Chapter 8. Conclusion

This chapter contains a summary of the dissertation and briefly outlines two future extensions of the present work.

Summary

Handling the semantic connections established and elaborated upon in extended discourse represents a key challenge for understanding the notion of meaning involved in natural language interpretation. Devising a precise compositional interpretation procedure is particularly difficult for discourses involving complex descriptions of multiple related objects (individuals, events, times, propositions etc.), as for example, the discourses in (1), (2) and (3) below.

1. Every person who buys a^u computer and has $a^{u'}$ credit card uses it$_{u'}$ to pay for it$_u$.
2. **a.** Harvey^u courts $a^{u'}$ girl at every$^{u''}$ convention.

    b. She$_{u'}$ always$_{u''}$ comes to the banquet with him$_u$.

    (Karttunen 1976)
3. **a.** If^p a^u man is alive, he$_u$ must$_p$ find something pleasurable.

    b. Therefore, if$_p^{p'}$ he$_u$ doesn't have any spiritual pleasure, he$_u$ must$_{p'}$ have a carnal

    pleasure.

    (based on Thomas Aquinas)

The main achievement of this dissertation is the introduction of a representation language couched in classical type logic in which we can compositionally translate natural language discourses like (1), (2) and (3) above and capture their truth-conditions and the intricate anaphoric dependencies established in them.

The dissertation argues that discourse reference involves two equally important components with essentially the same interpretive dynamics, namely reference to *values*, i.e. (non-singleton) sets of objects (individuals and possible worlds), and reference to *structure*, i.e. the correlation / dependency between such sets, which is introduced and incrementally elaborated upon in discourse.

To define and investigate structured discourse reference, a new dynamic system couched in classical (many-sorted) type logic is introduced which extends Compositional DRT (Muskens 1996) with plural information states, i.e. information states are modeled as sets of variable assignments (following van den Berg 1996), which can be can be represented as matrices with assignments (sequences) as rows – as shown in the table in (4) below. A plural info state encodes both values (the columns of the matrix store sets of objects) and structure (each row of the matrix encodes a correlation / dependency between the objects stored in it).

4. Info State I	…	u	u'	p	p'	…
i_1	…	x_1 (i.e. ui_1)	y_1 (i.e. $u'i_1$)	w_1 (i.e. pi_1)	v_1 (i.e. $p'i_1$)	…
i_2	…	x_2 (i.e. ui_2)	y_2 (i.e. $u'i_2$)	w_2 (i.e. pi_2)	v_2 (i.e. $p'i_2$)	…
i_3	…	x_3 (i.e. ui_3)	y_3 (i.e. $u'i_3$)	w_3 (i.e. pi_3)	v_3 (i.e. $p'i_3$)	…
…	…	…	…	…	…	…

Values (sets of individuals or worlds): $\{x_1, x_2, x_3, …\}$, $\{w_1, w_2, w_3, …\}$ etc.

Structure (relations between individuals and / or worlds): $\{<x_1, y_1>, <x_2, y_2>, <x_3, y_3>, …\}$, $\{<x_1, y_1, w_1>, <x_2, y_2, w_2>, <x_3, y_3, w_3>, …\}$, $\{<w_1, v_1>, <w_2, v_2>, <w_3, v_3>, …\}$ etc.

In Plural Compositional DRT (PCDRT), sentences denote relations between an input and an output plural info state. Indefinites and conditional antecedents non-deterministically introduce both values and structure, i.e. they introduce structured sets of individuals and possible worlds respectively; pronouns, verbal moods and modal verbs are anaphoric to such structured sets. Quantification over individuals and over possible worlds is defined in terms of matrices instead of single assignments and the semantics of the non-quantificational part becomes rules for how to fill out a matrix.

Given the underlying type logic, compositionality at sub-clausal level follows automatically and standard techniques from Montague semantics (e.g. type shifting) become available.

PCDRT enables us to account for a variety of phenomena, including: (**i**) mixed reading (weak & strong) relative-clause donkey sentences (chapter **5**), instantiated by example (1) above, (**ii**) quantificational subordination (chapter **6**), exemplified by discourse (2), and (**iii**) the complex interactions between entailment particles (i.e.

therefore), modal anaphora and modal subordination exhibited by discourse (3) above (chapter **7**).

In more detail, example (1) is a mixed reading (weak & strong) relative-clause donkey sentence which is interpreted as follows: for any person that is a computer buyer and credit card owner, for *every* (strong) computer s/he buys, s/he uses *some* (weak) credit card of her/his to pay for the computer. In particular, note that the weak indefinite *a$^{u'}$ credit card* co-varies with, i.e. is dependent on, the strong indefinite *a^u computer* (I can buy my Dell desktop with a MasterCard and my Toshiba laptop with a Visa) despite the fact that the two indefinites are syntactically trapped in their respective VP-conjuncts. The notion of plural info state employed in PCDRT enables us to capture this kind of non-local structured anaphoric dependencies (**i**) across VP-conjuncts and (**ii**) across clauses, i.e. between the two indefinites in the restrictor of the quantification in (1) and the two pronouns in the nuclear scope.

The PCDRT account successfully generalizes to the mixed reading DP-conjunction donkey sentences in (5) and (6) below, where the same pronoun is intuitively interpreted as having two distinct indefinites as antecedents – and the two indefinites have different readings (one is weak and the other is strong).

5. (Today's newspaper claims that, based on the most recent statistics:)
   Every^u company who hired a$^{\textbf{str:}u'}$ Moldavian man, but no$^{u''}$ company who hired a$^{\textbf{wk:}u'}$ Transylvanian man promoted him$_{u'}$ within two weeks of hiring.

6. (Imagine a Sunday fair where people come to sell their young puppies before they get too old and where the entrance fee is one dollar. The fair has two strict rules: all the puppies need to be checked for fleas at the gate and, at the same time, the one dollar bills also need to be checked for authenticity because of the many faux-monnayeurs in the area. So:)
   Everyone^u who has a$^{\textbf{str:}u'}$ puppy and everyone$^{u''}$ who has a$^{\textbf{wk:}u'}$ dollar brings it$_{u'}$ to the gate to be checked.

The above mixed reading DP-conjunction donkey sentences pose problems for the family of D-/E-type approaches to donkey anaphora because such approaches locate the

weak / strong donkey ambiguity at the level of the donkey pronouns. However, there is only one pronoun in both (5) and (6) above – and two distinct donkey readings associated with it. The PCDRT account, which locates the ambiguity at the level of the donkey indefinites, seems more plausible.

Furthermore, the PCDRT account predicts that the same indefinite cannot be interpreted as strong with respect to one pronoun (or any other kind of anaphor, e.g. a definite) and weak with respect to another pronoun – and this prediction seems to be borne out. By the same token, D-/E-type approaches predict the exact opposite: according to them, the same indefinite should be able to be interpreted as strong with respect to one pronoun and as weak with respect to another – which seems to be an incorrect prediction.

Discourse (2) is an instance of quantificational subordination. Crucially, its interpretation contrasts with the interpretation of discourse (7) below, whose first sentence is identical to (2a) above. Sentence (2a/7a) is ambiguous between two quantifier scopings: Harvey courts the same girl vs. a possibly different girl at every convention. Discourse (7) as a whole allows only for the "same girl" reading, while discourse (2) is compatible with both readings.

7. **a.** Harvey^u courts a$^{u'}$ girl at every$^{u''}$ convention. **b.** She$_{u'}$ is very pretty.
    (Karttunen 1976)

The non-local, cross-sentential interaction between quantifier scope and anaphora, in particular the fact that a *singular* pronoun in the second sentence can disambiguate between the two readings of the first sentence, can be captured in PCDRT because plural information states enable us to store both quantifier domains (i.e. values) and quantificational dependencies (i.e. structure), pass them across sentential boundaries and further elaborate on them, e.g. by letting a pronoun constrain the cardinality of a previously introduced quantifier domain.

The contrast between the two Karttunen examples is derived by giving a suitable dynamic reformulation of the independently motivated static meanings for generalized quantifiers and singular number morphology. In the process, we see how generalized

quantifiers enter anaphoric connections as a matter of course, usually functioning simultaneously as both indefinites and pronouns.

Finally, adding (discourse referents for) possible worlds to PCDRT enables us to account for discourse (3) above, which is a more explicit version of the naturally occurring discourse in (8) below.

8. [A] man cannot live without joy. Therefore, when he is deprived of true spiritual joys, it is necessary that he become addicted to carnal pleasures.
   (Thomas Aquinas)

Discourse (3) exhibits complex interactions between entailment particles (i.e. *therefore*), modal anaphora and modal subordination: on the one hand, *therefore* relates the propositional contents (formalized as sets of possible worlds) contributed by the premise (3a) and the conclusion (3b) and tests that they stand in an entailment relation; on the other hand, the premise and the conclusion themselves are modal quantifications and, consequently, relate a restrictor and a nuclear scope set of possible worlds.

Moreover, the propositional contents of the two modalized conditionals in (3a) and (3b) can be determined only if we are able to capture: (**i**) the donkey anaphoric connection between the indefinite a^u *man* in the antecedent of (3a) and the pronoun he_u consequent of (3a) and (**ii**) the fact that the antecedent of the conditional in (3b) is modally subordinationated to the antecedent of (3a), i.e. (3b) is interpreted as if the antecedent of (3a) is covertly repeated, i.e. as *if a man is alive and he doesn't have any spiritual pleasure, he must have a carnal pleasure*.

The discourse is analyzed in PCDRT as a network of structured anaphoric connections and the meaning (and validity) of the Aquinas argument emerges as a consequence of the intertwined individual-level and modal anaphora. Moreover, modal subordination is basically analyzed as quantifier domain restriction via structured modal anaphora; that is, the antecedent of (3b) is simultaneously anaphoric to the set of worlds and the set of individuals introduced by the the antecedent of (3a) and, also, to the quantificational dependency established between these two sets.

The dissertation is located at the intersection of two major research programs in semantics that have gained substantial momentum in the last fifteen years: (**i**) the development of theories and formal systems that unify different semantic frameworks and (**ii**) the investigation of the semantic parallels between the individual, temporal and modal domains. As the dissertation shows, one of the outcomes of bringing together these two research programs is a novel compositional account of non-local (modal and individual-level) quantificational dependencies as *anaphora to structure*.

The unification of different semantics frameworks, in particular Montague semantics, situation semantics and dynamic semantics (see Janssen 1986, Groenendijk & Stokhof 1990 and Muskens 1995a, 1995b, 1996 among others) enables us to incorporate the generally complementary strengths of these different frameworks and allows for an easy cross-framework comparison of alternative analyses of the same phenomenon.

Building on the Compositional DRT (CDRT) of Muskens (1996), chapters **2** through **4** of the dissertation incrementally develop a formal system couched in classical type logic which unifies dynamic semantics, in particular its account of basic kinds of cross-sentential / cross-clausal anaphora, and Montague semantics, in particular its compositional interpretation procedure and its account of generalized quantification.

The resulting CDRT+GQ system can compositionally account for a variety of phenomena, including cross-sentential anaphora, bound-variable anaphora, quantifier scope ambiguities and a fairly diverse range of relative-clause and conditional donkey sentences. Moreover, the analysis of donkey anaphora avoids the proportion problem and can account for simple instances of weak / strong donkey ambiguities. But CDRT+GQ cannot account for the three phenomena instantiated in (1), (2) and (3) above, i.e. mixed reading (weak & strong) relative-clause donkey sentences, quantificational subordination and the interaction between quantifier scope and number morphology on cross-sentential anaphora and modal anaphora, modal subordination and their interaction with entailment particles.

Plural Compositional DRT (PCDRT) pushes the framework unification program further and unifies in classical type logic the compositional analysis of selective

generalized quantification in Montague semantics, its account of quantifier scope ambiguities and singular number morphology with Dynamic Plural Logic (van den Berg 1994, 1996a, b). A novel, compositional account of mixed reading relative-clause donkey sentences (chapter **5**) and an account of quantificational subordination and its interaction with singular anaphora (chapter **6**) are some of the immediate benefits of this unification.

The introduction of (dref's for) possible worlds enables us to further extend PCDRT and unify it with the static Lewis (1973) / Kratzer (1981) analysis of modal quantification. The resulting Intensional PCDRT (IP-CDRT) system enables us to capture structured modal anaphora and modal subordination (chapter **7**).

The account brings further support to the idea that the dynamic turn in natural language semantics does not require us to abandon the classical approach to meaning and reference: I show that the classical notion of truth-conditional *content* (as opposed to *meaning*, which I take to be context-change potential) can be recovered within IP-CDRT and this enables us to analyze the entailment particle *therefore* as involving structured discourse reference to (propositional) contents, contributed by the premise(s) and the conclusion of an argument.

At the same time, Intensional PCDRT (IP-CDRT) pushes further the second research program, namely the investigation of anaphoric and quantificational parallels across domains.

The anaphoric (and quantificational) parallels between the individual and temporal domains have been noticed at least since Partee (1973, 1984) and they have been extended to the modal domain by Stone (1997, 1999) and, subsequently, by Bittner (2001, 2006) and Schlenker (2003, 2005b) among others.

IP-CDRT extends this research program and brings further support to the conjecture that our semantic competence is domain neutral by providing a point-for-point parallel account of quantificational and modal subordination. For example, the quantificational subordination discourse in (2) above is analyzed in the same way as the modal subordination discourse in (9) below; in particular, the interaction between *a^u girl-every*

convention and *she_u-always* in (2) is captured in the same way as the interaction between *a^u wolf-might* and *it_u-would* in (9).

9. A^u wolf might^p come in. It$_u$ would$_p$ attack Harvey first.
   (based on Roberts 1989)

IP-CDRT – which builds on and unifies Muskens (1996), van den Berg (1996a) and Stone (1999) – is, to my knowledge, the first dynamic system that systematically captures the anaphoric and quantificational parallels between the individual and modal domains (from the types of the discourse referents to the form that the translations of anaphoric and quantificational expressions have) while, at the same time, keeping the underlying logic classical and preserving the Montagovian approach to compositionality.

PCDRT differs from most previous dynamic approaches in at least three respects. The first difference is conceptual: PCDRT captures the idea that discourse reference to structure is as important as discourse reference to value and that the two have the same dynamics and should therefore be treated in parallel (contra van den Berg 1996a among others).

The second difference is empirical: the motivation for plural information states is provided by *singular* and *intra-sentential* donkey anaphora, in contrast to the previous literature which relies on *plural* and *cross-sentential* anaphora (see van den Berg 1996a, Krifka 1996b and Nouwen 2003 among others).

Finally, from a formal point of view, PCDRT accomplishes two non-trivial goals for the first time. On the one hand, it is not obvious how to recast van den Berg's Dynamic Plural Logic in classical type logic, given that, among other things, the former logic is partial and it conflates discourse-level plurality, i.e. plural information states, and domain-level plurality, i.e. non-atomic individuals (for more on this distinction, see the discussion of plural anaphora and quantification below).

On the other hand, previous dynamic analyses of modal quantification in the spirit of Lewis (1973) / Kratzer (1981), e.g. the ones in Geurts (1995/1999), Frank (1996) and Stone (1999), are not completely satisfactory insofar as they fail to associate modal quantifications with the propositional contents that they express (in a particular context)

and they fail to explicitly introduce these contents in discourse. Consequently, within these approaches, we cannot account for the fact that the entailment particle *therefore* relates such contents (across sentences), as shown, for example, by the Aquinas discourse in (3) above.

Two Extensions

The mostly foundational research pursued in this dissertation can be extended in various directions. I will outline here only two of them, namely:

- a cross-linguistic analysis of the interpretation and distribution of verbal moods when they occur under (particular kinds of) attitude verbs and in (particular kinds of) conditional structures;
- extending PCDRT with an account of plural anaphora and quantification.

De Se Attitudes and the Romanian Subjunctive B Mood

Intensional PCDRT seems to provide a suitable framework for a cross-linguistic investigation of aspect / tense / mood systems. I will illustrate the kind of issues that arise by briefly examining the interpretation and distribution of the subjunctive B mood in Romanian.

Romanian is the most widely spoken Romance language in the Balkan Sprachbund. Its distinctive position in the Indo-European spectrum has provided Romanian with a rich verbal morphology system, including two subjunctive (i.e. non-indicative finite) moods. The moods' distribution in intensional contexts is clearly interpretation-driven and the fine-grained distinctions drawn between different kinds of attitude reports and conditional structures suggest the existence of previously unnoticed semantic universals.

We will focus on the interpretation of the Romanian subjunctive B mood when embedded under attitude verbs like *crede* (believe), as shown in example (10) below. The main idea of the analysis is that subjunctive B is temporally and propositionally *de se* – thus extending the parallel between pronouns, tenses and moods to *de se* readings.

10. Maria	crede	că	**ar**	fi	în	pericol.
Mary	believe.ind.pres.3s	that	**subjB**.3s	be	in	danger.

Mary believes that she is in danger.

Thus, the contrast between indicative and subjunctive B in Romanian is parallel to the contrast between overt pronouns (e.g. *John hopes that **he** will win*) and null PRO (e.g. *John hopes to win*) in the individual domain: as Chierchia (1989) and Schlenker (2003) observe, overt pronouns are compatible with both the *de se* and non-*de se readings*, while null PRO allows only for a *de se* reading. In particular, subjunctive B is parallel to PRO, in that it requires a temporally and propositionally *de se* reading, while indicative can, but does not have to receive such a reading.

Temporal *de se* means that the reported belief of being in danger is temporally located at the *internal now* of the believer, e.g., in (10) above, at the time at which Mary (correctly or not) thinks she entertains the belief that she is in danger. Propositional *de se* means that the believer has an attitude towards a 'self-referential' kind of content similar to the self-referential experience contents proposed by Searle (1983). For example, the content of my visual experience of seeing a yellow station wagon is that: (a) there is a yellow station wagon there and (b) the fact that there is a yellow station wagon there is causing *this* very visual experience. This 'self-referentiality' is the expression of the common sense intuition that having an experience or an attitude is assuming a particular point of view / perspective on the content of the experience or of the attitude.

Intuitively, a belief report with subjunctive B mood is propositionally *de se* insofar it *explicitly* encodes in the believed content this *perspectival* component inherent in any attitude; the form of such a report is basically *I believe that: p and p is what I believe*. Its redundancy is crucial in deriving two surprising empirical generalizations: on the one hand, in a report of the form *x believes that not p*, subjunctive B always takes wide scope with respect to embedded negation[1]; on the other hand, unlike the indicative mood, subjunctive B is incompatible with the adverb *probabil* (probably) in reports of the form *x believes that probably p*.

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[1] See Brasoveanu (2006a) for the clarification of what "wide scope" means in this particular context.

The interpretation of Romanian subjunctive B motivates a new analysis of attitude reports in terms of *centered propositions* as opposed to centered worlds (as in Lewis 1979a, Creswell & von Stechow 1982, Abusch 1997 among others). Moreover, these centered propositions have an essentially dynamic behavior: in a report of the form *x believes that p*, they are contributed by the matrix clause '*x believes...*' and then anaphorically retrieved and elaborated on by the embedded clause '*...that p*'.

The analysis of *de se* and *de re* belief in Lewis (1979a) involves three ingredients:

- *centered worlds*: the believed content is not a proposition, i.e. a set of worlds (as the standard analysis would have it[2]), but a property, or, equivalently, a set of centered worlds[3]. A centered world is a pair $<w, x^{self}>$, where w is a world and x^{self}, the center of world w, is the individual that Neo takes himself to be in w, i.e. the belief-internal 'self';

- *self ascription*: the verb believe is interpreted as a relation between an individual and a set of centered worlds (and not as a relation between an individual and a proposition). That is, we replace the function $\mathbf{dox}_{w*,x*}$ that returns a set of worlds (the set of $x*$'s doxastic alternatives to world $w*$) with a function $\mathbf{self\_ascribe}_{w*,x*}$, which returns a set of centered worlds $<w, x^{self}>$. Crucially, given the "two god" argument in Lewis (1979a), we might have two distinct self-ascribed pairs $<w, x^{self}>$ and $<w, y^{self}>$ that contain the same world w but different individuals x^{self} and y^{self};

- *acquaintance relations*: the reported belief is about an individual with whom the belief-internal 'self' is acquainted in a particular way. In the *de se* case, the acquaintance relation is the most intimate relation the belief-internal 'self' can have with any individual whatsoever, namely the identity relation.

The analysis of temporal *de se* / *de re* is parallel to the analysis of individual *de se* / *de re*. Following Abusch (1997), we only extend centered worlds with a variable for time: Heimson is self-ascribing in world $w*$ at time $t*$ a set of centered worlds that are now represented as triples $<w, x^{self}, t^{now}>$, where x^{self} is the individual that Heimson takes

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[2] See for example Hintikka (1969).

[3] See for example Creswell & von Stechow (1982) for more discussion.

himself to be in w and t^{now} is the time that Heimson takes his internal 'now' to be in w. Moreover, we will also have acquaintance relations relative to time intervals.

The incompatibility between subjunctive B and *probabil* in reports of the form *x believes that probably q* suggests that centered worlds should be generalized to centered propositions, i.e. to triples of the form $<p, f^{self}, g^{now}>$, where:

- p is a set of possible worlds (of type $\mathbf{w}t$), i.e. the set of x's doxastic alternatives;
- f^{self} is a relation[4] between worlds and individuals (of type $\mathbf{w}(et)$) that specifies, for each doxastic alternative $w \in p$, what individual(s) x takes himself to be in w;
- g^{now} is a relation between worlds and time-intervals (of type $\mathbf{w}(\tau t)$[5]).

The basic idea of the centered-propositions analysis is that, in a belief report of the form *x believes + embedded clause*, the matrix clause *x believes* sets up the context for the interpretation of the embedded clause by contributing a centered proposition relative to which the embedded clause is interpreted. The matrix clause basically introduces a centered proposition discourse referent (more exactly, three suitably related discourse referents – for p, f^{self} and g^{now}), which is (are) anaphorically accessed by the embedded clause.

The incompatibility between subjunctive B and *probabil* is a consequence of the fact that subjunctive B is anaphoric to the set of doxastic alternatives p and requires the proposition q expressed by the embedded clause to be true in every doxasatic alternative w in p, while *probabil* implicates that that there must be at least one world w in p where q is false (see Brasoveanu 2006a for more discussion).

This analysis is independently motivated by the fact that a subsequent matrix clause with a subjunctive B mood can also be interpreted relative to the same centered proposition (in fact: it has to be interpreted in this way) – as shown by (11) below. The

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[4] f^{self} and g^{now} are relations between worlds and individuals / times and not functions from worlds to individuals / times because of the "two god" argument in Lewis (1979a).

[5] Where τ is whatever type we decide to assign to temporal intervals, e.g. it might be a basic type or a characteristic function of convex sets of temporal instants etc.

subjunctive B sentence in (11b) has to be interpreted as a further elaboration on Mary's beliefs[6] and cannot be interpreted as stating that John has beautiful eyes in the actual world.

11. **a.** Maria   crede   că   Ion   **ar**   fi   chipeş.

Mary   believes   that   John **subjB**.3s   be   handsome.

Mary believes that John is handsome.

b. Ar   avea   ochi   frumoşi.

subjB.3s   have   eyes   beautiful.

[She believes that] he has beautiful eyes.

The fact that plural information states are basically designed to store and pass on information about quantificational dependencies between multiple objects makes IP-CDRT an ideal framework for the formalization of *de se* reports in terms of anaphora to centered propositions.

Basically, a verb like *believe* would introduce three discourse referents: p (a modal dref of type $s\mathbf{w}$), u^{self} (an individual-level dref of type se) and χ^{now} (a temporal dref of type $s\tau$). The correlation between worlds, individuals and times and anaphora to it is just another instance of discourse reference and anaphora to structure and, as expected, it will be store in a plural info state I_{st}. That is, instead of having to build the quantificational dependencies into complex functions (see the triples $<p, f^{self}, g^{now}>$ above), the dependencies emerge as a consequence of the independently motivated account of structured discourse reference in IP-CDRT: for each 'assignment' i_s in info state I, $u^{self}i$ is the individual that Heimson takes himself to be in world pi and $\chi^{now}i$ is the time that Heimson takes his internal 'now' to be in world pi.

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[6] We can even have modal subordination, as shown in (i) below.

(i) **a.** Maria crede că **ar** fi vampiri în LA.

Mary believes that there are (**subjB**) vampires in LA.

   b. Ar intra noaptea în case şi **ar** ataca oamenii în somn.

[She believes that] they break (**subjB**) into houses at night and attack (**subjB**) people in their sleep.

Given that IP-CDRT is couched in type logic, we preserve the static, compositional analysis of attitude reports while, at the same time, being able to account for the possibility of structured cross-sentential anaphora to centered propositions (see (11) above) and for the interpretation and distribution of the Romanian subjunctive B mood.

The analysis of subjunctive B sketched above raises at least the following three questions, which I leave for future research:

- how is subjunctive B located within the mood system of Romanian, in particular, how does its interpretation and distribution differ from indicative and subjunctive A (analyzed in Farkas 1985, 1992)?

- what are the similarities and differences between the Romanian subjunctive A and B moods and the non-indicative moods of other Indo-European and non-Indo-European languages, e.g. the French subjunctive investigated Schlenker (2005a) (among others), the German reportive subjunctive analyzed in Fabricius-Hansen & Saebø (2004), the English subjunctive (see Frank 1996, Stone 1997, Condoravdi 2001, Ippolito 2003 among others) or the Kalaallisut dependent moods analyzed in Bittner (2006)?

- can we successfully generalize IP-CDRT to capture the entire verbal mood system in Romanian and to accommodate a broader range of aspect / tense / mood systems attested in other languages?

Plural Anaphora and Quantification

Given that the main arguments for plural information states are based on morphologically singular anaphora and not on plural anaphora (as in the previous dynamic literature), the following question arises: what is the relationship between plural information states and the pluralities involved in morphologically plural anaphora?

My answer to this question is that the two notions of plurality are distinct, which goes against the seemingly received wisdom in the literature (see van den Berg 1996a, Krifka 1996b and Nouwen 2003 among others). Morphologically plural anaphora involves *domain-level plural reference*, i.e. non-atomic individuals of the kind countenanced in Link (1983) among many others. In contrast, plural information states

formalize a notion of *discourse-level plural reference* (more precisely: a notion of plural discourse reference), which encodes discourse reference to quantificational dependencies established and elaborated upon in discourse between (non-singleton) sets of objects, be they atomic and / or non-atomic individuals.

This systematic distinction and the ensuing extension of PCDRT with non-atomic individuals (see Brasoveanu 2006c) enable us to provide a unified account of several phenomena.

First, we can account for the fact that singular donkey anaphora can involve non-singleton sets of atomic individuals while being incompatible with collective predicates, as shown in (12) below.

12. #Every farmer who owns a^u donkey gathers it$_u$ around the fire at night.

(based on Kanazawa 2001)

Second, we can capture the intuitive parallel between multiple singular and plural donkey anaphora exhibited by the examples in (13) and (14) below (see chapter **5** for the PCDRT analysis of (13)).

13. Every boy who bought a^u gift for a$^{u'}$ girl in his class asked her$_{u'}$ deskmate to wrap it$_u$.

14. Every parent who gives a^u balloon to two$^{u'}$ boys expects them$_{u'}$ to end up fighting (each other) for it$_u$.

(based on an example due to Maria Bittner, p.c.)

The parallel between singular and plural donkey anaphora also covers weak donkey readings – see (15) and (16) below – and 'sage plant' example – see (17) and (18) below.

15. Every person who has a^u dime will put it$_u$ in the meter.

(Pelletier & Schubert 1989)

16. Every person who has two^u dimes will put them$_u$ in the meter.

17. Everybody who bought a^u sage plant here bought eight others along with it$_u$.

(Heim 1982/1988)

18. Everybody who bought two^u sage plants here bought seven others along with them$_u$.

The novel distinction between plural reference and plural discourse reference as well as the (partly novel) empirical observations above hardly begin to explore three important issues.

First, what are the necessary ontological (i.e. domain-level) commitments for an adequate treatment of plurality in natural language?

Second, what is the relationship between the instances of anaphora in the examples above that are both morphologically and semantically plural and morphologically singular anaphora that (usually) is semantically plural of the kind instantiated by quantificational subordination and telescoping discourses (see (19) and (20) below) – which were analyzed in chapter **6** above?

19. Every chess set comes with a^u spare pawn. It$_u$ is taped to the top of the box.
    (Sells 1984, 1985)
20. Each^u candidate for the space mission meets all our requirements. He$_u$ has a PhD in Astrophysics and extensive prior flight experience.
    (Roberts 1987)

Finally, is there any cross-linguistic variation in the morphological realization of semantically plural anaphora and quantification and, if so, what are the parameters of variation and what is their significance for the current theories of domain-level and discourse-level plurality?