boys will fish or hunt | and gamble.

### 5.2.1 Implementation of the standard meaning of OC into the present system

What we need to derive, in the present system, is the difference in meaning between the two sentences in (49) and between the two sentences in (50).

(49) a. Yesterday, John married Sue and Judy.

---

interpretations depending on the context and also on the presence of additional material such as focus markers (for the latter cf. in particular Mauri (2008)) and, possibly, intonation. Namely, several languages employing juxtaposition as a formal means in coordinate structures apparently allow for such structures to have both the interpretation of an AC and that of an OC (cf. in particular (Payne 1985:39f)) and some languages with coordinating morphemes apparently also may the same morpheme for structures with an AC-interpretation and structures with an OC-interpretation (*ibid.*). Note that in English and German, we find such cases, too (cf. in particular Payne (1985), Winter (1995), Hartmann (to appear) – Winter states that they always have a conjunctive reading, but the data below falsify this claim (\ stands for falling

(i) a. Es sind drei, vier Leute gekommen.
there were three, four people come
'Three, four people came.' (adapted from (Payne 1985:40))

b. Sie hatte Goethe gelesen, Sexton, Plath. Vielleicht hat sie sich deshalb umgebracht.
she had Goethe read, Sexton, Plath. Maybe has she REFL therefore committed-suicide
'She read Goethe, Sexton, Plath. Maybe this is why she committed suicide.'

c. *A*: Oh my god– the police! What happened?
1) *B*: The house burnt down \ the car was stolen \ John shot his sister \ [FALLING CONTOUR] . . . It was a horrible day.
⇝ The house burnt down and the car was stolen and John shot his sister.
2) *B*: The house burnt down / the car was stolen / John shot his sister / [RISING CONTOUR] . . . how should I know!
⇝ The house burnt down or the car was stolen or John shot his sister (or something else happened).

[31] This prosodic boundary is here taken to be indicative of syntactic bracketing, cf. Wagner (2005, 2010) for more discussion.

b. Yesterday, John married Sue or Judy.

(50) a. The boys were dancing and smoking.

b. The boys were dancing or smoking.

At first sight, it seems we can easily do this by assuming that OC are for the singular domain what AC are for the plural domain. $\sqcup$, defined in (45) above is the functional correlate of set-union. Accordingly, for two extensions $X$, $Y$ in $D_a$, OC derives the union of $X$ and $Y$ in $D_a$, while AC derives the correlate of union in $\mathcal{R}$ for the representations of $\{X\}$, $\{Y\}$, (52).[32]

(51) a. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expression of type $a \in T$ then $\alpha$ is an interpretable expression of type $a$.

b. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a \in T$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} \sqcup [\![\gamma]\!]^{M,g}$

(52) a. dance and smoke

L2 = [ [R dance]$_{\langle et \rangle}$* [R smoke]$_{\langle et \rangle}$*]

$[\![$[ [R dance]$_{\langle et \rangle}$* [R smoke]$_{\langle et \rangle}$*]$]\!] = \rho(\{[\![\text{dance}]\!]\}) + \rho(\{[\![\text{smoke}]\!]\})$

b. dance or smoke

L2 = [ [dance]$_{\langle et \rangle}$ [smoke]$_{\langle et \rangle}$]

$[\![\text{dance and smoke}]\!] = \lambda x.[\![\text{dance}]\!](x) \vee [\![\text{smoke}]\!](x)$

Apart from the problem of how to distinguish OC from instances of predicate modification – if the latter is indeed part of the language (see section 3.2) – another, more pressing problem is introduced by nested coordinations, in particular those where an OC embeds an AC or, more generally, a plural expression, as in (53) above, repeated in (53).

(53) John was smoking | or eating and drinking.

Here, I would predict that the plural expression moves out of the OC, (54a) yielding the sentence meaning in (54a).

(54) a. [[eat and drink] [1* [⟨1, ⟨et⟩⟩ [John smoked or 1]]]]

b. $+\rho(\{f(P)\}) : \rho\{P\} \leq_{AT} \rho(\{[\![\text{eat}]\!]\}) + \rho(\{[\![\text{eat}]\!]\}) \wedge f = \lambda Q_{\langle et \rangle}.Q(j') \vee [\![\text{smoke}]\!](j')$.

In fact, (54) yields the right truth-conditions for the sentence: It is true if John smoked or ate and it is true if John smoked or drank, accordingly, it is true if he smoked and neither ate and it is true he if ate and drank and didn't smoke (it is also true, of course, if he smoked and ate, but didn't drink and true if he smoked and drank, but didn't eat or if he did all

[32] If $\beta$ and $\gamma$ are of type $e$, as in (49b), (51) cannot apply, in these cases, each of the coordinates must be affixed with $\pi$, Partee (1986), (i).

(i) a. John married Sue or Judy.

b. $\pi = \lambda x_e.\lambda P_{\langle et \rangle}.P(x)$.

c. [ [$\pi$ [Sue ] ] [$\pi$ [Judy ] ]

of it). However, something isn't quite correct about (54). We see this in examples like (55), where another plural expression is present.

(55) The boys were smoking | or eating and drinking.

To actually comprehend the problem, we need to become clear about the general truth-conditions of (55) and also about the (related) question whether we should distinguish between two readings in those cases, namely, the wide-scope (WS) reading of disjunction and the narrow scope (NS) reading of disjunction, cf. Partee and Rooth (1983), Keenan and Faltz (1984), Larson (1985), Winter (1995, 1998), Merin (2006)). For the latter point, consider first the simpler sentence in (56a). (56a) is true in three types of scenarios: First, if every boy was smoking and no boy was dancing. Second, if every boy was dancing and no boy was smoking. And third if some boys were smoking and the others were dancing (which includes all of the boys smoking and all of the boys dancing). Should we say that (56a) actually has two readings, such that the first – the WS-reading paraphrased in (56b) – will make it true in the first two scenarios and the second – the NS-reading paraphrased in (56c)– will make it true in the third scenario?

(56) a. The boys were smoking or dancing.
b. Every boy was smoking $\vee$ Every boy was dancing.
c. For each individual boy $x$: $x$ was smoking $\vee$ $x$ was dancing.

To find out whether a sentence is ambiguous we usually test its behavior in scenarios where it true under reading and false under the other. As far as I am aware, there is no (non-intensional) context where *or* is unstressed (on which more below) and where a sentence such as (56a) comes out as false if the stronger reading in (56b) is false (cf. also Winter (1995)).[33] Accordingly, following Merin (2006), I assume that there is no ambiguity here and that *or* is interpreted in surface position. This means that for a simple sentence such as (56a) (51) above in combination with the proposal outlined in chapter 4 yields (57), accordingly, we predict the sentence to be true whenever (56c) is fulfilled.

(57) $+\rho(\{f(x)\}) : \rho(\{x\}) \leq_{AT} [\![\text{the boys}]\!] \wedge f = \lambda y_e.[\![\text{smoke or dance}]\!](y)$

Now consider the more complex cases in (58), where a plural is embedded in an OC.

(58) a. The party was a great success. Really noisy. The boys were smoking and dancing | or drinking. The band was excellent.
b. The party was horrible. The boys drank like crazy or beat up the girls. The band was terrible.

[33]However, according to Meyer and Sauerland (2009), ambiguity might go undetected in such a case. They argue that as long as a sentence is true on its most accessible reading, i.e. the surface scope reading, the sentence will be judged true (their so-called *truth-dominance*).

There are three types of scenarios where these sentences are true. I illustrate them based on (58a). (58a) is true in a scenario where all boys drank, none of the boys smoked and none of the boys danced. It is also true in a scenario where some boys danced, some smoked, all of the boys were either dancing or smoking but none of the boys drank. Finally, it is true if some boys smoked, some boys drank and the some boys smoked, as long as all of the boys were dancing or smoking and drinking. Crucially, it is not true, but rather unvalued if some of the boys smoked and the rest danced but did not smoke or drink. The strategy I sketched above falsely predicts it to be true in this scenario.[34]

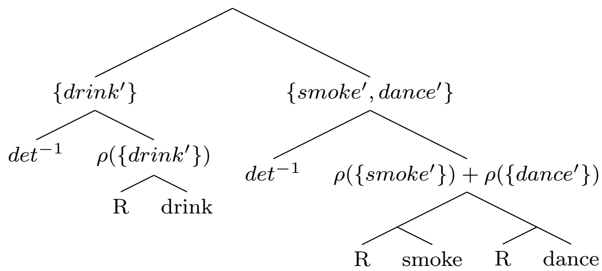
Here is a sketchy alternative, which is questionable as it requires several stipulations. First, we need to assume that just as $\rho$ is directly represented in the language – by the definite determiner – so is $\rho^{-1}$. Let's call its syntactic realization $det^{-1}$, (59).[35]

(59) a. If $\alpha$ is a binary branching node with daughters $\beta$, $det^{-1}$, where $\beta$ is an interpretable expression of type $a \in T^{0*}$ then $\alpha$ is an interpretable expression of type $\langle b, t\rangle$, where $b* = a$.

b. If $\alpha$ is a binary branching node with daughters $\beta$, $det^{-1}$ where $\beta$ is an interpretable expression of type $a \in T^{0*}$, then $[\![\alpha]\!]^{M,g} = \rho^{-1}([\![\beta]\!]^{M,g})$.

Second, we need to posit that the coordinates in a disjunction are all affixed with $det^{-1}$ (which means that singulars will previously have to be affixed with R). (58a) then has the structure in (60).

(60)




Third, we require the disjunction rule in (61), which necessitates the extension of $T^*$ to $T^{+*}$: $T* \subset T^{+*}$ and for any type $a$ in $T^*$, $\langle a, t\rangle \in T^{+*}$ and if $a$, $b \in T^{+*}$, then $\langle a, b\rangle \in T^{+*}$.

(61) a. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expression of type $a \in T$ then $\alpha$ is an interpretable expression of type $\langle a*, t\rangle$.

[34] Note that Krifka's 1990 analysis derives the correct meaning if we cumulate the result of disjunction, (i). However, Krifka's proposal again does not extend to cases such as (ii), in particular, it does that derive that the sentence is true if none of the boys hate Peter and some of them want John to beat up Sue and the some want him to beat up Mary and this either covers all the boys or the rest is smoking.

(i) $[\![+ \text{ [drink or [ smoke and dance]]}]\!] = {}^*\lambda x.drink(x) \vee \exists y, z[y + z = x \wedge smoke'(y) \wedge dance'(z)$

(ii) The boys hate Peter or want John to beat up Sue and Mary.

[35] For atoms of in $\mathcal{R}_e$, the effect of $det^{-1}$ is similar to Partee's 1986 BE.

b. If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a \in T$, then $[\![\alpha]\!]^{M,g} = \{\rho([\![\beta]\!], \rho([\![\gamma]\!]), \rho([\![\beta]\!] + \rho([\![\gamma]\!])\}$.

Fourth, we must posit that if there is a set of pluralities in the sentence, the denotations of all other plural expression are turned into (singleton) sets of pluralities. In other words, for any expression $\beta$ of type $a \in T^*$ $\beta$ must be affixed by $\uparrow$, where $\uparrow$ is that function $f : \mathcal{R}_a \rightarrow [\mathcal{R}_a \rightarrow D_t]$ such that for any $X \in \mathcal{R}_a$, $f(X) = \{X\}$. (In other words, $\uparrow$ has the effect of all the rules underlying the formation of OC, performed on a single coordinate).

Fifth, we must assume that these sets of pluralities move, just as standard plural expressions that the corresponding $n$-place plural relation is formed.

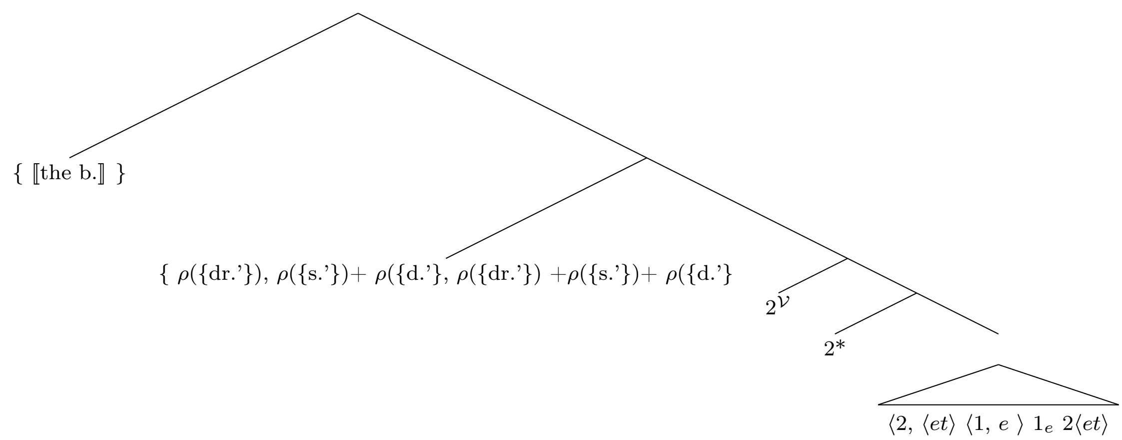
Sixth, we have to introduce an operator $n^{\mathcal{V}}$ that attaches to n-place plural relations and turns them into relations between sets of pluralities, yielding a value in $t$, (62). What (62) does, in effect, is that we establish the plural value for the relation applying to the pluralities $X_1$, $X_2$, $\ldots X_n$, where $X_1$ is a plurality of the first set, $X_2$ a member of the second set etc. and then applying $\mathcal{V}$ to the results, which is essentially disjunction extended to plural truth values (i.e. the disjunction of all elements of the $t$-plurality).

(62) a. If $\alpha$ binary branching node with daughters $n^{\mathcal{V}}$ and $\beta$, where $\beta$ is an interpretable expression of type $\langle a_1 \langle \ldots \langle a_n, t* \rangle\rangle\rangle \in T^*$, then $\alpha$ is an interpretable expression of type $\langle\langle a_1, t\rangle \langle \ldots \langle\langle a_n, t\rangle, t\rangle\rangle\rangle \in T^{+*}$.

b. If $\alpha$ binary branching node with daughters $n^{\mathcal{V}}$ and $\beta$, where $\beta$ is an interpretable expression of type $\langle a_1 \langle \ldots \langle a_n, t* \rangle\rangle\rangle \in T^*$, then $\alpha$ is that function of type $\langle\langle a_1, t\rangle \langle \ldots \langle\langle a_n, t\rangle, t\rangle\rangle\rangle \in T^{+*}$, which for all $X_1$ of type $\langle a_1, t\rangle$ $\ldots X_n$ of type $\langle a_n, t\rangle$, $f(X_1)\ldots(X_n) = \mathcal{V}(\rho(\{\mathcal{V}\beta(Y_1)\ldots(Y_n)|Y_1 \in X_1, \ldots, Y_n \in X_n\})$ where $\mathcal{V}(\rho(\{1\}) = 1, \mathcal{V}(\rho(\{0,1\}) = 1, \mathcal{V}(\rho(\{0\}) = 0$.

Put sloppily, (58a) has the structure in (63) (where I inserted the denotations directly for the purpose of illustration) and - applies to the values of (64a) – (64c).

(63)




(64) a. $+\rho\{([\![\text{drink}]\!](x))\} : \rho(\{x\}) \leq_{AT} [\![\text{the boys}]\!]$

b. $+\rho\{f(x))\} : \rho(\{x\}) \leq_{AT} [\![\text{the boys}]\!] \wedge f = \lambda y_e.\exists P.P \leq_{AT} \rho(\{dance'\})$ $+\rho(\{smoke'\}) \wedge P(y) + +\rho\{g(Q))\} : \rho(\{Q\}) \leq_{AT} \rho(\{dance'\}) + \rho(\{smoke'\})$

$\wedge g = \lambda P_{\langle et \rangle}.\exists y.y \leq_{AT} [\![\text{the boys}]\!] \wedge P(y)$

c. $+\rho\{f(x))\} : \rho(\{x\}) \leq_{AT} [\![\text{the boys}]\!] \wedge f = \lambda y_e.\exists P.P \leq_{AT} \rho(\{dance'\})$
$+\rho(\{smoke'\}) + \rho(\{drink'\})) \wedge P(y) + +\rho\{g(Q))\} : \rho(\{Q\}) \leq_{AT} \rho(\{dance'\})$
$+\rho(\{smoke'\}) + \rho(\{drink'\}) \wedge g = \lambda P_{\langle et \rangle}.\exists y.y \leq_{AT} [\![\text{the boys}]\!] \wedge P(y)$

The sentence comes out as true if as long as at least one of the values of (64a) – (64c) is 1. It comes out as false if all of the values are 0. And it comes out as undefined, if at least one of the values is a plural value and none of the other values is 1. This seems essentially correct, but it also is a pretty complicated story for disjunction, involving a lot of syntactic stipulations. Further, it does not, in the present form, extend to cases like (65). In order to come to terms with this, we need to apply a special operation $\mathcal{V}^0$, which must be that function $f : [\mathcal{R}_t \rightarrow D_t] \rightarrow D_t]$ such that for any $X$ of type $\langle t*, t \rangle$, $\mathcal{V}^0(X) = \mathcal{V})(\rho\{\mathcal{V}(Y)|Y \in X\})$.

(65) John is a pervert or Mary is a fascist.

Further, (62b) does not yield a result for nested coordinations where an OC is embedded in a plural expression, as in (66), where the complex DP has the representation in (67) *qua* the third and the fourth stipulation from above, where, obviously, our standard *AC*-rule cannot apply.

(66) Tonight, Mary | and Peter or John will meet in the bar.

(67) $[\ [\{R(Peter'), R(John'), R(Peter') + R(John')\}][\{\text{R (Mary')}\}]]$

Here, we would require an additional distributive rule for AC, namely, a disjunctive rule so that for any node $\alpha$ with sisters $\beta, \gamma$ of type $a \in T^{0}*$, we obtain the standard result $([\![\beta]\!] + [\![\gamma]\!])$ and for any node $\alpha$ with sisters $\beta, \gamma$ of type $\langle a, t \rangle \in T^{+}*$, with $a \in T^{0}*$, $[\![\alpha]\!] = \{Z|ZX + Y : X \in [\![\beta]\!], Y \in [\![\gamma]\!]\}$. This would yield (68) for (67).

(68) $\{R(Peter') + R(Mary), R(John') + R(Mary), R(Peter') + R(John') + R(Mary)\}$

In other words, the overall picture we would obtain with all these stipulations is the following: If two parallel structures $\beta, \gamma$ denote pluralities, we obtain their sum. For these structures, the phonological reflection is *and* and the resulting objects are the arguments of predicates affixed with *n. If two parallel structures $\beta, \gamma$ denote sets in $D$, we obtain the set containing the plurality corresponding to $\beta$'s denotation, the plurality corresponding to $\gamma$'s denotation, and the sum of these two pluralities. For these structures, the phonological reflection is *or* and such objects are the arguments of predicates affixed with $\text{n}^{\mathcal{V}}$, which, in turn, directly embed predicates affixed with $n*$. Finally, if two parallel structures $\beta, \gamma$ denote sets of pluralities, we obtain the set of pluralities derived by point-wise sum-formation of elements of these two sets. The phonological reflection in this case is *and* and such objects are the arguments of predicates affixed with $\text{n}^{\mathcal{V}}$, which, in turn, directly embed predicates affixed with $n*$. I only give this sketchy version of the account here because I don't really believe it myself. Possibly, a more elegant implementation could be found based on an alternative meaning for *or*. The (potential) motivation for departing from the standard analysis is briefly outlined in the next paragraph.

### 5.2.2 The meaning of OC

There is some reason to doubt that (45) above is the correct meaning for OC, or at least, that it is the correct *uniform* meaning for OC. In particular, we find a number of cases where OC seem to involve conjunction rather than disjunction.

The most prominent case, discussed by Zimmermann (2000) (cf. also Geurts (2005), Fox (2006), Simons (2005), Klinedinst (2007b,a), Eckardt (2007), Groenendijk (2009), Ciardelli et al. (2012)) are sentences where the coordinates either occur in the (surface) scope of an epistemic existential modal, (69a) or where each of the disjuncts contains such a modal, (69b).[36] (69a) and (69b) entail both sentences in (69d), hence it seems that they can express (69d) (For the moment I use the standard analysis of *and* to avoid confusion).

(69) a. The cat might be in the living room or in the kitchen.
b. The cat might be in the living room or it might be in the kitchen.
c. The cat might be in the living room. The cat might be in the kitchen.
d. $\leadsto \Diamond$ the cat is in the living room $\wedge \Diamond$ the cat is in the kitchen.

When considering these data, it is crucial to be clear about what we are witnessing here. Generally, if I utter a disjunction in a non-downward entailing context and without any modal expressions (on which below) I will not know which of the disjuncts is true. My attitude to this lack of knowledge may differ – I might want to know, (70a), or I might simply not care, (70b) (and this difference in attitude is formally reflected in many languages, morphologically (cf. Payne (1985)) or, as in English, by intonation Groenendijk (2009)).[37] If I don't know which is true, I must deem both disjuncts possible, i.e. OC, in many cases, seems convey conjunction of epistemic possibilities.[38]

[36] Simons (2005) assumes that both structures are basically equivalent, assuming covert ATB-movement of the modal in (69b), this idea being based on Johnson (1996) (cf. also Johnson (2002)). I think there is absolutely no evidence that material that is linearized in both coordinates can ever move ATB, a point that we spell out in detail and w.r.t. Johnson's proposal in Mayr and Schmitt (2010). In other words, I do not consider this a plausible syntactic position.

[37] This difference in attitude makes a clear difference in questions, which I don't discuss here (cf. Groenendijk and Stokhof (1984b,a, 1989, 1997), Groenendijk (2009) a.o.). Again, we find a difference in intonation, (i), and, I believe, also in number agreement, at least in German, (ii).

(i) a. Will HAns or PEter bring the beer? Hans.
b. Will Hans or Peter bring the BEER? Yes (Hans will).

(ii) a. $\text{Bringt}_{sg}$ / ??$\text{Bringen}_{pl}$ HAns oder PEter das Bier mit? Hans.
b. ?$\text{Bringt}_{sg}$ / $\text{Bringen}_{pl}$ Hans oder Peter das BIER mit? Ja. (Hans bringt es mit).

[38] This does say anything about the relation of the possibilities to each other. They might be likely to co-occur or unlikely to co-occur. In the latter case, German tends to use *aber*, (i) (roughly the same as English *else*, cf. Geurts (2005)). I don't think there is an explicit strategy for the the former case. *auch* (also)

(70) a. John danced or smoked – I don't know which.
b. John danced or smoked – (I don't give a shit.) He certainly didn't drink.

(71) $\Diamond$ John danced $\wedge$ $\Diamond$ John smoked.

What is special about (69a) and (69b) is that they seem to have two construals. The expected one, if we generally paraphrase the meaning of OC as in (71), is the one in (72): It could be possible that the cat is in the kitchen and it could be possible that the cat is in living room. The much more prominent one in (69d), however, is unexpected.

(72) $\Diamond\Diamond$ The cat is in the kitchen. $\wedge$ $\Diamond\Diamond$ The cat is in the living room.

The question that (69a), (69b) raises concerns the status of (71). Here I used the sloppy terms that use of an OC can be taken to *convey* conjunction of epistemic possibilities. This does not mean that conjunction of epistemic possibilities is the actual meaning of OC. (71) could arise due to pragmatic factors: If a speaker utters *John danced or smoked* rather than *John danced* I might conclude that she doesn't whether *John smoked* is false (and *vice versa*), hence I arrive at the conclusion that she will consider both possible. Now Zimmermann (2000) and Geurts (2005) argue that data such as (69a) and (69b) show that that conjunction of epistemic possibilities can be (Zimmermann) or always is (Geurts) in fact the actual, i.e. the *strict* meaning of OC. Otherwise, they argue, what I here sloppily call the "identification" of the overt modal with the implicit modal that we observe in the construal in (69d) could not be possible.[39] In other words, the strict meaning of (73a) below is (73b)

(73) a. Look, the police! At the palace! The aristocrats must have gone crazy. One of the Welfs raped the host or a Bismarck jumped off the balcony.
b. $\Diamond$ One of the Welfs raped the host. $\wedge$ $\Diamond$ A Bismarck jumped off the balcony.

This assumption has been challenged on various grounds (most of which are noted by Zimmermann (2000) and Geurts (2005) themselves) and various different alternatives have been

might at first came to mind, (ib) but think that the meaning of (ib) is best paraphrased as in (ic)

(i) a. Hans wird tanzen oder *aber* er wird sich total betrinken und ohnmächtig werden.
'Hans will dance or else he will get completely wasted and pass out.'
b. Hans wird tanzen oder auch rauchen.
hans will dance or also smoke
c. That Hans will dance is a possibility and that Hans will smoked is also a possibility.

[39] Zimmermann (2000) derives this identification for epistemic modality *qua* the self-reflection principle, (i), according to which a speaker (explicitily) knows what she knows (I changed the variables / constants in order to prevent a mix-up with the ones I used above). Geurts (2005) on the other hand follows Kratzer's 1991 treatment of conditionals and assumes that either both the implicit and the overt modal are interpreted or only the overt modal.

(i) $\mathcal{A}_{u,w}$ is the set of epistemic alternatives open to agent $u$ in $w$, then $\mathcal{A}_{u,w} = \mathcal{A}_{u,w'}$ for any $w' \in \mathcal{A}_{a,w}$.

(Ciardelli et al. 2012:66) point out that this "identification" only works if the two possibilities are disjoint and further argue that it is not available for all instances of epistemic modality.

proposed, which I don't go through here in any detail (cf. Fox (2006), Klinedinst (2007b,a), Eckardt (2007), Groenendijk (2009), Ciardelli et al. (2012)). The two most important problems are the following. First, we find instances where OC seems to have a conjunctive meaning that aren't straightforwardly derived by the assumption that OC denotes conjunction of epistemic possibilities. So-called free-choice permission is one such prominent case (cf. Merin (1992), Zimmermann (2000), Geurts (2005), Simons (2005), Fox (2006)). (74a) and (74b) can be equivalent to (74c) and thus can express (74d) (where I indicate deontic possibility by $\diamond$). However, for these cases, both Zimmermann and Geurts propose a solution, which, in some sense, involves identification of the implicit (epistemic) existential modal and the explicit (deontic) modal.[40]

(74) a. You may have coffee or you may have tea.
  b. You may have coffee or tea.
  c. You may have coffee and you may have tea.
  d. $\diamond$ (You have coffee) $\wedge$ $\diamond$ (You have tea)

However, they lack a solution for cases such as the following, which clearly have a conjunctive meaning, but this conjunctive meaning does not have a modal component: (75) does not mean that it is possible that Sigmund Freud wrote for the EB and possible that Albert Einstein wrote for the EB etc., but rather seems to be identical in meaning to (76).

(75) Geboten werden lange Artikel, Analysen und Abhandlungen über Geschichte, Wissenschaft und Politik. Sigmund Freud, Albert Einstein oder Bill Clinton haben für die Britannica geschrieben.
'The Encyclopedia Britanica offers in-depth articles, analysis and treatments on history, science and politics. Sigmund Freud, Albert Einstein or Bill Clinton contributed to the Britannica.'
http://www.tagesschau.de/kultur/encyclopaediabritannica100.html (example due to Daniel Büring (pc))

[40] Zimmermann assumes the *authority*-principle in (ia). $\mathcal{A}_{u,w}$ is the set of epistemic alternatives to $u$ in $w$. Hence if $u$ is an authority on your having tea and your having coffee, (74a) above comes out as (ib) below. This approach is shown to argued to make false predictions in Geurts (2005) broadly speaking, that only the overt modal can be interpreted, so that (74a) above can have either of the meanings in (id).

(i) a. If $u$ is an authority on $p$ in $w$ and if $\mathcal{A}_{u,w} \cap p \neq \emptyset$, then $\mathcal{A}_{u,w} \subseteq p$.
  b. You may have tea or you may have coffee $\Leftrightarrow$ $\Box\diamond$ you have tea $\wedge$ $\Box\diamond$ you have coffee.
  c. You must go to Paris or you must go to London $\Leftrightarrow$ You must go to L and you must go to P..
  d. $\Diamond\diamond$ You have coffee $\wedge$ $\Diamond\diamond$ You have tea   $\diamond$ You have coffee $\wedge$ $\diamond$ You have tea

I here assume that cases with generic tense such as (ii), which clearly have a (very prominent) conjunctive meaning could involve a modality (cf. Leslie (2007) for related cases involving standard generics) or else, are similar to the plural cases addressed below.

(ii) Ich esse (gern) Karotten, Bohnen oder (auch) Gurken.
'I (like to) eat carrots, beans or (also) cucumbers.'

(76) Sigmund Freud, Albert Einstein und Bill Clinton haben für die Britannica geschrieben.
'Sigmund Freud, Albert Einstein and Bill Clinton contributed to the Britannica.'

The second problem is that the analysis (partially) makes the wrong predictions for OC in downward-entailing contexts. (77a) expresses that John didn't go to Holboken and that he didn't go to Trenton, but the predicted meaning is (77b), if the OC itself denotes conjunction of epistemic possibilities and thus occurs in the scope of the negation (assuming that negation out-scopes the conjunction of epistemic possibilities).[41]

(77) a. John visited Atlantic City, but he didn't go to Holboken or Trenton.
b. $\neg(\Diamond$(he went to Holboken) $\wedge\Diamond$(he went to Trenton)) $\leftrightarrow$ $\neg(\Diamond$(he went to Holboken)) $\vee\neg(\Diamond$(he went to Trenton))

As far as I can see, however, no other analysis of OC covers all these data, either. Analyses which assume the standard meaning of OC and derive the "conjunctive" effect by means of implicatures (variants of which are found in Fox (2006) Eckardt (2007), Klinedinst (2007b,a)), do, of course, derive the correct meaning for OC in downward entailing contexts as in (77),[42] but none of them, I believe, derives the right meaning for cases where the OC does not occur in the scope of the existential modal, as in (69b) or (74a) above, nor can they account for (77a).[43] Within the framework of *inquisitive semantics* (cf. Groenendijk (2009), Ciardelli and Roelofsen (2011), Ciardelli et al. (2009, 2012) a special rule for *might / may* is given

[41]The same point could be made about the restrictor of *every*. The predicted meaning is illustrated in (i) (but cf. (Zimmermann 2000:278) for the discussion of meaning for NP-disjunction).

(i) Every whale or shark must be killed!
$\rightsquigarrow \forall x[(\Diamond(W'(x)) \wedge \Diamond(S'(x)) \rightarrow$ x must be killed ]

However, I am not so sure that (i) is indeed completely off track. I fine that there is indeed a slight asymmetry between *and* and *or* in the restrictor of left-downward-monotone determiners, at least in German. If it is somehow unclear which individuals I might encounter, (ii), *or* in (iia) seems better to me than *and* in (iib). If, however, it is the sets of individuals that I am talking about are more salient, as in (iii), I prefer *and*, (iiia) to *or*, (iiib).

(ii) a. Ich segle jetzt nach Madgaskar. Ich bin so unerschrocken, ich werde jeden Wal oder Hai mit meiner Machete angreifen.
'I am sailing to Madgaskar. I am so fearless, I will attack every whale or shark with my machete.'
b. (?) Ich segle jetzt nach Madgaskar. Ich bin so unerschrocken, ich werde jeden Wal und Hai mit meiner Machete angreifen.
'I am sailing to Madgaskar. I am so fearless, I will attack every whale or shark with my machete.'

(iii) *There are 300 professors and 500 assistant professors at this university. Unfortunately, ...*
a. hat jeder Professor und Assistent das Anrecht auf eine jährliche Gehaltserhöhung.
' has every professor and assistant a right to his or her annual pay rise.'
b. (?) hat jeder Professor oder Assistent das Anrecht auf eine jährliche Gehaltserhöhung.
' has every professor or assistant a right to his or her annual pay rise.'

[42]In fact, there are some construals for OC in the antecedent of conditionals that they cannot derive, cf. (Zimmermann 2000:275f).
[43].Further, Chemla and Bott (2012) argue, on the basis of experimental evidence, that no implicatures might be involved in the derivation of FC-effects.

(cf. Ciardelli et al. (2009), which, in effect, derives the "conjunctive" effect for (69a) and (69b) and I see no straightforward extension thereof to free-choice permission or cases such as (77a).[44]

I don't have a solution for this problem. Possibly, one might venture to investigate that OC denote pluralities which are in a cumulative relation with their argument or a plurality that their argument is a part of (this is inspired by some aspects of Klinedinst (2007b,a)).[45] Roughly, what I mean thereby is something like what I sketched in (78). I have no idea how to implement this or to become more specific, all I can do is to point out that such a proposal (whatever it might actually look like) might explain why OC behave like plural expressions in some respects. They can, for instance, occur with plurality seekers, in some contexts (78) (cf. also Gawron and Kehler (2004)).

(78) a. John smoked and danced.

b. $+\rho(\{f(y)\}) : \exists X[X \in \mathcal{R}_e \wedge y \leq_{AT} X \wedge john' \leq_{AT} X] \wedge f = \lambda z_e.\exists Q[Q \leq_{AT} \rho(\{smoke'\})+\rho(\{dance'\}) \wedge Q(z)] ++\rho(\{g(P)\}) : P \leq_{AT} \rho(\{smoke'\})+\rho(\{dance'\}) \wedge g = \lambda Q_{\langle et\rangle}.\exists X[X \in \mathcal{R}_e \wedge john' \leq_{AT} X \wedge \exists z[y \leq_{AT} X \wedge Q(z)]$

(79) a. You can have both coffee or tea – it's up to you!

b. Outside of the precincts of Dutch and German fantasists who believe, respec-

[44] In effect, the meaning they derive is slightly different from conjunction of epistemic possibilities. I don't want to go into the details here, but the basic assumption of this framework is that there are two basic types of content: informative content and inquisitive content. Broadly speaking, informative content corresponds to our standard notion of an assertion and inquisitive content is such that it requires a response, or rather, requests information. Expressions can have either informative content (standard declarative sentences without disjunction), inquisitive content (questions) or both (OC)). In addition to these two types of content, Ciardelli et al. (2009) add the notion of attentive content: Roughly, we can think of this as the potential of an expression to draw attention to certain possibilities. What *might* does, in this system, is that it trivializes the informative and inquisitive content of an expression (as this is a dynamic system, this means that we leave the information state unchanged) but draws attention to certain possibilities (the possibilities raised by the disjuncts).

[45] Klinedinst's 2007b and Klinedinst's 2007a analysis explains free choice effects by assuming that the OC is indeed disjunction, that we derive implicatures locally (as in Sauerland (2004), Chierchia and Fox (2009)) and that the argument is a plurality, which co-occurs with a distributivity operator, the latter taking scope over the disjunction. The FC-effect for his example (ia) is derived as follows: The underlying syntactic structure is (ib), the denotation of the VP [DIST *got nauseous or had trouble breathing*]. At this point, we add the implicature, (id) and then, finally, add the plurality, (ia). If we assume that there are pluralities of wolds (and that existential modals involve existential quantification over such pluralities) we can give an analogous story for FC-effects with existential modals – unless of course, the modal does not take scope over the OC. In other words, his analysis does not extend to the cases in (ii).

(i) a. Some passengers got nauseous or had trouble breathing. $\rightsquigarrow$ Some passengers go nauseous and some passengers had trouble breathing.

b. Some passengers DIST got nauseous or had trouble breathing

c. $\forall x[x \leq y \rightarrow N(x) \vee T(x)$

d. $\forall x[x \leq y \rightarrow N(x) \vee T(x)] \wedge \neg\forall \mathbf{x}[\mathbf{x} \leq \mathbf{y} \rightarrow \mathbf{N}(\mathbf{x})] \wedge \neg\forall \mathbf{x}[\mathbf{x} \leq \mathbf{y} \rightarrow \mathbf{T}(\mathbf{x})] =$
$\forall x[x \leq y \rightarrow N(x) \vee T(x) \wedge \exists z[z \leq y \rightarrow \neg(N(x))] \wedge \exists z[z \leq y \rightarrow \neg(T(x))]$

e. $\exists y P[P(y) \wedge \forall x[x \leq y \rightarrow N(x) \vee T(x) \wedge \exists z[z \leq y \rightarrow \neg(N(x))] \wedge \exists z[z \leq y \rightarrow \neg(T(x))]]]$

(ii) a. You may have coffee or you may have tea.

b. The cat might be in the kitchen and the cat might be in the living room.

tively, that the German team should be excluded from the international tournaments forever, or that Dutch team should be incorporated into the Belgian one, a joint European league is understood to be an objective of both sides

c. *John is going to meet one of his two new Norwegian internet acquaintances tonight, but does not know which one.*
For safety reasons, John will meet Vondur, or Varg, respectively, in a public place.

### 5.2.3 Interim summary

I discussed the relation of AC and OC in the present proposal. I sketched one possibility where OC were viewed as sets of pluralities, where these sets contained the individual coordinates as well as the sum of these. The objects were then the arguments of a plural function affixed by an operator – which formed the disjunction of the resulting sums. As I pointed out above, I don't consider this analysis very elegant. I then showed, mostly based on existing literature, that there are some reasons to doubt that the standard conception of OC as disjunction is flawed. Should these doubts turn out to be justified, then, possibly, new perspectives on how to implement OC in the present system could open up.

.

## 5.3 Summary of chapter 5

I discussed two problems, each of which related to one of the two core claims of the proposal, repeated below.

a. ACs with coordinates of any type $a$ denote pluralities of objects of type $a$ and are subject to cumulative interpretation.
b. Pluralities are hybrid objects, i.e. there are no expressions that primitively denote properties of such objects.

I first discussed collectivity as the most evident problem for (b). At first sight, the mere existence of collective predicates or collective construals for mixed predicates seems to straightforwardly falsify (b). However, I showed that the matter is less clear than it might seem: As we find homogeneity effects in such cases, a simple story, where we simply attribute a property to a plurality directly, is not without its problems, either. I then sketched an alternative treatment for two types of predicates: true collective predicates, as in (80a), which were analyzed as involving a transitive relation as sketched in (80b), and for a subset of mixed predicates (those without degree arguments) as in (81a), where I argued that the singular expression can optionally be mapped to a plurality (indicated by the subscript PL) and which, accordingly, involve the underlying relation in (81b).

(80) a. The girls met.

b. [the girls] [the girls] **2 $\lambda x.\lambda y.met'(x)(y)$

(81) a. The boys ate the pizza.
b. [the boys] [the pizza]$_{pl}$ **2 $\lambda x.\lambda y.ate'(x)(y)$

Concerning (a), I discussed the implications for the relation between AC and OC. I gave a rather inelegant sketch of how OC could be embedded in the present system and then turned to the question whether the standard analysis of OC is correct. This discussion remained inconclusive.

Obviously, there are a number of pivotal problems for the proposal I have not addressed.

First, I have not discussed the terms of use of AC. In a number of contexts where the scenario is such that I would expect an AC to be true, use of an OC is strongly preferred. Take (82): In a scenario where half of the workers were fired and the other half offered a new job, an utterance of (82b) is by far more appropriate than an utterance of (82b), even though I predict (82a) to be true.

(82) a. After Holtrup took over, the workers were fired and offered a job as management consultants.
b. After Holtrup took over, the workers were fired or offered a job as management consultants.

I think these facts have to do with something I repeatedly alluded to and which I cannot really grasp, namely, the conditions of when we generally use a plural expression (of any kind). There seems to be a very spurious notion of representing a group (I don't employ term in a theoretical sense here), something that shares certain properties (including negative ones): (82a) becomes significantly better if followed up as in (83). (I thank Daniel Büring for pointing this out to me). Here, grouping being fired and being offered a good gob together are similar in the sense that they are something that happened to the workers – as opposed to other things. (84) makes the same point. However, I lack a proper characterization of this restriction and accordingly leave the matter open.

(83) There were 3 options. After Holtrup took over, the workers were fired and offered a job as management consultants, but none of them received a full pension offer.

(84) a. ??The soldiers fighting in the battles of the Isonzo died *and* became invalids.
b. ?The soldiers fighting at the battles of the Isonzo died *and* became invalids, not a single one could ever lead a normal life again.

Further, I have not said anything about AC under quantificational determiners in the present system. Concerning the *external* problem, I must state that quantificational determiners represent boundaries for plural syntax, otherwise, I would predict that – relating to the internal problem – all quantificational determiners should be distributing determiners. As already stated in chapter 2 above, there is some reason to believe that quantificational determiners head phrases that fall into the class of plural expressions, I would thus predict that, just as all other plural expressions, they represent cycles for plural syntax. However, I lack a proper implementation of that basic intuition which views DPs headed by quantificational determiners as plural expressions. Concerning the *internal problem*, I have nothing relevant to say about it, and I think its solution must be sought in the internal make-up of quantificational determiners.

A possibly connected phenomenon which I have not addressed at all is number marking in particular number marking on quantificational determiners and its apparent semantic effect. I just don't see how all the facts can be tied together. Number morphology shows a contradictory behavior w.r.t. the internal problem: On the one hand, it does not have a direct impact, as it does not determine whether a determiner is distributing or non-distributing, as illustrated in (85), where we find two distributing determiners, which, however, differ in their morpho-syntactic number. On the other hand, it makes a clear difference with singular and plural (negative) existential, (86).[46] Whereas (86b) cannot be true in a scenario where they arrested a murderer, but no rapist, (86a) can.

(85) a. Die meisten Deutschen und Österreicher lieben die deutsche Fußballnationalmannschaft.
'Most Germans and Austrians love the German national soccer team.'
b. Jeder Deutsche und Österreicher liebt die deutsche Fußballnationalmannschaft.
'Every German and Austrian loves the German national soccer team.'

(86) a. Sie haben keinen Mörder und Vergewaltiger festgenommen.
'They arrested no murderer and rapist.'
b. Sie haben keine Mörder und Vergewaltiger festgenommen.
'They arrested no murderers and rapists.'

Number morphology also exhibits a contradictory behavior w.r.t. the external problem. I showed above that it does not seem to have an impact on whether a quantifier can have a "cumulative" construal in general, i.e. (87) is fine if Hans knows half of the actors and Maria knows the other half, albeit the quantifier has singular morphology.

(87) Hans und Maria kennen jeden Schauspieler in dieser Stadt.
'Hans and Maria know every actor in this city.'

However, number morphology on quantificational DPs does seem to have an effect in the case of collective predicates: (88a) is rather bad.[47] What is worse, while it does not matter for the cumulative construal of quantifiers whether or not the DP embeds a plural, it does seem to matter in the context of collective predicates, as shown by the contrast between (88a) on the

[46] Contrary to first appearances, these facts are not predicted by Sauerland's 2003 theory of number marking. In particular, the difference for the existentials is unexpected.

[47] The effect increases if the quantificational element triggers agreement on $T^0$ or on a pronoun, as noted (in a different) context by Clemens Mayr in unpublished work on conjoined quantifiers.

one hand and (88b) and (88c) on the other. I have no explanation for these facts and neither does anyone else, as far as I can see: As analyses such as Krifka's 1990 must allow for optional cumulation of morphologically singular NPs (to be able to deal with embedded plurals such as *every essay of the girls*) there is no difference in the NP-denotation between (88a), (88b) and (88c). Again, this is a matter I leave unresolved, as is the connection between the external problem and sentences where we seem to find a branching quantifier-configuration, (89) (cf. Barwise (1979), Westerstahl (1987), Krifka (1990) and cf. in particular Sher (1990)).

(88) a. Maria hat viele Aufsätze geschrieben. # Ich habe jeden Aufsatz verglichen und festgestellt, dass sie sich oft wiederholt.
'Maria wrote many essays. ?? I compared every essay and noticed that she repeats herself a lot.'
b. (?)Ich habe jeden Aufsatz der Mädchen verglichen und festgestellt, dass sie von einander abgeschrieben haben.
'(?)I compared every essay of the girls and noticed that they copied from each other.'
c. (?)Ich habe jeden Bericht und Leitartikel verglichen und festgestellt, dass überall das gleiche drinsteht.
'(?)I compared every report and commentary and noticed that they all have the same content.'

(89) Most boys and most girls hate each other
$\rightsquigarrow$ There is a group containing most girls and also containing most boys and every member of this group hates every other member of the group.

I also have not discussed or aimed for an implementation of some of the most prominent phenomena connected to plurals, including bound plural variables (cf. in particular Kamp and Reyle (1993), Reinhart (1997), Brasoveanu (2010)), (90), reciprocals, (cf. in particular Heim et al. (1991b,b), Dalrymple et al. (1994, 1998) Beck (2001), Dotlačil (2012)) and elements that might contain reciprocal semantics, such as *different* or *same* (cf. Beck (2000b), Brasoveanu (2011), but cf. also Meier (2009)).

(90) Only the stupid workers broke the table they carried.

As pointed out above, I have further left open the semantic distrbution so-called plurality-seekers (some of which were already mentioned above) such as DP-adjacent or floated *all, both* (cf. Dowty (1986), Brisson (1998, 2000, 2003), Burnett (in press)), *respectively* (cf. Gawron and Kehler (2004)) as well as stressed *and*.

I have ignored some theoretically interesting questions relating to plurals and pluralities, such as the relation of plurals and mass nouns (cf. Link (1983), Chierchia (1998), Rothstein (2010)), the relation of plurals and theories of measurement (as based on Schwarzschild (2006), cf. Solt (2009) and in particular Champollion (2010b)) and the relation of plurals and generics, which is particular evident when considering bare plurals (for discussion of the latter cf. Ruys (1992), Reinhart (1997), Winter (2001a)). Nor have I discussed how the present proposal fits in with theories assuming that pragmatic covers are responsible for apparent ambiguities in the interpretation of plural sentences and whether there are any data that show that we require covers for higher-order pluralities. As indicated above, I believe that the data addressed in Wagner (2010) could be relevant for this discussion, but I don't spell this out here.

I also omitted any serious discussion of imprecision. If homogeneity and imprecision are indeed tied together, as suggested by Malamud (2012), then, depending on the exact nature of the connection, the view of homogeneity given above might have to be revised. In this connection, I also point out that my treatment here is completely static, which, of course, makes it unsuitable for explanation of any phenomena that have been argued to require a dynamic system. This is might include imprecision (cf. Križ and Schmitt (2012a)) but also the behavior w.r.t. presupposition projection.

Finally, I did not consider the cross-linguistic situation. In a number of languages, AC and universal quantification can be expressed by the same of similar morphemes.[48] Given the claims made here, I would either expect the corresponding alleged universals to exhibit weak construals across the board or else assume that they AC in these languages exhibits a behavior similar to English *both ... and ...*. As shown in section 3.5 above, the latter comes close to, but isn't identical to, universal quantification.

[48]Cf. the *World Atlas of Language Structures*, *http://wals.info/feature/56A*.

# 6 General discussion

This thesis proposed a novel (but salient, I believe) view of AC, where AC were considered members of the same semantic and syntactic class as standard plurals such as *the cats*.

This change in perspective was embedded in a more general conception of plurals, involving a more manifest distinction between plurals and singulars than is normally assumed. In particular, I argued that both standard plurals and AC are plural expressions, and that plural and singular expressions are distinguished at the syntactic level of plural syntax. The level of plural syntax was argued to exhibit its own set of syntactic rules, in particular, a special type of cylcity. I furthermore argued that all plural expressions denote pluralities, where pluralities are hybrid objects, to speak, which are accessible by our standard functional domains only *qua* their atoms. All pluralities were taken to occur as the arguments of pluralized predicates, where a pluralized predicate was conceived function from pluralities to pluralities, in particular, that plurality which is result of adding up the values that the singular predicate yields for each atomic part of the plurality the pluralized predicate applies to.

## 6.1 Motivation

My original motivation was that the traditional account of *and*–coordinations, which views *and* as intersective, does not yield the right result in a number of cases. For (1), the traditional account of *and* predicts that it is true only if every animals is both crowing and barking, but the actual truth-conditions are much weaker: The sentence is true as long as some animals were crowing and some animals were barking, as long as all animals were either crowing or barking. I showed that there are no independent factors that this difference between the apparent truth-conditions and the predictions of the intersective analysis of *and* can be attributed to.

(1) *My night at the farm was terrible.* The animals were crowing and barking. *The farmer went beserk. The car was stolen. ...*

I furthermore showed that the most promising alternative to the traditional analysis of *and*, namely, Krifka's 1990 proposal for non-intersective *and* is not satisfactory, either: As it assumes that *and* in (2) forms a complex predicate and that the weak truth-conditions are hidden, so to speak, in the predicate denotation, it cannot explain why the sentences in (2) are true in the scenario given – the complex predicate does not apply to the subject of the matrix clause.

(2) SCENARIO: *John met three people in Watertown: Father Paul, Crazy Bill and Jane, the bar owner. Father Paul considered him cruel but couldn't tell whether he is intelligent or not. Crazy Bill thought him arrogant and highly intelligent, but didn't notice anything else. Jane liked him a lot and considered him highly intelligent.*

a. The people that John met during his stay in Watertown considered him (to be) cruel, arrogant and highly intelligent.
b. The people that John met during his stay in Watertown thought that he was cruel, arrogant and highly intelligent.

Finally, I noted that AC and plurals display a number of semantic and syntactic parallels.

First, we find the weak truth-conditions typically (but not exclusively) whenever a sentence contains more than one expression that is either a plural or an AC, as illustrated by (1) and (2) above.

Second, sentences with plurals and sentences with AC both display homogeneity effects – which means that they exhibit a polar behavior under negation. (3a) conveys that both Mary and Sue arrived, but (3b) conveys that neither of them arrived. Likewise, (4a) conveys that John is both old and stupid, but (4b) conveys that he is neither.

(3) a. Mary and Sue arrived.
b. Mary and Sue didn't arrive.

(4) a. John is old and stupid.
b. John isn't old and stupid.

Third, we found that no matter whether we consider sentences with plurals or sentences with ACs, the relation for which we find the weak construal – the relation $R$ which holds of objects $X$, $Y$, as long as for every atomic part of $X$, there is some atomic part of $Y$ such that $R(X)(Y)$ and for every atomic part of $Y$ there is some atomic part of $X$ such that $R(X)(Y)$ – could correspond to parts of the sentences that included islands for syntactic movement, as illustrated by (2b) which contains a clause boundary, which is generally considered an island for covert syntactic movement.

Fourth, we found that the only exception to that latter generalization, both for sentences containing standard plurals as well as for sentences containing ACs, are those cases, where the formation of $R$ would have to take place across an embedding plural expression, and that that plural expression can correspond to a standard plural or to an AC: For (5) to be true it does not have to be the case that John and Bill each have to hate a man that hates Sue or Carry.

(5) John and Bill hate the men who hate Sue and Carry and the women who like Mary.

Fifth, we saw that determiners fall into two classes – the class of distributing determiners and the class of non-distributing determiners – when embedding a standard plural and that the same mapping from determiner to class is found when ACs are embedded under determiners. German *die meisten* (most)), for instance, is distributing in both cases, whereas German numerals, such as *fünf* (five) is non-distributing in both cases. A distributing determiner "distributes" over the "atoms", (6), whereas a non-distributing determiner doesn't, (7).

(6) a. Hans hat die meisten Tagebücher der Mädchen gelesen.
'Hans read most diaries of the girls.' $\rightsquigarrow$ For each of the girls, John read most diaries of her.
b. Hans hasst die meisten Deutschen und Österreicher.
'Hans hates most German and Austrians.' $\rightsquigarrow$ Hans hates most Germans and Hans hates most Austrians.

(7) a. Hans hat genau fünf Tagebücher der Mädchen gelesen.
'Hans read exactly diaries of the girls.' $\not\rightsquigarrow$ For each of the girls, John read most diaries of her.
b. Hans hasst genau fünf Deutsche und Österreicher.
'Hans hates exactly five Germans and Austrians.' $\not\rightsquigarrow$ Hans hates exactly five Germans and Hans hates exactly five Austrians.

Sixth, we saw that so-called *plurality*-seekers such as *both, respectively* can occur with both plurals and AC and seem to make the same semantic contribution in both cases.

(8) a. John and Sue like Peter and Mary, respectively.
b. John and Sue smoked and sang, respectively.

(9) a. John and Sue are both blond.
b. John is both old and stupid.

## 6.2 Desiderata and analysis

I aimed to set up a proposal that would account for the major parallels between AC and plurals – the weak truth-conditions and homogeneity on the semantic side and the particular locality restrictions (which means blindness to standard locality and sensitivity to embedding plurals) on the syntactic side.

The system that I suggested assumed that both standard plurals and all ACs are plural expressions and denote pluralities. It is based on the standard treatment of plural DPs and plural predication, but deviates from it in three respects. First, there is a particular level of plural syntax, where a special set of rules applies. Second, plural denotations – pluralities – are members of domains derived from our standard ontological layers and are not part of our standard functional ontology. Pluralities are accessible only via their atoms. Third, cumulation is not inheritance of a property of the atoms by the plurality, but rather pluralization of a function, which means that a function from atoms to atoms is turned into a function from pluralities to pluralities. As only atoms can be mapped back to our standard ontology, some plural sentences will have no truth-value.

In the following, I provide a brief overview of all the rules I posited and how they were employed.

### 6.2.1 A short list of the rules posited and their application

#### Syntax

I proposed that the language distinguishes plural and singular expressions syntactically, i.e. in terms of semantic categories. The former have types in $T$, (10), the latter have types in $T^*$, (11). There are no syntactically primitive plural expressions, rather, all plural expressions are derived. The language contains at least three operators which may turn singular expressions into plural expressions or vice versa: $R$, an abstract plural morpheme, which maps any expression of type $a \in T$ to an expression of type $a^* \in T^*$, $\bar{R}$, which maps any expression of type $a \in T^*$ to an expression of type $b \in T$, such that $b^* = a$ and DEF which maps any expression of type $\langle et \rangle \in T$ to an expression of type $e^* \in T^*$.

(10) The set of types $T$ is the smallest set such that

a. $e$ type

b. $t$ is a type

c. If $a$ is a type in T and $b$ is a type in T, then $\langle a, b \rangle$ is a type.

(11) $T^{*0}$ is the image of T under a fixed bijection $\Phi$, such that $T^{*0} \cap T = \emptyset$. The set of types $T^*$ is the smallest set such that if $a$ is a member of $T$, $a*$ is a member of $T^*$ and, for any $a \in T, b \in T*$, $\langle a*, b \rangle \in T^*$.

I then proposed two syntactic levels: A level L1, which is our standard LF and which is derived from the lexicon (or whatever we take to be the initial state of the derivation) L. L1 is blind to the singular-plural distinction, and so are the operations that map L to L1. These operations that map L to L1 are the standard ones – overt and covert movement, constrained by locality. In addition to L1 I proposed a second syntactic level, L2, which is derived from, i.e. crucially ordered *after*, L1. L2 is sensitive to the plural / singular distinction, as are the syntactic operations that map L1 to L2. Further, the syntactic operations mapping L1 to L2 do not adhere to any of the standard locality constraints, but they are constrained by a separate set of restrictions, which I called the cyclicity of plural syntax.

In order to make the distinctions between L1 and L2 as clear as possible, I first discuss the two levels without recurring to plural cyclicity.

There are a number of expressions that are L1-well-formed and L2 interpretable – namely, all those configurations which do not require syntactic composition of a plural and a singular expression, (12).

(12) *Set of L1-well-formed and L2-interpretable expressions*

a. *terminal nodes*

If $\alpha$ is a constant or variable of type $a \in T$, $\alpha$ is an L1-well-formed and L2-interpretable expression of type $a$.

b. *non-branching nodes*

If $\alpha$ a non-branching node and its daughter is an L1-well-formed expression type $a \in T$, then $\alpha$ is an L1-well-formed and L2-interpretable expression of type $a$.

c. *functional application with singular daughters*

If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, such that $\beta$ is an L1-well-formed and L2-interpretable expression of type $a \in T$ and $\gamma$ an L1-well-formed expression of type $\langle a, b\rangle \in T$, then $\alpha$ is an L1- well-formed expression of type $b \in T$.

d. *abstraction*

If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is a tuple $\langle n, a\rangle \in \mathbb{N} \times T$ and $\gamma$ an L1-well-formed and L2-interpretable expression of type $b \in T$, then $\alpha$ is an L1- well-formed expression of type $\langle a, b\rangle$.

e. *Plural operator R*

If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $R$ and $\gamma$ an L1-well-formed and and L2-interpretable expression of type $a \in T$, then $\alpha$ is an L1-well-formed expression of type $a$*.

f. *Singular operator* $\bar{R}$

If $\alpha$ is a binary-branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $\bar{R}$ and $\gamma$ an L1-well-formed and L2-interpretable expression of type $b \in T*$, then $\alpha$ is an L1-well-formed and L2-interpretable expression of type $a \in T$, such that $b = a*$.

g. *Plural operator* DEF

If $\alpha$ is a binary branching node with daughters DEF, $\beta$, where $\beta$ is an L1-well-formed and L2-interpretable expression of type $\langle et\rangle$, then $\alpha$ is an $L - 1$ well-formed expression of type $e$*.

h. *AC*

If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are L1-well-formed and L2-interpretable expressions of type $a \in T$*, then $\alpha$ is an L1-well-formed expression of type $a$.

L1 and L2 differ when it comes to combination of singular and plural nodes. The two expressions in (13) are L1-well-formed but not L2-interpretable. Note that L1 simply ignores the plural type.

(13) *L1 well-formed but not L2-interpretable expressions*

a. *functional application with singular functor and plural argument*
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\gamma$ is an L1-well-formed expression of type $a, b \in T$, and $\beta$ is an L1-well-formed expression of type $a*$, then $\alpha$ is an L1-well-formed expression of type $b \in T$.

b. *functional application with plural functor and singular argument*
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an L1-well-formed expression of type $a \in T$ and $\gamma$ is an L1-well-formed expression of type $\langle a, b\rangle*$, then $\alpha$ is an L1 interpretable expression of type $b \in T$.

In order to derive L2-interpretable expressions for such cases, I added the syntactic movement rule for the mapping of L1 to L2, (15). This rule proceeds top-down, starting with the highest plural expression, which moves to the closest node of type $t$ – which means that it will move below all sentential operators out-scoping it at L1. If there are more plural expressions in the sentence, they will *tuck in* between the previously moved plural the the binder it introduces, i.e. I here generalize Beck and Sauerland's 2000 movement rule for the syntactic derivation of plural predicates. Finally, the trace of this movement is always a variable of the type of the atoms of the plurality, (14).

(14) a. *mapping from L to L1– traces*
Let $\alpha$ be a binary branching node with sisters $\alpha$, $\beta$, with $\gamma$ an interpretable expression of type $\langle\langle et\rangle t\rangle$ or $\langle\langle et\rangle t\rangle*$ and $\beta$ an interpretable expression of type $b \in T \cup T*$, then, if $\beta$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $e \in T$ and $\gamma$.

b. *mapping from L1 to L2 – traces*
Let $\alpha$ be a binary branching node with sisters $\alpha$, $\beta$, with $\gamma$ an interpretable expression of type $a \in T^*$ and $\beta$ an interpretable expression of type $b \in T \cup T*$, then, if $\beta$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $b \in T$, where $b^* = a$ and $\gamma$.

c. *general – abstraction*
Let $\alpha$ be an interpretable expression of type $a \in T \cup T^*$, then, if $\alpha$ has moved from a constituent $\gamma$ to a position where it is the sister of node $\beta$, $\beta$ is branching node with daughters $\gamma$ and a tuple $\langle n, c\rangle$ where $n \in \mathbb{N}$ and $c$ is the type of the variable in the position of $\alpha$ where that variable is the $n$-th occurrence of a variable of type $c$.

(15) *mapping from L1 to L2*
If $\alpha$ is an expression of type $a \in T^*$ on L1, move $\alpha$ to a position where $\alpha$ is immediately dominated by a node $\kappa$, such that $\kappa$ is the sister of a node $\gamma$ where $\gamma$ is of type $b \in T^*$ and where $\alpha$ is the sister of $\delta$, such that $\delta$ immediately dominates a tuple $\langle n, b\rangle$, where $n \in \mathbb{N}$ and a node $\theta$ of type $b \in TC$. If there is no such position, move $\alpha$ to the *closest node* of type $t$. Start with the highest expression with a type in $T^*$.

By subsequent movement of plural expressions $\alpha_1, \alpha_2, \alpha_3$, of types $a, b, c$, respectively, by means of (15) we derive a predicate of type $\langle c\langle b\langle a, t\rangle\rangle\rangle$. I now assume that the language contains operators *n, $1 \leq n$ that turns predicates of atoms into sums of predicates of atoms. These are affixed to the predicates derived by plural movement. As in the case of standard cumulation (cf. Sternefeld (1998)), $i*$ and $j*$ are distinct if $1 \leq i, j$ and $i \neq j$. I proposed that $n*$ is affixed to any relation with $n$-arguments derived by plural movement. Insertion of $n*$ is counter-cyclic and happens in the derivation of L2 from L1. In other words, we obtain (16a) as another L2-interpretable expression. Functional application is now generalized at L2 to all types, (16b)

(16) *Set of L2-interpretable expressions*

a. *plural predicates*
If $\alpha$ is a binary branching node with daughters *n and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle \ldots \langle a-n, t\rangle\rangle\rangle$, then $\alpha$ is an L2-interpretable expression of type $\langle a-1*\langle \ldots \langle a-nt*\rangle\rangle\rangle$.

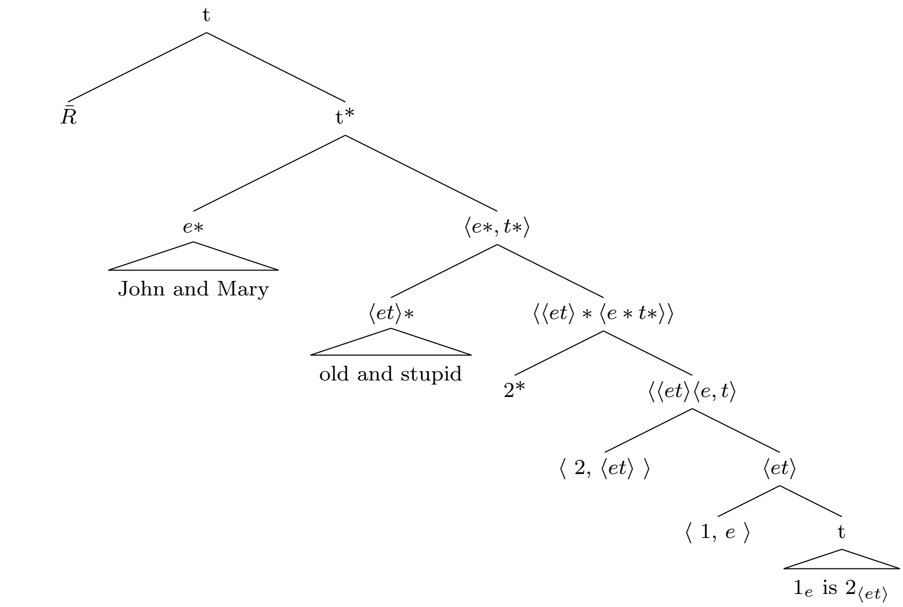
b. *functional application*
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T \cup T^*$ and $\gamma$ an interpretable expression of type $\langle a, b\rangle \in T \cup T^*$- then $\alpha$ is an interpretable expression of type $b$.

Finally, I assumed that for all nodes of type $t^*$ are affixed with the singular operator $\bar{R}$ which will yield an expression of type $t$. Sentential operators apply to the output of this singular operation. The L2-structures of the two sentences in (17) is given below.

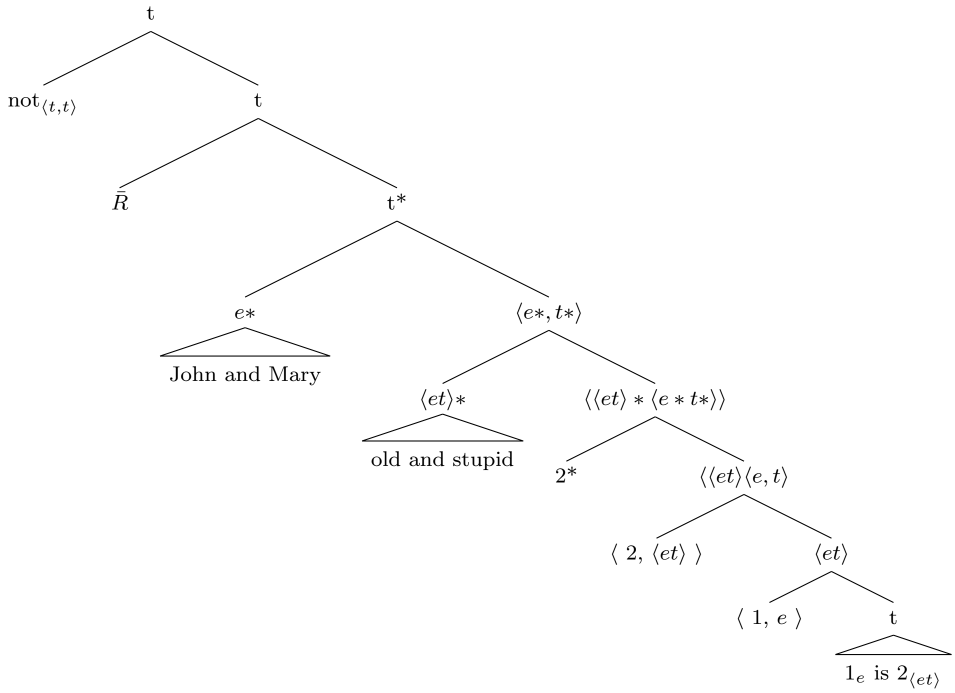
(17) a. John and Peter were smoking and dancing.

b. John and Peter weren't smoking and dancing.

(18) a.




b.




This was just the first step in the formulation of the plural syntax. The second step built on the observation that plural expressions embedded in plural expressions, such as (19), are not straightforwardly derivable, unless we assume that the mapping of L1 to L2 proceeds cyclically.

(19) a. John and Peter want Sue to kill Harry and Max and hope that Chris will leave the town.
b. John and Peter fed the cats and brushed the dogs.
c. John and Peter gave the bones to the dogs and fed the cats.

As a first step, I introduced a rather general concept of cylces, (20). I assume that the L1-L2 mapping proceeds cyclically, bottom up. Higher cycles properly contain lower cycles. Basically, $\gamma$ will count as a cycle if it is the sister of one of the plural operators, $R$ or DEF. In this sense, these cycles are determined by the plural – singular distinction. Note that a cylce is only L2-relevant if it contains a plural expression.

(20) a. A cycle $C$ is that part of an $L1$ structure such that the highest node $\gamma$ in $C$ is a node in of type $a \in T \cup T^*$ and $\gamma$ is immediately dominated by node $\beta$ of type $b \in T^*$ and $a \neq b$ or $\gamma$ is not dominated by any other node.

b. A cycle $C^i$ is *lower than* a cycle $C^j$ iff there is a node $\gamma$ in $C^j$ but not in $C^i$ such that $\gamma$ dominates $C^i$ (v.v. for *higher than*). A cycle $C^j$ contains all lower cycles $C^i$. $C^j - C^i$ is the material in $C^j$ *to the exclusion* of a lower cycle $C^i$.

c. Cycles $C^i$, $C^j$ are *parallel* iff there is no node $\gamma$ in both $C^j$ and $C^j$ and if there is no node $\beta$ in $C^i$ such that $\beta$ dominates $C^j$ and no node $\delta$ in $C^j$ such that $\delta$ dominates $C^i$ and the number of cycles higher than $C^i$, $C^j$ is identical.

d. A cycle $C^i$ is L2-relevant if it contains a node $\gamma$ of type $a \in T^*$ and if there is no cycle $C^j$ that is lower than $C^i$ and that contains $\gamma$. If a cylce is non-L2-relevant, it is added to the next highest cycle.

e. Mapping from L1 to L2 proceeds in a stepwise fashion, starting with the lowest L2-relevant cycles. For any L2-relevant cycle $C^i$, mapping is such that all material within $C^i$ is L2-interpretable after all rules have applied.

f. $\bar{R}$ is affixed to expressions of type $t^*$ only in the highest cycle.

I then relativized the mapping rules from L1 and L2 to cycles, as in (22). What happens is that we proceed with our movement rules as before, just that this time, we move the highest plurality in the cycle to the edge of its cycle (movement of further pluralities will again *tuck in* between the previously moved plurals and their binders), (22). The difference is that in this case, the operator inducing the cycle - R or DEF intervenes between the plurals and the movement-induced binders, (21).

(21) a. *traces in L1 to L2-mapping, relativized to cycles* Let $\alpha$ be a binary branching node with daughters $\beta$, $\gamma$, with $\gamma$ an L1- well-formed expression of type $a \in T^*$ and $\beta$ an L1-well-formed expression of type $b \in T \cup T*$, then, if $\gamma$ moves from under $\alpha$ to a position c-commanding $\alpha$, $\alpha$ immediately dominates a variable of type $c \in T$, where $c* = a$, and $\beta$.

b. Let $\alpha$ be an L1-well-formed expression of type $a \in T^*$, then, if $\alpha$ has moved from a constituent $\gamma$ to a position where it is the sister of node $\beta$, then,

(i) if $\beta$ is an L1-well-formed expression of type $b \in T$, then $\beta$ is a branching node with daughters $\gamma$ and a tuple $\langle n, c\rangle \in \mathbb{N} \times T$, where $c$ is the type of the variable in the original position of $\alpha$.

(ii) if $\beta$ is an L1-well-formed expression of type $b \in T^*$, then $\beta$ is a branching node with daughters $R$ and $\gamma$, where $\gamma$ is a branching node immediately dominating a tuple $\langle n, c\rangle \in \mathbb{N} \times T$, where $c$ is the type of the variable in the original position of $\alpha$ or $\beta$ is a branching node with daughters $def$, $\gamma$, where $\gamma$ is a branching node which immediately dominates a tuple $\langle n, c\rangle \in \mathbb{N} \times T$ where $c$ is the type of the variable in the original position of $\alpha$.

(22) *Mapping from L1 to L2 relativized to cycles*
If $C_i$ is an L2-relevant cycle, $\beta$ and expression of type $a \in T^0*$ in $C_i$ then

a. if there is no node $\alpha$ immediately dominating $C_i$,move $\beta$ to a position where $\beta$ is immediately dominated by $\kappa$, such that $\kappa$ is the sister of a $\gamma$ where $\gamma$ is of type $b \in T^*$ and where $\alpha$ is the sister of $\delta$, such that $\delta$ immediately dominates a tuple $\langle n, b\rangle \in \mathbb{N} \times T$ and a node $\theta$ of type $b \in TC$. If there is no such position, move $\beta$ to the highest node of type $t$. Start with the highest element that has type in $T^0*$.

b. if there is a node $\alpha$ immediately dominating $C_i$, move $\beta$ to a position where $\beta$ is the sister of $\delta$, such that $\delta$ immediately dominates $R$ or DEF.

I further assumed that an operator $n^*$ is affixed to the derived predicate of each cyclic application of L1 to L2-mapping. This means that is introduced immediately under the operator that triggered cyclicity, i.e. R or DEF. I therefore extended the set of L2-interpretable expressions as in (23).

(23) *Extension of the set of L2-interpretable expressions*

a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L2-interpretable expression $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle$, then $\alpha$ is an L2-interpretable expression of type $\langle a-1 * \langle \ldots \langle a - *n, b*\rangle\rangle\rangle$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle \in T^* \backslash T^0*$, then $\alpha$ is an L2-well-formed expression of type $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle$.

Finally, as a cyclic derivation means that the L1 of higher cycles will contain the L2 of lower cycles, I needed to extend the set of L1-well-formed expressions as in (24).

(24) *Extension of the set of L1-well-formed expressions*

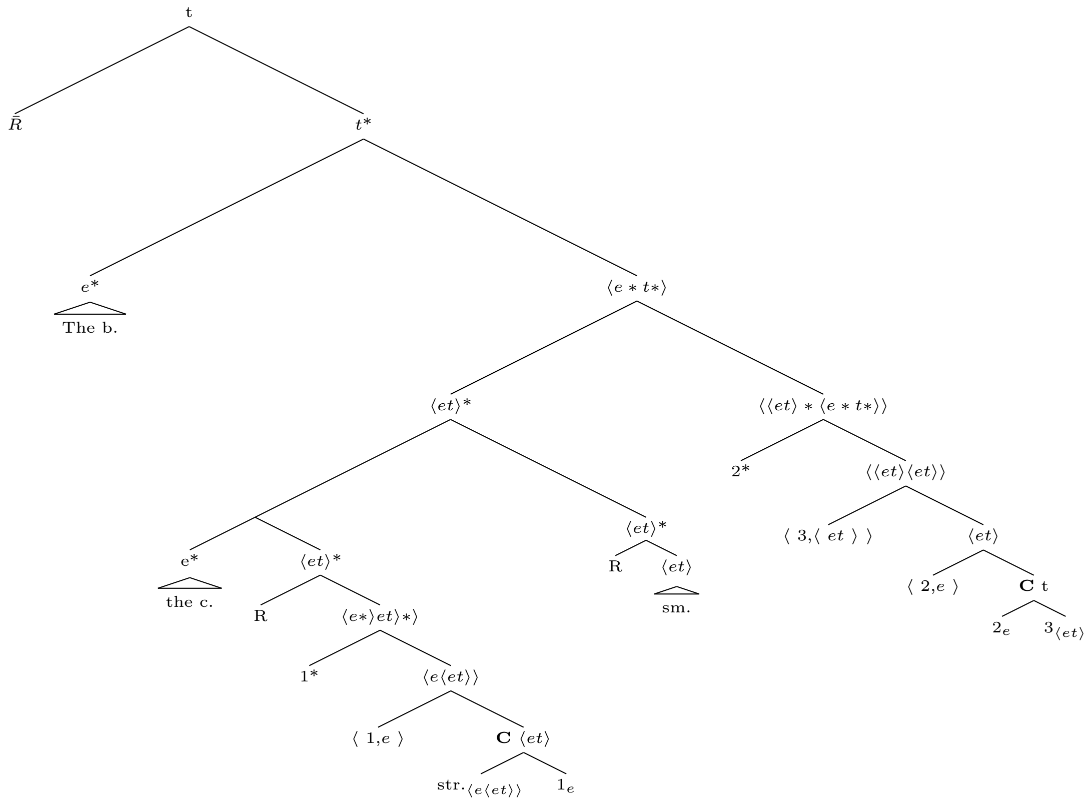
a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L1-well-formed expression $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle$, then $\alpha$ is an L1-well-formed expression of type $\langle a-1 * \langle \ldots \langle a - *n, b*\rangle\rangle\rangle$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L1-well-formed expression of type $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle \in T^* \backslash T^0*$, then $\alpha$ is an L1-well-formed expression of type $\langle a-1\langle \ldots \langle a-n, b\rangle\rangle\rangle$.

The L2-structures for the sentences in (25) is given in (26).

(25) The boys stroked the cats and smoked.

(26)




In sum, I distinguished singular and plural expressions syntactically and introduced an extra level of syntactic operations which deals exclusively with plural expressions and is subject to a separate set of locality conditions.

## Semantics

I assumed that singular and plural expressions have their denotations in separate domains. The plural domains act as shadow domains, so to speak. Expressions of L2 are interpreted w.r.t. a model $\mathcal{M}$, which, relative to a standard model, is enriched by a family of isomorphism $\rho$. The role of $\rho$ is to map our standard domains, (30) to shadow domains which contain the denotations of plurals, (28).

(27) The model $\mathcal{M} = \langle A, \mathcal{F}, \rho \rangle$, where

a. $A \neq \emptyset$

b. $\mathcal{F} : C \rightarrow \bigcup D_a$

c. $\rho$ is the family all isomorphisms $(\rho_a), a \in T$.

(28) a. For any type $a \in T$, $\rho_a$ is a bijection $\rho_a : D_a^+ \rightarrow \mathcal{R}_a$

b. For any two types $a, b \in T, a \neq b, \mathcal{R}_a \cap \mathcal{R}_b = \emptyset$

(29) $g : V \rightarrow \bigcup D_a$

(30) a. $D_e = A$

b. $D_t$ is the set of truth values, $\{1, 0\}$

c. $D_{\langle a,b \rangle}$ is the set of all functions from $D_a$ to $D_b$

The basic extensions are given in (31).

(31) a. *constants*
If $\alpha$ is a constant of type $a \in T$, then $[\![\alpha]\!]^{M,g} = \mathcal{F}(a)$.

b. *variables*
If $\alpha$ is a variable of type $a \in T$, then $[\![\alpha]\!]^{M,g} = g(a)$.

c. *non-branching nodes*
If $\alpha$ is a non-branching node with daughter $\beta$, where $\beta$ is an interpretable expression of type $a \in T$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g}$.

d. *functional application*
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is an interpretable expression of type $a \in T$ and $\gamma$ an interpretable expression of type $\langle a, b \rangle \in T$, then $[\![\alpha]\!]^{M,g} = [\![\gamma]\!]^{M,g} \ ([\![\beta]\!]^{M,g})$.

e. *abstraction*
If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta$ is a tuple $\langle n, a \rangle \in \mathbb{N} \times T$ and $\gamma$ and interpretable expression of type $b \in T$, then $[\![\alpha]\!]^{M,g}$ is that function $f$ of type $\langle a, b \rangle \in T$, such that for all objects $u$ of type $a$, $f(u) = [\![\alpha]\!]^{M,h}$(x), where $x$ is the $n$-th variable of type $a$ and $h = g^{[x/u]} = (g \backslash \{x | g(x)\}) \cup \{\langle x, u \rangle\}$.

f. *plural operator R*
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $R$ and $\gamma$ an interpretable expression of type $a \in T$, then $[\![\alpha]\!]^{M,g} = \rho_a(\{[\![\gamma]\!]^{M,g}\})$.

g. *singular operator* $\bar{R}$
If $\alpha$ is a binary branching node with daughters $\beta$, $\gamma$, where $\beta$ is the operator $\bar{R}$ and $\gamma$ an interpretable expression of type $a \in T^0*$, then $[\![\alpha]\!]^{M,g} = \downarrow (\rho_a^{-1}( [\![\gamma]\!]))$ (where, for any $x \downarrow = \{\langle \{x\}, x \rangle | x \in D_a\}$.[1]

h. *definite determiner*
If $\alpha$ is a binary-branching node with daughters, DEF, $\beta$, such that $\beta$ is an interpretable expression of type $\langle et \rangle$ then $[\![\alpha]\!]^{M,g} = \rho_e([\![\beta]\!]^{M,g})$
(or rather $\rho_e(\{x | [\![\beta]\!]^{M,g}(x)\})$).

i. *AC*
SEMANTICS + If $\alpha$ is a binary branching node with daughters $\beta, \gamma$, where $\beta, \gamma$ are interpretable expressions of type $a \in T^0*$, then $[\![\alpha]\!]^{M,g} = [\![\beta]\!]^{M,g} + [\![\gamma]\!]^{M,g}$.

The operators *n pluralize derived predicates in the sense that they add their sums together. Without reference to cycles, the meaning for *n was given as in (32). Basically, what this

[1] In other words, $\bar{R}$ will only yield an element in $D_a$ if application of $\rho^{-1}(x)$ yields a singleton, which means that $\rho(x)$ must be a member of $AT_a$.

operator does is that it adds up the function values for each atom of each argument, checking for each of these atoms $X$ if there are atoms of the other pluralities (if there are any) such that $X$ is in the respective relation with these atoms. Accordingly, the value of such a function, when applied to its arguments, will be a plurality of truth-values. Subsequent application of the singular operator $\bar{R}$ to this value will thus only yield a value in $D_t$ – a truth-value – if the sum is an atom. This means that either all atoms have the property in question (in which case the sum would be the object corresponding to 1) or none of the atoms have the property in question (in this case, the sum would be the object corresponding to 0).

(32) If $\alpha$ is a branching node with daughters *n and $\beta$, where $\beta$ is an interpretable expression of type $\langle a-1\langle \ldots \langle a-n, t\rangle\rangle\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function
$f : \mathcal{R}_{a-1} \rightarrow \ldots \rightarrow [\mathcal{R}_{a-n} \rightarrow \mathcal{R}_t]]$, such that for any $X_1 \in \mathcal{R}_{a-1}, \ldots, X_n \in \mathcal{R}_{a-n}$
$f(X_1)\ldots(X_n) =$
$= +(\rho(\{g(X_1^i)\})|\rho(\{X_1^i\}) \leq_{AT} X_1, g = \lambda Z_{a-1}^1.\exists X_2^i, \ldots, X_n^i[\rho(\{X_2^i\}) \leq_{AT} X_2, \ldots$
$\rho(\{X_{n\}}^i) \leq_{AT} X_n \wedge [\![\beta]\!]^{M,g}(Z^1)(X_2^i)\ldots(X_n^i)) + \ldots +$
$+(\rho(\{g(X_n^i\}))|\rho(\{X_n^i\}) \leq_{AT} X_n^i, g = \lambda Z_{a-n}^n.\exists X_1^i, \ldots, X_{n-1}^i[\rho(\{X_1^i\}) \leq_{AT} X_1, \ldots$
$\rho(\{X_{n-1}^i\}) \leq_{AT} X_{n-1} \wedge [\![\beta]\!]^{M,g}(X_1^i)\ldots(X_{n-1}^i)(Z^n))$.

The meaning for the sentences in (33a) and (33b), based on the structures that I gave above, is found in (34a) and (34b). (33a) is true and (33b) false if John is old or stupid and Mary is old or stupid and at least of them is old and at least one of them is stupid, (33a) is false and (33b) true if neither John nor Mary are old and stupid and both are undefined otherwise.

(33) a. John and Mary are old and stupid.
b. John and Mary aren't old and stupid.

(34) a. $\downarrow (\rho^{-1}(+(\rho(\{g(P\}))|\rho(\{P\}) \leq_{AT} \rho(\{[\![\text{old}]\!]^{M,g}\}) + \rho(\{[\![\text{stupid}]\!]^{M,g}),$
$g = \lambda Q_{\langle et\rangle}.\exists x[\rho(\{x\}) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\}) + \rho(\{[\![\text{Mary}]\!]^{M,g}) \wedge \text{ is' } (Q)(x)])+$
$+(\rho(\{g(x)\}))|\rho(x) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\})+\rho(\{[\![\text{Mary}]\!]^{M,g}), g = \lambda z_e.\exists P[\rho(\{P\}) \leq_{AT}$
$\rho(\{[\![\text{old}]\!]^{M,g}\}) + \rho(\{[\![\text{stupid}]\!]^{M,g}) \wedge \text{is'}(P)(z)))$
b. $\neg(\downarrow (\rho^{-1}(+(\rho(\{g(P\}))|\rho(\{P\}) \leq_{AT} \rho(\{[\![\text{old}]\!]^{M,g}\}) + \rho(\{[\![\text{stupid}]\!]^{M,g}),$
$g = \lambda Q_{\langle et\rangle}.\exists x[\rho(\{x\}) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\}) + \rho(\{[\![\text{Mary}]\!]^{M,g}) \wedge \text{ is' } (Q)(x)])+$
$+(\rho(\{g(x)\}))|\rho(x) \leq_{AT} \rho(\{[\![\text{John}]\!]^{M,g}\})+\rho(\{[\![\text{Mary}]\!]^{M,g}), g = \lambda z_e.\exists P[\rho(\{P\}) \leq_{AT}$
$\rho(\{[\![\text{old}]\!]^{M,g}\}) + \rho(\{[\![\text{stupid}]\!]^{M,g}) \wedge \text{is'}(P)(z))))$

Relativized to cycles, the semantics remains as before if we consider the highest cycle, but when we consider lower cycles, it is no longer strictly compositional: we now sum up $C(X)$, where C is the operator that induces cylicity ($R$ or DEF) and X is an atom of the *function* derived by application of $n*$.

(35) *Extension of the semantics*

a. If $\alpha$ is a branching node with daughters $*n$ and $\beta$ is an L2-interpretable expression $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle$, then $[\![\alpha]\!]^{M,g}$ is that function $f:\mathcal{R}_{a-1}\rightarrow\ldots\rightarrow[\mathcal{R}_{a-n}\rightarrow\mathcal{R}_b]]$, such that for any $X_1{\in}\mathcal{R}_{a-1},\ldots,X_n{\in}\mathcal{R}_{a-n}$

(i) if $b=t$, $f(X_1)\ldots(X_n)=$
$=+(\rho(\{g(X_1^i)\})|\rho(\{X_1^i\})\leq_{AT}X_1, g=\lambda Z^1_{a-1}.\exists X_2^i,\ldots,X_n^i[\rho(\{X_2^i\})\leq_{AT}X_2,\ldots\rho(\{X^i_{n\}})\leq_{AT}X_n\wedge[\![\beta]\!]^{M,g}(Z^1)(X_2^i)\ldots(X_n^i))]+\ldots+$
$+(\rho(\{g(X_n^i\}))|\rho(\{X_n^i\})\leq_{AT}X_n^i, g=\lambda Z^n_{a-n}.\exists X_1^i,\ldots,X^i_{n-1}[\rho(\{X_1^i\})\leq_{AT}X_1,\ldots\rho(\{X^i_{n-1}\})\leq_{AT}X_{n-1}\wedge[\![\beta]\!]^{M,g}(X_1^i)\ldots(X^i_{n-1})(Z^n))]$.

(ii) if $b=\langle c-1\langle\ldots\langle c-n,t\rangle$, $f(X_1)\ldots(X_n)=$
$=+(\rho(\{g(X_1^i)\})|\rho(\{X_1^i\})\leq_{AT}X_1, g=\lambda Z^1_{a-1}.\lambda C^1_{c-1}.\ldots\lambda C^n_{c-n}.\exists X_2^i,\ldots,X_n^i$
$[\rho(\{X_2^i\})\leq_{AT}X_2,\ldots\rho(\{X^i_{n\}})\leq_{AT}X_n\wedge$
$[\![\beta]\!]^{M,g}(Z^1)(X_2^i)\ldots(X_n^i))(C^1_{c-1})\ldots(C^n_{c-n})]+\ldots$
$++(\rho(\{g(X_n^i\}))|\rho(\{X_n^i\})\leq_{AT}X_n^i, g=\lambda Z^n_{a-n}.\lambda C^1_{c-1}.\ldots\lambda C^n_{c-n}.$
$\exists X_1^i,\ldots,X^i_{n-1}[\rho(\{X_1^i\})\leq_{AT}X_1,\ldots$
$\rho(\{X^i_{n-1}\})\leq_{AT}X_{n-1}\wedge[\![\beta]\!]^{M,g}(X_1^i)\ldots(X^i_{n-1})(Z^n))(C^1_{c-1})\ldots(C^n_{c-n})]$.

b. If $\alpha$ is a branching node with daughters $R$ and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle\ldots\langle a-n,b\rangle\rangle\rangle\in T^*\setminus T^{0}*$, then $[\![\alpha]\!]=[\![\beta]\!]$.

c. If $\alpha$ is a branching node with daughters DEF and $\beta$, where $\beta$ is an L2-interpretable expression of type $\langle a-1\langle\ldots\langle a-n,\langle et\rangle\rangle\rangle\rangle\in T^*\setminus T^{0}*$, then $[\![\alpha]\!]^{M,g}$ is that function $\mathcal{R}_{a-1}\rightarrow\ldots\rightarrow[\mathcal{R}_{a-n}\rightarrow\mathcal{R}_e]]$, such that for any $X_1{\in}\mathcal{R}_{a-1},\ldots,X_n{\in}\mathcal{R}_{a-n}$
$f(X_1)\ldots(X_n)=\rho(g(X_1^i))|\rho(\{X_1^i\})\leq_{AT}X_1, g=\lambda Z^1_{a-1}.\lambda y_e.\exists X_2^i,\ldots,X_n^i[\rho(\{X_2^i\})\leq_{AT}X_2,\ldots\rho(\{X^i_{n\}})\leq_{AT}X_n\wedge[\![\beta]\!]^{M,g}(Z^1)(X_2^i)\ldots(X_n^i)(y))]+\ldots+$
$+(\rho(g(X_n^i))|\rho(\{X_n^i\})\leq_{AT}X_n^i, g=\lambda Z^n_{a-n}.\lambda y_e.\exists X_1^i,\ldots,X^i_{n-1}[\rho(\{X_1^i\})\leq_{AT}X_1,\ldots\rho(\{X^i_{n-1}\})\leq_{AT}X_{n-1}\wedge[\![\beta]\!]^{M,g}(X_1^i)\ldots(X^i_{n-1})(Z^n)(y)]$.

The meaning for the sentence in (36), based on the structure given above, is the one in (37). It is true if each of the boys stroked a cat or smoked and each cat was stroked by at least one boy and at least one boy smoked, false if none of the boys stroked any cat or smoked and undefined otherwise.

(36) The boys stroked the cats and smoked.

(37) $[\![(36)]\!]^{M,g}=\downarrow(\rho^{-1}+\rho(\{f(x)\}:\rho\{x\}\leq_{AT}\rho(\{c'\})+\rho(\{p'\})\wedge f=\lambda y_e.\exists P[\rho(\{P\})\leq_{AT}\rho(\{\lambda z^1_e.z^1\text{str.'}j'\})+\rho(\{\lambda z^1_e.z^1\text{str.'}m'\})+\rho(\{\lambda z^2_e.z^2\text{sm.}\})\wedge P(y)]++\rho(\{g(Q)\}:\rho\{Q\}\leq_{AT}\rho(\{\lambda z^1_e.z^1\text{str.'}j'\})+\rho(\{\lambda z^1_e.z^1\text{str.'}m'\})+\rho(\{\lambda z^2_e.z^2\text{sm.}\})\wedge g=\lambda P_{\langle et\rangle}.\exists y[\rho(\{y\})\leq_{AT}\rho(\{c'\})+\rho(\{p'\})\wedge P(y)])))$

In sum, what I did here was to assume that all pluralities are hybrid objects, the atoms of which can correspond to any $X\in D_a$. Pluralities occur as arguments of pluralized functions, where we add up the function values obtained by application of the singular function to the atoms of the plurality. Accordingly, the value of such a plural function is itself a plurality. Only some pluralities have corresponding objects in the singular domain. Most crucially, only atomic pluralities of truth-values have corresponding elements in $D_t$. Accordingly, not all plural sentences have a truth value.

## 6.3 Further issues

As one of the basic assumptions I made was that their are no expressions that primitively denote properties of pluralities, the system is unable to cope with collective predication, i.e. sentences such as the ones in (38).

(38) a. Bert, Chris and Dick met.
b. Bert, Chris and Dick ate the pizza.

However, I showed that there might be something wrong with our traditional view of these cases – or a subset thereof. The traditional view assumes that the property in question is directly attributed to the plurality denoted by the subject, without taking into consideration its atomic parts. However, collective predication can still be shown to display homogeneity effects. The negation of (38a) in (39) below conveys that there was no meeting between any of the three boys in question. Analogously for the negation of (38b) in (40), which conveys that none of the boys ate any part of the pizza.

(39) Bert, Chris and Dick didn't meet.

(40) Bert, Chris and Dick didn't eat the pizza.

I sketched an alternative account of both types of collective predication. For inherently collective predicates such as *meet* I suggested an underlyingly transitive structure, involving the pluralized counterpart of *meet with*. For mixed predicates I tentatively advocated a view where the singular object – *the pizza* in (38b) above – is mapped to a plurality of its material parts and where the relation – *ate* in (38b) – is then pluralized. In both cases, the sketched analyses remained incomplete.

## 6.4 Outlook

In principle, this section should have the title *Problems and Outlook*, but since chapter 5 already listed the most prominent problems for the proposal, I limit myself to a brief consideration of possible extensions of the analysis – provided it can be maintained in some form.

I think the two most prominent issues directly concern the re-categorization of AC that I undertook here.

First, I removed AC – or *and* – from the class of expressions considered to correspond to connectives in (classical) propositional logic – hence, we have to say something about the relation of AC to the other members of the class it was pulled out off. This issue was already partially addressed in chapter 5 w.r.t. *or*–coordinations: Which of the traditionally assumed logical relations between *and*–and *or*–coordinations can be maintained in the present view and, more importantly even, which are such that the linguistic evidence compels us to maintain them? And further, if we re-categorize *and*–coordinations, shouldn't we also investigate whether we should re-categorize *or*–coordinations?

Second, I moved AC to the class of plural expressions. As has become evident above, we require a better description of this class. What exactly are its distinctive features? I listed some, but I do not claim that this list is exhaustive, nor do I claim that the properties listed as discrete are indeed independent of each other. When exactly can we use plural expressions and how can we specify the intuition that I repeatedly cited (but which I could not specify) that when we use a plural expression there is some property that "keeps these atoms together" and that somehow we don't consider each atom in isolation? How exactly, in other words, are plural expressions distinct from quantificational expression, where that intuition does not apply? Further, what other members fall into this class? Generics are an obvious candidate, not discussed here at all, but I certainly not the only one.

A final point (as always) is that in order to corroborate my claims here (or to investigate the follow-up questions) we would need a more solid empirical underpinning, qualitatively and quantitatively. Concerning the former, the claims made here would be need to be subjected to a serious (that is, well-designed) test probing how speakers really understand sentences containing AC (or plurals). Concerning the latter, a cross-linguistic investigation of the interpretation of AC – possibly parametrized so as to take into account different formal strategies, would seem desirable.

.

# Bibliography

Asher, Nicholas. 1987. A typology for attitude verbs and their anaphoric properties. *Linguistics and Philosophy* 125–197.

Askedal, John Ole. 2001. Mysteries of response particles in Norgwegian and German: towards a comparative study. In *Making Sense: From Lexeme to Discourse*. Groningen: Center for Language and Cognition.

Baker, Mark. 1985. The mirror principle and morphosyntactic explanation. *Linguistic Inquiry* 16:373–416.

Barker, Chris. 2010. Free choice permission as resource-sensitive reasoning. *Semantics and Pragmatics* 3:1–38.

Barwise, John. 1979. On Branching Quantifiers in English. *Journal of Philosphical Logic* 47–80.

Barwise, John, and Robin Cooper. 1981. Generalized quantifiers and natural language. *Linguistics and Philosophy* 4:159–219.

Beck, Sigrid. 2000a. Contextual Restrictions on Plural Operators. In *The Syntax-Semantics Interface,*, ed. C. Boeckx, L. Marti, and D. Wharram, volume 9 of *UConn Working Papers in Linguistics*, 1–17. University of Connecticut.

Beck, Sigrid. 2000b. The semantics of *different*: comparison operator and relationa adjective. *Linguistics and Philosophy* 101–139.

Beck, Sigrid. 2001. Reciprocals are definites. *Natural Language Semantics* 9:69–138.

Beck, Sigrid, and Uli Sauerland. 2000. Cumulation is needed: a reply to Winter (2000). *Natural Language Semantics* 8:349–371.

Beck, Sigrid, and Yael Sharvit. 2002. Pluralities of Questions. *Journal of Semantics* 105–157.

Belnap, Nuel D. 1977. A useful four-valued logic. In *Modern Uses of Multiple-Valued Logic 5-37*, ed. J.M. Dunn and G. Epstein, 8–38. Reidel Publishing Company.

Bennett, M.R. 1974. Some Extensions of a Montague fragment in English. Doctoral Dissertation, UCLA.

Benthem, J.van. 1986. *Essays in Logical Semantics*. Kluwer Academic Publishers.

Bergmann, Merrie. 1982. Cross-categorial semantics for conjoined common nouns. *Linguistics and Philosophy* 5:399–401.

Berman, Stephen. 1991. On the Semantics and Logical Form of Wh-Clauses. Doctoral Dissertation, University of Massachusetts, Amherst.

Bobaljik, Jonathan D., and Susanne Wurmbrand. to appear. Word order and scope: Transparent interfaces and the 3/4 signature. *Linguistic Inquiry* .

Brasoveanu, Adrian. 2010. Decomposing Modal Quantification. *Journal of Semantics* 4:437–527.

Brasoveanu, Adrian. 2011. Sentence-Internal Different as Quantifier-Internal Anaphora. *Linguistics and Philosophy* 34:93–168.

Breheny, Richard. 2008. A New Look at the Semantics and Pragmatics of Numerically Quantified Noun Phrases. *Journal of Semantics* 2:93–140.

Brisson, Christine. 1998. Distributivity, Maximality, and Floating Quantifiers. Doctoral Dissertation, Rutgers.

Brisson, Christine. 2000. Floating quantifiers as adverbs. In *Proceedings of the ESCOL 15*, ed. Rebecca Daly and Anastasia Riehl, 13–24. Ithaca, NY: CLC Publications.

Brisson, Christine. 2003. Plurals, *all* and the Nonuniformity of Collective Predication. *Linguistics and Philosophy* 129–184.

Bruening, Benjamin. 2001. QR obeys superiority: frozen scope and ACD. *Linguistic Inquiry* 32:233–273.

Büring, Daniel, and Manuel Križ. 2012. It's That, and That's It! Exhaustivity and Homogeneity Presuppositions in Clefts (And Definites). Ms. University of Vienna.

Burnett, Heather. in press. Vague Determiner Phrases and Distributive Predication. In *New Directions in Logic, Language, and Interaction*, ed. Marija Slavkovik and Daniel Lassiter. Springer. H.

Carlson, Greg. 1987. Same and Different: Some Consequences for Syntax and Semantics. *Linguistics and Philosophy* 531–566.

Carlson, Gregory N. 1977. Reference to Kinds in English. Doctoral Dissertation, University of Massachusetts, Amherst.

Champollion, Lucas. 2010a. Cumulative readings of *every* do not provide evidence for events and thematic roles . springer berlin / heidelberg, 2010. In *Logic, Language and Meaning, Lecture Notes in Computer Science*, ed. M. Aloni, R. Bastiaanse, T. de Jager, and K. Schulz, 213–222. Heidelberg: Springer.

Champollion, Lucas. 2010b. Parts of a whole: Distributivity as a bridge between aspect and measurement. Doctoral Dissertation, University of Pennsylvania.

Chemla, Emmanuel, and Lewis Bott. 2012. Processing inferences at the semantics/pragmatics frontier: disjunctions and *free choice*. Under revision.

Chierchia, Gennaro. 1998. Plurality of mass nouns and the notion of "semantic parameter". In *Events and Grammar*, ed. Susan Rothstein, 53–104. Kluwer Academic Publishers.

Chierchia, Gennaro, and Danny Fox. 2009. Hurford's Constraint and the Theory of Scalar Implicatures. In *Presuppositions and Implicatures. Proceedings of the MIT-Paris Workshop*, ed. Paul Egré and Giorgio Magri. MIT Working Papers in Linguistics.

Chierchia, Gennaro, Danny Fox, and Benjamin Spector. to appear. The Grammatical View of Scalar Implicatures and the Relationship between Semantics and Pragmatics. In *An International Handbook of Natural Language Meaning*, ed. Paul Portner, Claudia Maienborn, and Klaus von Heusinger. Mouton de Gruyter.

Chierchia, Gennaro, and Raymond Turner. 1988. Semantics and Property Theory. *Linguistics and Philosophy* 261–302.

Chomsky, Noam. 1981. *Lectures on government and binding*. Dordrecht, The Netherlands: Foris Publications.

Chomsky, Noam. 1995. *The minimalist program*. Cambridge, Massachusetts: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A Life in Linguistics*, ed. Michael Kenstowicz, 1–52. Cambridge, Massachusetts: MIT Press.

Ciardelli, Ivano, Jeroen Groenendijk, and Floris Roelofsen. 2009. Attention! *might* in inquisitive semantics. In *Proceedings of SALT XIX*. CLC Publications.

Ciardelli, Ivano, Jeroen Groenendijk, and Floris Roelofsen. 2012. Inquisitive semantics. NASSLLI 2012 lecture notes.

Ciardelli, Ivano, and Floris Roelofsen. 2011. Inquisitive logic. *Journal of Philosophical Logic* 40:55–94.

Cooper, Robin. 1979. The interpretation of pronouns. In *Syntax and Semantics 10: Selections from the Third Groningen Round Table*, ed. Frank Heny and H. Schnelle, 61–92. New York: Academic Press.

Cooper, Robin. 1983. *Quantification and Syntactic Theory*. Dordrecht: Reidel.

Cooper, William E., and John Robert Ross. 1975. World Order. In *Papers from the Parasession on Functionalism*, ed. Robin E. Grossman, L. James San, and Timothy J. Vance, 63–111. Chicago: Chicago Linguistic Society.

Cruse, D.A. 1986. *Lexical Semantics*. Cambridge: Cambridge University Press.

Dalrymple, Mary, Makoto Kanazawa, Yookyung Kim, Sam Mchombo, and Stanley Peters. 1998. Reciprocal Expressions and the Concept of Reciprocity. *Linguistics and Philosophy* 159–210.

Dalrymple, Mary, Makoto Kanazawa, Sam Mchombo, and Stanley Peters. 1994. What do Reciprocals Mean? In *Proceedings of SALT 4*. University of Chicago Rochester.

Dalrymple, Mary, and Andrew Kehler. 1995. On the constraints imposed by *respectively*. *Linguistic Inquiry* 26:531–536.

Van der Does, Jaap. 1992. Applied Quantifier Logics. Doctoral Dissertation, University of Amsterdam.

Van der Does, Jaap. 1993. Sums and quantifiers. *Linguistics and Philosophy* 16:509–550.

Dotlačil, Jakub. 2012. Reciprocals Distribute over Information States. *Journal of Semantics* to appear.

Dowty, David. 1986. A note on collective predicates, distributive predicates and *all*. In *Proceedings of ESCOL 86*, 97–115.

Dowty, David. 1988. Type Raising, Functional Composition, and Non-Constitutent Conjunction. In *Categorial Grammars and Natural Language Structures,*, ed. Richard Oehrle, Emmon Bach, and Deirdre Wheeler, 153–198. Dordrecht: Reidel.

Dowty, David, and B. Brodie. 1984. A semantic account of floated quantifiers in a transformationless grammar. In *Proceedings of WCCFL 3*, ed. Cobler, MacKaye, and Wescot, 97–115. Stanford, CA: Stanford University.

Dowty, David, and Pauline Jacobson. 1989. Agreement as a semantic phenomenon. In *Proceedings of the Fifth ESCOL*, ed. Joyce Powers and Kenneth de Jong, 95–108. Ohio State University.

Eckardt, Regine. 2007. Licensing *or*. In *Presuppositions and Implicatures in Compositional Semantics*, ed. Uli Sauerland and Penka Stateva, 34–67. Palgrave-Macmillan.

van Eijck, Jan. 1983. Discourse representation theory and plurality. In *Studies in Modeltheoretic Semantics*, ed. Alice G. B. ter Meulen, 85–106. Foris.

Elbourne, Paul. 2005. *Situations and individuals*. Cambridge, Mass.: MIT Press.

Fiengo, Robert, and Howard Lasnik. 1973. The Logical Structure of Reciprocal Sentences in English. *Foundations of Language* 447–468.

Fiengo, Robert, and Robert May. 1994. *Indices and identity*. Cambridge, Massachusetts: MIT Press.

von Fintel, Kai. 1993. Exceptive constructions. *Natural Language Semantics* 1:123–148.

Fintel, Kai von. 2004. Would you believe it? The king of France is back! Presuppositions and truth-value intuitions. In *Descriptions and beyond*, ed. Marga Reimer and Anne Bezuidenhout, 315–341. Oxford: Oxford University Press.

Fitzgibbons, Natalia, Yael Sharvit, and Jon Gajewski. to appear. Plural Superlatives and Distributivity. In *Proceedings of SALT XVIII*.

Fodor, Janet Dean. 1970. The linguistic description of opaque contexts. Doctoral Dissertation, MIT, Cambridge, Mass.

Fox, Danny. 2006. Free choice disjunction and the Theory of scalar implicatures. Ms. MIT.

Gajewski, Jon. 2005. Neg-Raising: Polarity and Presupposition. Doctoral Dissertation, MIT, Cambridge, Mass.

Gawron, Jean Mark, and Andrew Kehler. 2002. The Semantics of the Adjective 'respective'. In *Proceedings of WCCFL 21*, 85–98. Santa Cruz, CA: UCSC.

Gawron, Jean Mark, and Andrew Kehler. 2004. The semantics of respective readings, conjunction, and filler-gap dependencies. *Linguistics and Philosophy* 27:169–207.

Gazdar, Gerald. 1980. A cross-categorial semantics for coordination. *Linguistics and Philosophy* 3:407–409.

Geurts, Bart. 2005. Entertaining Alternatives: Disjunctions as Modals. *Natural Language Semantics* 13:383–410.

Gillon, Brendan. 1987. The readings of plural noun phrases in English. *Linguistics and Philosophy* 10:199–219.

Goodall, Grant. 1987. *Parallel structures in syntax*. Cambridge: Cambridge University Press.

Grice, H. P. 1975. Logic and conversation. In *Synax and Semantics*, ed. P. Cole and J. Morgan, 41–58. New York: Academic Press.

Groenendijk, Jeroen. 2009. Inquistive semantics: Two possibilities for disjunction. In *Seventh International Tbilisi Symposion on Language, Logic and Computation*, ed. P. Bosch, D. Gabelaia, and J. Lang. Springer.

Groenendijk, Jeroen, and Martin Stokhof. 1984a. On the Semantics of Questions and the Pragmatics of Answers. In *Varieties of Formal Semantics*, ed. Fred Landman and Frank Veltman, 143–170. Dordrecht: Foris, 1984.

Groenendijk, Jeroen, and Martin Stokhof. 1984b. Studies on the Semantics of Questions and the Pragmatics of Answers. Doctoral Dissertation, University of Amsterdam, Amsterdam.

Groenendijk, Jeroen, and Martin Stokhof. 1989. Type-shifting rules and the semantics of interrogatives. In *Properties, types and meanings. Vol. 2: Semantic issues*, ed. Gennaro Chierchia, Barbara Hall Partee, and Raymond Turner, 21–68. Dordrecht: Kluwer Academic Publishers.

Groenendijk, Jeroen, and Martin Stokhof. 1997. Questions. In *Handbook of logic and language*, ed. Johan van Benthem and Alice G. B. ter Meulen, 1055–1124. Elsevier.

Grosz, Patrick. 2009. Movement and Agreement in Right-Node Raising Constructions. Ms.MIT.

Hackl, Martin. 2000. Comparative Quantifiers. Doctoral Dissertation, Massachusetts Institute of Technology.

Hackl, Martin. 2002. The ingredients of essentially plural predicates. In *Proceedings of North East Linguistic Society 32*, ed. Masako Hirotani, volume 1, 171–182.

Hackl, Martin. 2009. On the grammar and processing of proportional quantifiers: *most* versus *more than half. Natural Language Semantics* 63–98.

Haiden, Martin. 2005. *Theta Theory*, volume 73 of *Studies in Generative Grammar*. Berlin/New York: Mouton de Gruyter.

Haïk, Isabelle. 1987. Bound VPs that need to be. *Linguistics and Philosophy* 10:503–530.

Hamblin, Charles. 1973. Questions in Montague grammar. *Foundations of Language* 10:41–53.

Hankamer, Jorge. 1978. On the nontransformational derivation of some null VP anaphors. *Linguistic Inquiry* 9:66–74.

Hankamer, Jorge, and Ivan Sag. 1976. Deep and surface anaphora. *Linguistic Inquiry* 7:391–428.

Hartmann, Katharina. 2000. *Right Node Raising and Gapping: Interfaces Conditions on Prosodic Deletion*. Philadelphia, Pennsylvania: John Benjamins.

Hartmann, Katharina. to appear. Coordination. In *Syntax II. An International Handbook of Syntactic Research.*, ed. Artemis Alexiadou, Tibor Kiss, and Miriam Butt. Berlin: de Gruyter.

Haspelmath, Martin. 2006. Against markedness (and what to replace it with). *Journal of Linguistics* 42:25–70.

Haspelmath, Martin. 2007. Coordination. In *Language Typology and Syntactic Description*, ed. Timothy Shopen, volume 2: Compex Constructions, 1–51. Cambridge: Cambridge University Press, 2 edition.

Heim, Irene. 1982. The Semantics of Definite and Indefinite Noun Phrases. Doctoral Dissertation, University of Massachusetts, Amherst.

Heim, Irene. 1994. Lecture notes for Advanced Semantics. Ms.

Heim, Irene. 2008. Features on bound pronouns. In *Phi-Theory. Phi-features across Modules and Interfaces*, ed. Daniel Harbour, David Adger, and Susana Béjar, 35–56. Oxford: Oxford University Press.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden, MA: Blackwell.

Heim, Irene, Howard Lasnik, and Robert May. 1991a. On “reciprocal scope". *Linguistic Inquiry* 22:172–192.

Heim, Irene, Howard Lasnik, and Robert May. 1991b. Reciprocity and plurality. *Linguistic Inquiry* 22:63–102.

Hendriks, Herman, and Paul Dekker. 1996. Links without Locations. In *Proceedings of the Tenth Amsterdam Colloquium*, ed. Paul Dekker and Martin Stokhof, 339–358. University of Amsterdam.

Heusinger, Klaus von. 1997. *Salienz und Referenz. Der Epsilonoperator in der Semantik der Nominalphrase und anaphorischer Pronomen. âĽĹ. Berlin: Akademie Verlag.*. Studia grammatica 43. Berlin: Akademie Verlag.

Heycock, Caroline, and Anthony Kroch. 1999. Pseudocleft connectedness: Implications for the LF interface level. *Linguistic Inquiry* 30:365–397.

Heycock, Caroline, and Roberto Zamparelli. 2005. Friends and colleagues: Plurality, coordination, and the structure of DP. *Natural Language Semantics* 13:201–270.

Higgins, F. R. 1972. The Pseudocleft construction in English. Doctoral Dissertation, Massachusetts Institute of Technology.

Hintikka, Jaakko. 1969. Semantics for Propositional Attitueds. In *Philosophical Logic*, ed. D.J. Hockney and W.K. Wilson, 21–45. Reidel.

Hoeksema, Jack. 1983. Plurality and conjunction. In *Studies in Modeltheoretic Semantics*, ed. Alice G. B. ter Meulen, 63–83. Foris.

Hoeksema, Jack. 1987. The semantics of non-boolean AND. *Journal of Semantics* 19–40.

Horn, Larry. 1984. Towards a New Taxonomy for Pragmatic Inferences: Q-based vs. R-based Implicatures. In *Georgetown Roundtable on Languages and Linguistics*.

Horn, Lawrence. 1972. On the Semantic Properties of Logical Operators in English. Doctoral Dissertation, UCLA.

Huybregts, Riny, and Henk van Riemsdijk. 1985. Parasitic gaps and ATB. In *NELS XV conference*, ed. Stephen Berman, Jae W. Choe, and Joyce M. McDonough, 168–187. G.L.S.A. Department of Linguistics South College University of Massachusetts.

Jackendoff, Ray. 1977. *X′ Syntax*. Cambridge, Massachusetts: MIT Press.

Johannessen, Janne Bondi. 1998. *Coordination*. Oxford: Oxford University Press.

Johnson, Kyle. 1996. In search of the English middle field. Ms. University of Massachusetts at Amherst.

Johnson, Kyle. 2002. Restoring exotic coordinations to normalcy. *Linguistic Inquiry* 33:97–156.

Kamp, Hans. 1975. Two theories about adjectives. In *Formal Semantics of Natural Language*, ed. Edward L. Keenan, 123–155. Cambridge: Cambridge University Press.

Kamp, Hans, and Uwe Reyle. 1993. *From Discourse to Logic*. Dordrecht: Kluwer Academic Publishers.

Kaplan, David. 1975. How to Russell a Frege-Church. *Journal of Philosophy* 72.

Karttunen, L. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1:3–44.

Katzir, Roni, and Raj Singh. 2009. A note on the absence of XOR in natural language. In *Presuppositions and Implicatures: Proceedings of the MIT-Paris Workshop*, ed. Paul Égré and Giorgio Magri. Cambridge, Mass.: MITPWL.

Kayne, Richard S. 1994. *The Antisymmetry of Syntax*. Cambridge, Massachusetts: M.I.T. Press.

Keenan, E. L., and L. M. Faltz. 1984. *Boolean Semantics for Natural Language*. Dordrecht: Reidel Publishing Company.

Keenan, E. L., and Jonathan Stavi. 1986. A semantic characterization of natural language determiners. *Linguistics and Philosophy* 9:253–326.

Klinedinst, Nathan W. 2007a. Plurality and Possibiluty. Doctoral Dissertation, UCLA.

Klinedinst, Nathan W. 2007b. Plurals, possibilities and conjunctive disjunction. *UCL Working Papers in Linguistics* 261–284.

Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1–45.

Kratzer, Angelika. 1981. The notional category of modality. In *Words, Worlds and Contexts: New Approaches in Word Semantics*, 39–76. Berlin: de Gruyter.

Kratzer, Angelika. 1991. Conditionals. In *Semantics: An international handbook of contemporary research*, ed. Arnim von Stechow and Dieter Wunderlich, 651–656. Berlin: De Gruyter.

Kratzer, Angelika. 2000. The event argument and the semantics of verbs. Ms., University of Massachusetts at Amherst.

Krifka, Manfred. 1986. Nominalreferenz und Zeitkonstitution: Zur Semantik von Massentermen, Pluraltermen und Aspektklassen. Doctoral Dissertation, University of Munich, Munich.

Krifka, Manfred. 1990. Boolean and non-boolean 'and'. In *Papers from the Second Symposium on Logic and Language*, ed. László Kálmán and László Pólos, 161–188. Budapest: Akadémiai Kiadó.

Krifka, Manfred. 1992. Thematic Relations as Links between Nominal Reference and Temporal Constitution. In *Lexical Matters*, ed. Ivan A. Sag and Anna Szabolcsi, 29–53. Chicago: CSLI.

Krifka, Manfred. 1996. Pragmatic strengthening in plural predications and Donkey sentences. In *Proceedings of SALT VI*, ed. Teresa Galloway and Justin Spence, 136–153. Ithaca, NY: CLC Publications.

Krifka, Manfred. 1998. The origins of telicity. In *Events and Grammar*, ed. Susan Rothstein, 197–236. Dordrecht: Kluwer Academic Publishers.

Krifka, Manfred. 1999. At least some determiners aren't determiners. In *The semantics/pragmatics interface from different points of view*, ed. Ken Turner, 257–291. Elsevier.

Krifka, Manfred. 2002. Be brief and vague! and how bidirectional optimality theory allows for Verbosity and Precision. In *Sounds and Systems. Studies in Structure and Change. A Festschrift for Theo Vennemann*, ed. David Restle and Dietmar Zaefferer, 439–458. Mouton de Gruyter.

Krifka, Manfred. 2007. Approximate interpretation of number words: A case for strategic communication. In *Cognitive foundations of interpretation*, ed. Gerlof Bouma, Irene Krämer, and Joost Zwarts, 111–126. Amsterdam: Koninklijke Nederlandse Akademie van Wetenschapen.

Križ, Manuel, and Viola Schmitt. 2012a. Imprecision. Ms. University of Vienna, University of Frankfurt.

Križ, Manuel, and Viola Schmitt. 2012b. Plural propositions and the anaphoricity of 'no'. Ms. University of Vienna and University of Frankfurt.

Ladusaw, William A. 1979. Polarity Sensitivity as Inherent Scope Relations. Doctoral Dissertation, University of Massachusetts, Amherst, Amherst, MA.

Lahiri, Utpal. 2000. Lexical selection and quantificational variability in embedded interrogatives. *Linguistics and Philosophy* 325–389.

Lahiri, Utpal. 2002. *Questions and Answers in Embedded Contexts*. Oxford: Oxford University Press.

Lakoff, George, and Stanley Peters. 1966. Phrasal conjunction and symmetric predicates. *NSF-17* .

van Lambalgen, Michiel, and Keith Stenning. 2008. *Human Reasoning and Cognitive Science*. MIT Press.

Landman, Fred. 1989a. Groups I. *Linguistics and Philosophy* 12:559–605.

Landman, Fred. 1989b. Groups II. *Linguistics and Philosophy* 12:723–744.

Landman, Fred. 1996. Plurality. In *The Handbook of Contemporary Semantic Theorie*, ed. S. Lappin. Cambridge: Blackwell.

Landman, Fred. 2000. *Events and Plurality*. Dordrecht: Kluwer Academic Publishers.

Landman, Fred. 2004. *Indefinites and the type of sets*. Blackwell Publishers.

Langendoen, D. Terence. 1978. The logic of reciprocity. *Linguistic Inquiry* 9:177–197.

Larson, Richard K. 1985. On the syntax of disjunction scope. *Natural Language and Linguistic Theory* 3:217–264.

Lasersohn, Peter. 1990. Group Action and Spatio-Temporal Proximity. *Linguistics and Philosophy* 2:179–206.

Lasersohn, Peter. 1992. Generalized conjunction and temporal modification. *Linguistics and Philosophy* 15:381–410.

Lasersohn, Peter. 1995. *Plurality, Conjunction and Events*. Boston: Kluwer Academic Publishers.

Lasersohn, Peter. 1999. Pragmatic halos. *Language* 3:522–551.

Lassiter, Daniel. 2011. Measurement and Modality: The Scalar Basis of Modal Semantics. Doctoral Dissertation, New York University.

Lauer, Sven. 2011. On the pragmatics of pragmatic slack. Handout SuB 16.

Lepage, Francois. 1992. Partial Functions in Type Theory. *Notre Dame Journal of Formal Logic* 4:493–516.

Leslie, Sarah-Jane. 2007. Generics and the Structure of the Mind. *Philosophical Perspectives* 375–402.

Levinson, Stephen. 1983. *Pragmatics*. Cambridge: Cambridge University Press.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In *Meaning, Use and Interpretation of Language*, ed. R. Baeuerle, C. Schwarze, and Arnim von Stechow, 302–323. DeGruyter.

Link, Godehard. 1984. Hydras. on the logic of relative clause constructions with multiple heads. In *Varieties of Formal Semantics*, ed. Fred Landman and Frank Veltman, 245–257. Dordrecht: Foris.

Link, Godehard. 1987. Generalized Quantifiers and Plurals. In *Generalized Quantifiers:Lingustic and Logical Approaches*, ed. P. Gärdenfors, 151–180. Dordrecht: Reidel.

Link, Godehard. 1991. Plural. In *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, ed. Arnim von Stechow and Dieter Wunderlich. Berlin/New York: de Gruyter.

Löbner, Sebastian. 1987. The Conceptual Nature of Natural Language Quantification. In *Proceedings of the '87 Debrecen Symposion on Logic and Language*, ed. I. Rusza and Anna Szabolcsi. Budapest: Akadémiai Kiadó.

Löbner, Sebastian. 2000. Polariry in Natural Language: Predication, Quantification and Negation in Particular and Characterizing Sentences. *Linguistics and Philosophy* 213–308.

Longobardi, Giuseppe. 1994. Reference and proper names. *Linguistic Inquiry* 25:609–666.

Malamud, Sophia A. 2006. (non)-maximality and distributivity: a Decision Theory approach. In *Proceedings of SALT 16*, 120–137. Tokyo: CLC Publications.

Malamud, Sophia A. 2012. The meaning of plural definites: A decision-theoretic approach. *Semantics and Pragmatics* 5:1–58.

Mauri, Caterina. 2008. The irreality of alternatives. Towards a typology of disjunction. *Studiens in Language* 32:22–55.

Mayr, Clemens, and Viola Schmitt. 2010. Order and the coordinate structure constraint. Submitted. Harvard University and University of Frankfurt.

McCawley, James D. 1988. *The syntactic phenomena of English*. Chicago: University of Chicago.

McKinney-Bock, Katy, and Jean-Roger Vergnaud. 2010. Grafts and Beyond. Handout, GLOW 33.

McNally, Louise. 1993. Comitative coordination: A case study in group formation. *Natural Language and Linguistic Theory* 11:347–379.

Meier, Cécile. 2009. A Comparative Semantics for Resemblance. In *Proceedings of the 10th Symposion on Logic and Language*, ed. László Kálmán, 141–148.

Merin, Arthur. 1992. Permission Sentences Stand in the Way of Boolean and Other Lattice-Theoretic Semantics. *Journal of Semantics* 9:95–162.

Merin, Arthur. 1999. Information, relevance and social decisionmaking:Some principles and results of decision-theoretic semantics. In *Logic, language and computation*, ed. Lawrence S. Moss, Jonathan Ginzburg, and Maarten de Rijke, 179–221. CSLI.

Merin, Arthur. 2006. Multilinear Semantics for Double-Jointed Coordinate Constructions. [http://semanticsarchive.net/Archive/jdjODVmY/mlstct.pdf].

Meyer, Marie-Christine, and Uli Sauerland. 2009. A pragmatic constraint on ambiguity detection: A rejoinder to Büring and Hartmann and to Reis. *Natural Language and Linguistic Theory* 27:139–150.

Moltmann, Friederike. 1992. Coordination and comparatives. Doctoral Dissertation, MIT.

Moltmann, Friederike. 1994. Attitude Reports, Events and Partial Models. Ms.

Montague, Richard. 1970a. English as a formal language. In *Linguaggi nella Società e nella Technica*, ed. Bruno Visentini, 188–221. Milan: Edizioni die Comunità.Reprinted in Montague (1974), *Selected Papers of Richard Montague*, R.Thomason (ed.).

Montague, Richard. 1970b. Universal Grammar. *Theoria* 373–398.

Montague, Richard. 1973. The Proper Treatment of Quantification in Ordinary English. In *Approaches to Natural Language*, ed. Jaakko Hintikka, J. Moravczik, and P. Suppes. Dordrecht: Reidel. Reprinted in Montague (1974), *Selected Papers of Richard Montague*, R.Thomason (ed.).

Moro, Andrea. 1997. *The raising of predicates : predicative noun phrases and the theory of clause structure*. Cambridge ; New York ;: Cambridge University Press.

Munn, Alan Boag. 1993. Topics in the syntax and semantics of coordinate structures. Doctoral Dissertation, The University of Maryland.

Neijt, Anneke. 1979. *Gapping: a contribution to sentence grammar*. Dordrecht, The Netherlands: Foris Publications.

Partee, Barbara. 1986. Noun phrase interpretation and type-shifting principles. In *Studies in discourse representation theory and the theory of generalized quantifiers*, ed. J. Groenendijk. Foris.

Partee, Barbara. in press. Privative adjectives: subsective plus coercion. In *Presuppositions and Discouse*, ed. Rainer Bäuerle, Uwe Reyle, and Thomas Ede Zimmermann. Elsevier North-Holland, Inc.

Partee, Barbara Hall. 1989. Many Quantifiers. In *Proceedings of Fifth ESCOL*, ed. Joyce Powers and Kenneth de Jong, 383–402.

Partee, Barbara Hall, and Mats Rooth. 1983. Generalized conjunction and type ambiguity. In *Meaning, Use and Interpretation of Language*, ed. R. Bäuerle, C. Schwarze, and Arnim von Stechow, 362–383. de Gruyter.

Payne, John. 1985. Complex phrases and complex sentences. In *Language Typology and Syntactic Description*, ed. Timothy Shopen, volume 2. Cambridge: Cambridge University Press.

Penka, Doris. 2011. *Negative Indefinites*. Oxford: Oxford University Press.

Percus, Orin. 2000. Constraints on some other variables in syntax. *Natural Language Semantics* 8:173–229.

Perlmutter, David, and John Robert Ross. 1970. Relative clauses with split antecedent. *Linguistic Inquiry* 1:350.

Portner, Paul. 2009. *Modality*. Oxford University Press.

Postal, Paul M. 1998. *Three Investigations of Extraction*. Cambridge: The MIT Press.

Prinzhorn, Martin, and Jean-Roger Vergnaud. 2010. Defining Constituent Structure. Ms. University of Southern California and University of Vienna.

Quine, W.v.O. 1960. *Word and Object*. Cambridge, Mass.: MIT Press.

Quine, W.v.O. 1980. *Set Theory and Its Logic*. Cambridge, Massachusetts.: Harvard University Press, (Revised Edition) edition.

Reinhart, Tanya. 1983. Coreference and bound anaphora: A restatement of the anaphora questions. *Linguistics and Philosophy* 6:47–88.

Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and Philosophy* 20:335–397.

Reinhart, Tanya. 2006. *Interface Strategies. Optimal and Costly Derivations*. Cambridge, Mass.: MIT Press.

Richards, Norvin W., III. 1997. What moves where when in which language? Doctoral Dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Riemsdijk, Henk van. 1989. Movement and regeneration. In *Dialect Variation and the Theory of Grammar*, ed. Paola Benincà. Dordrecht: Foris.

Roberts, Craige. 1996. Information structure: Towards an intergrated formal theory of pragmatics. In *OSU Working Papers in Linguistics 49:Papers in Semantics*, ed. Jae-Hak Yoon and Andreas Kathol, 91–136. Ohio State University.

Roelofsen, Floris, and Maria Aloni. 2008. Perspectives on Concealed Questions. In *Proceedings of SALT 18*.

Rooij, Robert van. 2003. Questioning to resolve decision problems. *Linguistics and Philosophy* 29:727–763.

Ross, John. 1967. Constraints on variables in syntax. Doctoral Dissertation, Massachusetts Institute of Technology.

Ross, John Robert. 1970. Gapping and the order of constituents. In *Progress in Linguistics*, ed. Manfred Bierwisch and Karl E. Heidolph, 249–259. The Hague: Mouton.

Rothstein, Susan. 2010. Counting and the Mass/Count Distinction. *Journal of Semantics* 343–397.

Ruys, E. G. 1992. The scope of indefinites. Doctoral Dissertation, LEd, Utrecht.

Sabbagh, Joseph. 2007. Ordering and linearizing rightward movement. *Natural Language and Linguistic Theory* 25:349–401.

Safir, Ken. 1999. Vehicle change and reconstruction in A′-chains. *Linguistic Inquiry* 30:587–620.

Sassoon, Galit Weidman. 2010. Measurement theory in linguistics. *Synthese* 174:151–180.

Sauerland, Uli. 1998. The meaning of chains. Doctoral Dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Sauerland, Uli. 2003. A new semantics for number. In *Proceedings of SALT 13*, 258–275. Cornell University, Ithaca, NY: CLC Publications.

Sauerland, Uli. 2004. Scalar implicatures in complex sentences. *Linguistics and Philosophy* 367–391.

Scha, Remko. 1981. Distributive, collective and cumulative quantification. In *Formal Methods in the Study of Language*, ed. J. Groenendijk, T. Janssen, and M. Stokhof, volume 2, 483–512. Amsterdam: Mathematisch Centrum.

Schein, Barry. 1986. Event logic and the interpretation of plurals. Doctoral Dissertation, MIT.

Schein, Barry. 1993. *Plurals and events*. Cambridge, Massachusetts: MIT Press.

Schlenker, Philippe. 2004. Conditionals as definite descriptions (a referential analysis). *Research on Language and Computation* 417–462.

Schmitt, Viola. 2012. Two theories of collectivity. Ms.

Schwarzschild, Roger. 1994. Plurals, presuppositions and the sources of distributivity. *Natural Language Semantics* 2:201–248.

Schwarzschild, Roger. 1996. *Pluralities*. Dordrecht ; Boston: Kluwer Academic.

Schwarzschild, Roger. 2002. The grammar of measurement. In *Proceedings of SALT XII*, ed. Brendan Jackson, 225–245. Cornell University, Ithaca, NY: CLC Publications.

Schwarzschild, Roger. 2005. Measure Phrases as Modifiers of Adjectives. *Recherches Linguistiques de Vincennes* 207–228.

Schwarzschild, Roger. 2006. The role of dimensions in the syntax of noun phrases. *Syntax* 9:67–110.

Sher, Gila. 1990. Ways of Branching Quantifiers. *Linguistics and Philosophy* 393–422.

Simons, Mandy. 2005. Dividing things up: The semantics of *or* and the modal/*or* interaction. *Natural Language Semantics* 13:271–316.

Solt, Stephanie. 2007. Few and Fewer. *Snippets* .

Solt, Stephanie. 2009. The semantics of adjectives of quantity. Doctoral Dissertation, CUNY.

Solt, Stephanie. 2011a. Attributive Quantity Words as Nonrestrictive Modifiers. In *Proceedings of NELS 39*.

Solt, Stephanie. 2011b. How many Mosts? In *Proceedings of SuB 15*, 565–579.

von Stechow, Arnim. 1974. e–t kontextfreie Sprachen: Ein Beitrag zu einer natürlichen formalen semantik. *Linguistische Berichte* 34:1–33.

Sternefeld, Wolfgang. 1998. Reciprocity and cumulative predication. *Natural Language Semantics* 6:303–337.

Stockwell, Robert P., Paul Schachter, and Barbara Hall Partee. 1973. *The Major Syntactic Structures of English*. New York: Holt, Rinehart and Winston, Inc.

Swart, Henriëtte de. 2001. Scope ambiguities with neative quantifiers. In *Reference and anaphoric relations*, ed. Urs Egli, 109–132. Kluwer Academic Publishers.

Szabolcsi, Anna. 1984. The possessor that ran away from home. *The Linguistic Review* 3:89–102.

Szabolcsi, Anna. 1997. *Ways of scope taking*. Dordrecht ; Boston ; London: Kluwer Academic Publishers.

Szabolcsi, Anna, and Bill Haddican. 2004. Conjunction meets Negation: A Study in Cross-linguistic Variation. *Journal of Semantics* 219–249.

Taub, Alison. 1989. Collective predicates, Aktionsarten and *all*. In *Papers on Quantification*, ed. Emmon Bach, Angelika Kratzer, and Barbara Hall Partee. University of Massachusetts at Amherst.

de Vos, Mark A. 2005. The syntax of verbal pseudo-coordination in English and Afrikaans. Doctoral Dissertation, University of Leiden.

Wagner, Michael. 2005. Prosody and Recursion. Doctoral Dissertation, MIT.

Wagner, Michael. 2010. Prosody and recursion in coordinate structures and beyond. *Natural Language and Linguistic Theory* 28:183–237.

Westerstahl, D. 1985. Logical constants in quantifier languages. *Linguistics and Philosophy* 387–413.

Westerstahl, D. 1987. Branching Generalized Quantifiers and Natural Language. In *Generalized Quantifiers:Lingustic and Logical Approaches*, ed. Peter Gärdenfors, 269–298. Dordrecht: Reidel.

Wilder, Chris. 1999. Right-node-raising and the LCA. In *Proceedings of WCCFL 18*, ed. Sonya Bird, Andrew Carnie, Jason D. Haugen, and Peter Norquest.

Williams, Edwin. 1974. Rule Ordering in Syntax. Doctoral Dissertation, Massachusetts Institute of Technology.

Williams, Edwin. 1978. Across-the-board rule application. *Linguistic Inquiry* 9:31–43.

Williams, Edwin. 2003. *Representation Theory*. Cambridge, Massachusetts: MIT Press.

Winter, Yoad. 1995. Syncategorematic conjunction and structured meanings. In *Proceedings of SALT 5*. CLC Publications, Cornell University, Ithaca, NY.

Winter, Yoad. 1996. A unified semantic treatment of singular NP coordination. *Linguistics and Philosophy* 19:337–392.

Winter, Yoad. 1998. On Some Scopal Asymmetries of Coordination. In *KNAW conference on Interface Strategies*.

Winter, Yoad. 2000. Distributivity and dependency. *Natural Language Semantics* 8:27–69.

Winter, Yoad. 2001a. *Flexibility Principles in Boolean Semantics*. Cambridge, Massachusetts: MIT Press.

Winter, Yoad. 2001b. Plural Predication and the Strongest Meaning Hypothesis. *Journal of Semantics* 333–365.

Winter, Yoad. 2007. Multiple coordination:meaning composition vs. the syntax-semantics interface. Ms.

Wurmbrand, Susi. 2001. *Infinitives: Restructuring and clause structure*. Mouton de Gruyter.

Yatabe, Shuichi. 2003. A Linearization-Based Theory of Summative Agreement in Peripheral-Node Raising Constructions. In *Proceedings of the 9th International Conference on HPSG*. Stanford, CA: CSLI.

Yoon, Y. 1996. Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics* 217–236.

Zanuttini, Rafaella. 1991. Syntactic Properties of Sentential Negation: A Comparative Study of Romance Languages. Doctoral Dissertation, University of Pennsylvania.

Zimmermann, Thomas Ede. 1993. On the proper treatment of opacity in certain verbs. *Natural Language Semantics* 1:149–179.

Zimmermann, Thomas Ede. 2000. Free choice disjunction and epistemic possibility. *Natural Language Semantics* 8:255–290.

Zimmermann, Thomas Ede. 2006. Monotonicity in opaque verbs. *Linguistics and Philosophy* 29:715–761.

Zimmermann, Thomas Ede. 2011. Model-theoretic Semantics. In *Handbook of Semantics*. de Gruyter.

Zobel, Sarah. 2010. Deutsche als-Phrasen und englische as-Phrasen im Vergleich. Handout for a talk given at the University of Frankfurt.

Zoerner, Cyril Edward, III. 1995. Coordination: The Syntax of &P. Doctoral Dissertation, University of California-Irvine, Irvine.

# 7 Abstract (Deutsch)

Die Hauptthese dieser Dissertation ist, dass *und* –Koordinationen sowohl im Englischen als auch im Deutschen in die gleiche semantische und syntaktische Klasse fallen wie morphologisch pluralische DPn wie beispielsweise *die Katzen*.

Diese These basiert auf der Beobachtung, dass die Wahrheitsbedingungen von Sätzen, die *und* –Koordinationen enthalten, in vielen Fällen nicht jene sind, die die klassische Analyse von *und*, nach der *und* dem Konnektiv $\wedge$ aus der (klassischen) Aussagenlogik entspricht, vorhersagen würde. Vielmehr verhalten sich *und* – Koordinationen wie Plurale. Dies gilt in syntaktischer Hinsicht, da sie den gleichen syntaktischen Regeln unterliegen, die wir auch in Sätzen beobachten können, die morphologisch pluralische DPn enthalten. Dies gilt aber auch in semantischer Hinsicht. Zum einen können wir beobachten, dass Sätze, die mehr als einen pluralischen Ausdruck enthalten – wobei ein pluralischer Ausdruck eine morphologisch pluralische DP oder eben eine *und* – Koordination jedweder Kategorie sein kann – sehr spezifische Wahrheitsbedingungen aufweisen, die ich hier einfach als *schwach* bezeichne. Zum anderen finden wie Homogenitätseffekte bei Sätzen, die morphologisch pluralische DPn beinhalten, aber eben auch bei Sätzen die *und* – Koordinationen jedweder Kategorie enthalten.

Ich interpretiere diese Datenlage so direkt als mögliche und behaupte, dass morphologisch pluralische DPn und *und* – Koordinationen die gleiche Art von Ausdruck sind – ein pluralischer Ausdruck, und die gleiche Art von Objekt denotieren, nämlich eine Pluralität. Ich entwickle einen Ansatz, in dem Pluralisierung – sowohl in ihren morpho-syntaktischen als auch in ihren semantischen Aspekten – über alle syntaktischen Kategorien und semantischen Domänen generalisiert wird. Pluralische Ausdrücke stellen hier einen speziellen Teil der Sprache dar, der sowohl syntaktisch (über spezifische Regeln der Pluralsyntax) als auch semantisch (über die Bereiche der Denotate) vom singularischen Teil der Sprache abgegrenzt ist.

# 8 Abstract (English)

This thesis argues that *and* – coordinations in English and German fall into the same syntactic and semantic class as morphologically plural DPs such as *the cats*.

This claim is based on the observation that sentences containing *and* – coordinations, in a number of cases, do not have the truth-conditions that would be predicted by the traditional analysis of *and*, which assumes that *and* corresponds to the connective $\wedge$ from (classical) propositional logic or a function recursively derived from it. Rather *and*–coordinations behave like plurals. They do so syntactically, as they are subjected to the same syntactic rules that apply in the case of sentences containing morphologically plural DPs. They do so semantically as well: First, if a sentence contains more than one plural expression – where a plural expression can either correspond to a morphologically plural DP or an *and* – coordination of any category – that sentence very specific truth-conditions, which I here refer to as *weak* truth-conditions. Second, sentences containing plural expressions – again, a plural expression may either correspond to a morphologically plural DP or to an *and* – coordination of any category display homogeneity effects.

I take the data at face value and argue that both morphologically plural DPs and *and*–coordinations are plural expressions and that all plural expressions denote the same *kind* of object. More precisely, I develop a view where pluralization – understood as both a morpho-syntactic as well as a semantic process – is completely general and persists across all syntactic and semantic domains. I argue that all plural expressions, including morphologically plural DPs as well as all *and*-coordinations, form a discrete part of the language, so to speak, subject to its own set of syntactic rules and, crucially, involving a particular set of semantic rules.

# 9 Lebenslauf

Born 20.06.1978 in Frankfurt/Main (Germany), Citizenship: German

Private address

Wollzeile 23/23 A-1010 Wien (Vienna)
0043-1-7186734
vs.violaschmitt@gmail.com

Educational history

1988 –1997 Ricarda-Huch-Gymnasium, Dreieich (Germany),

1994 Immaculate-Heart-Central High School, Watertown, NY (US)

2006 MA in general linguistics, Department of linguistics, University of Vienna. Title of MA-thesis: *Hessian headed relative clauses and the syntactic role of the relative pronoun.* Supervisor: Henk van Riemsdijk (Tilburg University)

2007–2013 PhD student, University of Vienna.

2007 Visiting student at MIT, Cambridge, MA, KWA-grant of the University of Vienna

Teaching and work experience

2008 Lecturer in linguistics, University of California at Los Angeles (UCLA). Course taught: *Linguistics 127: Syntactic Typology and Universals.*

July 2009 – February 2010 Research associate (full position), Department of linguistics, Goethe-Universität Frankfurt am Main. Research project *Grammatical modification*, head of research Thomas Ede Zimmermann.

March 2010 – October 2013 Research associate (full position), Department of linguistics, Johann Wolfgang Goethe-University Frankfurt am Main. DFG- project GR 559/8, *The linearization of syntactic structures in a hierarchical model of syntax*, head of research Günther Grewendorf

Talks and conference presentations

The middle construction in German (with Katharina Schroll and Micha Wille). 30. Österreichische Linguistiktagung (ÖLT 30) (30th Austria Linguistics Colloquium), 6.- 8. 12. 2002, Universität Innsbruck.

Epistemic modals and Theory of Mind: A criticism of Papafragou 1998 (with Martin Prinzhorn). ÖLT 31, 8.12. 2003, Universität Wien.

Hessian relative clauses. ÖLT 32, 12.-14. 11. 2004, Universität Salzburg.

Hessian relative clauses. Generative Grammatik des Südens (GGS) 31 (Generative Grammar of the South), 6.-8. 3. 2005, Eberhard-Karls-Universität Tübingen.

Relative pronouns and left dislocation. ÖLT 32, 8.-10. 12. 2006, Universität Klagenfurt.

Some instances of 2:1 correspondences in German syntax. February 2007, UCLA. Invited talk.

On relative pronouns. Jahrestagung der Deutschen Gesellschaft for Sprachwissenschaft (DGfS) 29, Workshop on Microvariation, 28.2. 2007, Universität Siegen.

Asymmetric coordination and the CSC (with Clemens Mayr). Workshop on movement and its relations to the interfaces, 7.5. 2007, Harvard University.

Extraction and parallelism (with Clemens Mayr). Ling-lunch, October 2007, MIT.

Extraction from coordinate structures (with Clemens Mayr). 31st GLOW colloquium, 26.-28. 3. 2008, Newcastle University.

Extraction from coordinate structures (with Clemens Mayr). Syntax and Semantics seminar, May 2008, UCLA.

Extraction from coordinate structures and inaccessible domains (with Clemens Mayr). WC-CFL 27, 16.-18. 5. 2008, UCLA.

Multidominance Induced Islands (with Clemens Mayr). BCGL 3, 21.- 23. 5. 2008, Brussels.

Across-the-board AÕ-movement in relative clauses. May 2009, Goethe-Universität Frankfurt. Invited talk.

An ordering semantics for German 'aber' (with Patrick Grosz). *Sinn und Bedeutung 15*, 9.-11.9. 2010. Universität Saarbrücken.

The impact of syntactic structure on the interpretation of conjoined structures. January 2011, ZAS, Berlin. Invited talk.

Semantic slack in plural predication (with Manuel Križ) . *Workshop on Semantics*, 21.5.2012, Universität Wien.

Publications

"A note on relative pronouns in German" (with Martin Prinzhorn). 2005. In: H. Broekhuis, N. Corver, R.Huybregts, U. Kleinherz & J. Koster (eds.), *Organizing Grammar. Studies in Honor of Henk van Riemsdijk.* Berlin: Mouton de Gruyter, 505-513.

"On Extending the Application-domain of the CSC" (with Clemens Mayr). 2008. *Proceedings of WCCFL 27*. Somerville, MA: Cascadilla, 318-325.

"Discontinuous DP-coordination in German" (with Martin Prinzhorn). 2010. In: Craenenbroeck, J. & J. Rooryck (eds.), *Linguistic Variation Yearbook 2010*, Amsterdam: Benjamins, 161-200.

"Violations of the *right-edge-constraint* in *right-node-raising* "(with Katharina Hartmann). Forthcoming. *Snippets*.

Submitted, under revision

"Order and the coordinate structure constraint" (with Clemens Mayr). Submitted at *Linguistic Inquiry*. Under revision. 91 pages.
(An older version of the paper can be found on *http://ling.auf.net/lingbuzz/000857*).

"Adverbial conjunctions. Exposition of a problem" (with Manuel Križ). Submitted at *Natural Language and Linguistic Theory*. Under revision. 14 pages.

Drafts and manuscripts

"Semantic slack in plural predication" (with Manuel Križ). Ms., Universität Wien, Goethe-Universität Frankfurt. 27 pages.

"Two theories of collectivity". 2012. Ms., Goethe-Universität Frankfurt. 9 pages.

"Asymmetric coordination" (with Clemens Mayr). 2013. Commissioned for the second edition of the *Blackwell Companion to Syntax*.

Volumes edited

*Proceedings of Sinn und Bedeutung 14* (with Friedrich Neubarth, Martin Prinzhorn, Sarah Zobel), 2010. Universität Wien.

Academic services

Since 2005 member of the GLOW-board (Generative linguistics in the old world).

Reviewing for ConSole conference, CGSW, *Journal of Comparative Germanic Linguistics*, *Linguistische Berichte*.

Co-organizer of *Sinn und Bedeutung 14*, Vienna, 2009, *GLOW 34*, Vienna, 2011.