Generalized quantifiers and clarification content

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Abstract

Purver and Ginzburg introduce the Reprise Content Hypothesis (RCH) and use it to argue for a non-generalized quantifier approach to certain quantifiers. Here we will contrast their approach with an approach which employs a more classical generalized quantifier analysis and examine what predictions it has for possible clarifications and reexamine the data which Purver and Ginzburg present in the light of this.

1 Introduction

Ginzburg (forthcoming) and previous work (Purver and Ginzburg, 2004; Ginzburg and Purver, 2008) introduce the Reprise Content Hypothesis (RCH) and use it to argue for a non-generalized quantifier approach to certain quantifiers. RCH comes in two versions and is stated in Ginzburg (forthcoming) as

RCH (weak) A fragment reprise question queries a part of the standard semantic content of the fragment being reprised.

RCH (strong) A fragment reprise question queries exactly the standard semantic content of the fragment being reprised.

They argue for the strong variant and then use this to draw consequences for the semantic content of quantified noun phrases in general, claiming that this provides a strengthening of the constraints placed on semantic interpretation by compositionality.

In this paper, we will question this conclusion, arguing that a more classical generalized quantifier analysis, recast in terms of type theory with records, not only provides a more adequate coverage of the basic compositional semantics but also accounts in an explanatory way for the reprise

clarification data that Purver and Ginzburg cite. We will first consider (in Section 2) the anatomy of generalized quantifiers and the latest version of the Purver and Ginzburg proposal presented by Ginzburg (forthcoming). We will then look at some theoretical possibilities for how generalized quantifiers might be clarified (Section 3). We will then review the data concerning the clarification of quantifiers that Purver and Ginzburg have presented (Section 4) concentrating mainly on the kinds of clarifications they involve whereas Purver and Ginzburg concentrated on the types of clarification requests. Finally, we will draw some general conclusions about the relationship between clarifications and quantifiers in Section 5.

2 The anatomy of generalized quantifiers

The anatomy of quantified propositions can be characterized using TTR (Cooper, 2005; Cooper, forthcoming) and the analysis of non-dynamic generalized quantifiers presented in (Cooper, 2004) as the type in (1).

$$(1) \quad \begin{bmatrix} \text{restr} & : & \textit{Prop} \\ \text{scope} & : & \textit{Prop} \\ \text{c}_q & : & q(\text{restr},\text{scope}) \end{bmatrix}$$

Here we use the idea from type theory that the intuitive notion of proposition is represented by a type (known under the slogan "propositions as types"). In particular we shall use a record type as in the TTR analyses we have been developing. The idea is that the proposition is "true" if there is something of the type and "false" if the type is empty. The first field represents the restriction of the quantifier (corresponding to the common noun phrase such as *thief*) which is required to be of type "property". We take *Prop* to be an abbreviation for the function type $\begin{bmatrix} \text{x:}\textit{Ind} \end{bmatrix} \rightarrow \textit{RecType}$, that is, the type of functions from records with a field

labelled 'x' for an individual to record types (corresponding to the intuitive notion of proposition).

The second field represents the scope of the quantifier, also required to be a property. If the quantifier corresponds to a noun phrase in subject position the scope corresponds to a verb phrase such as *broke in here last night*.

The third field represents a constraint requiring that a certain quantifier relation q hold between the two properties. For example, if q is the existential quantifier relation (corresponding to the English determiner *a* or singular count *some*) then the relation will hold just in case there is an object which has both the restriction and the scope property. $q(\text{restr},\text{scope})$ also represents a type. We can think of it as the type of witnesses for the quantifier relation holding between the two properties. So in the case of the existential a witness would be something which has both properties 'restr' and 'scope'. If there is no such object then this type will be empty.

An object will be of this record type if it is a record containing at least three fields with the labels in the type (labels may only occur once in a record or record type) and values of the types required by the record type. Thus if there is no witness for the quantifier constraint type 'c_q' then there will not be anything of the quantified proposition type of the form (1) either. A particular example of a quantified proposition will be a refinement of the type in (1). If we represent the property of being a thief informally as '*thief*', the property corresponding to *broke in here last night* as '*bihln*' and the existential quantifier relation as $\exists$, then the type corresponding to the proposition corresponding to *a thief broke in here last night* would be (2).

$$(2)\quad \begin{bmatrix} \text{restr}=\text{'}thief\text{'} & : & Prop \\ \text{scope}=\text{'}bihln\text{'} & : & Prop \\ c_\exists & : & \exists(\text{restr},\text{scope}) \end{bmatrix}$$

where the type *Prop* has been restricted to be the singleton type which contains exactly the property '*thief*' in the restriction field and the property '*bihln*' in the scope field. Note that what makes this a crucially generalized quantifier approach to quantified propositions is the use of the quantifier relation which holds between two properties and not the use of abstraction over properties in the compositional treatment of noun phrase interpretations according to Montague's style (Mon-

tague, (1974), Chapter 8: 'The Proper Treatment of Quantification in Ordinary English'). So, for example, the content of the noun phrase *a thief* will be a function from properties to record types where the scope field has been abstracted over:

$$(3)\quad \lambda P{:}Prop$$
$$\left(\begin{bmatrix} \text{restr}=\text{'}thief\text{'} & : & Prop \\ \text{scope}=P & : & Prop \\ c_\exists & : & \exists(\text{restr},\text{scope}) \end{bmatrix}\right)$$

It is normally an object like that represented in (3) that is considered as a generalized quantifier, following the presentation of generalized quantifiers in Barwise and Cooper (1981) as sets of sets. It is this view that Purver and Ginzburg seek to argue against. However, it must be emphasized that the essential component of generalized quantifier theory is the use of the relation between properties (or sets) to represent quantification. The use of the lambda calculus in (3) can be regarded as a kind of glue to get the compositional semantics to work out. (This is the kind of view of the lambda calculus as a glue language which is presented by Blackburn and Bos (2005).) If you have another way to engineer the compositional semantics then you could abandon the kind of lambda abstraction used in (3) but still use the generalized quantifier notion of relations between sets.

Now let us consider (4).

$$(4)\quad \begin{bmatrix} \text{q-params:} \begin{bmatrix} \text{x:}\{Ind\} \\ \text{r:most(x,student)} \end{bmatrix} \\ \text{cont:left(q-params.x)} \end{bmatrix}$$

This a representation for *most students left* proposed by Ginzburg (forthcoming) in his TTR recasting of the Purver and Ginzburg approach to quantification. It requires that there be a set 'x' which is what Barwise and Cooper (1981) would call a witness for the quantifier 'most(student)', that is, some set containing most students. In addition it requires that the predicate 'left' holds (collectively) for that set (which we may interpret as the predicate 'left' holding individually of each member of the witness).[1] This analysis is,

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[1]Note that the notion of witness for a quantifier introduced by Barwise and Cooper is different from the notion of witness for a quantified sentence which we discussed above. The set of witnesses for a quantifier is the set of objects which potentially could be witnesses for the whole quantified sentence. A witness for the sentence will be a witness for the quantifier, but a witness for the quantifier will not necessarily be a

then, also a generalized quantifier analysis. It differs from the previous one in that it emphasizes the witness set and uses a different relation between sets for the quantifier relation, namely a relation between a witness set and the set corresponding to what we called the restriction previously. The witness quantifier relation is 'most' in (4). This analysis works well for monotone increasing quantifiers. However, as Purver and Ginzburg (2004) point out, it is more problematic with monotone decreasing quantifiers since there you have to check the witness set against the restriction and the scope in a different way. In that paper they go through a number of different options for solving the problem, finally coming to a preference for treating monotone decreasing quantifiers as the negation of monotone increasing quantifiers. That suggests to me that the representation for *few students left* corresponding to the analysis in (4) should be something like (5).

(5) $\left[\text{c:}\neg(\left[\text{q-params:} \left[\begin{array}{l} \text{x:}\{Ind\} \\ \text{r:many(x,student)} \end{array} \right] \right]) \right]$
$\left. \text{cont:left(q-params.x)} \right]$

that is, something that requires that there is no set x containing many students such that x (collectively) left. Now the only way I can think of to engineer the compositional semantics to achieve (5) is to have something along the lines of (6) corresponding to the noun phrase.

(6) λP:*Prop*
$(\left[\text{c:}\neg(\left[\text{q-params:} \left[\begin{array}{l} \text{x:}\{Ind\} \\ \text{r:many(x,student)} \end{array} \right] \right]) \right])$
$\left. \text{cont:}P(\text{q-params.x}) \right]$

but this involves exactly the Montagueesque lambda paraphernalia that Purver and Ginzburg wish to avoid. However, as before, if you have an alternative way of engineering the compositional glue then you can apply it here as well while still maintaining the anatomy of quantification based on the witness quantifier relation.

Perhaps more difficult is the fact that the Purver-Ginzburg analysis also has difficulties with non-monotone quantifiers such as *only students* or *an even number of students* where it is not so clear that the negation strategy is available.

witness for the sentence. However, this distinction seems difficult to tease apart when looking at the clarification data and we will ignore it below.

This separation of the glue function of the lambda calculus and the analysis of quantified utterances in terms of generalized quantifier relations between sets leads me to suppose that Purver and Ginzburg's objection is not so much to generalized quantifiers as such as to the use of Montague's lambda calculus based approach to compositional semantics. This leads me to go back and reconsider their data in terms of the original generalized quantifier relation. Whereas they focussed their attention mainly on the clarification request, we will focus ours mainly on the clarification itself.

3 Potential clarification requests and clarifications

We might expect clarifications corresponding to each of the three fields, that is, the restriction, the scope and the quantifier constraint. In the case of the quantifier constraint we might expect the quantifier relation to be clarified or the witness. We consider two kinds of clarifications: the responses given to noun phrase reprise clarification requests and non-reprise clarification requests relating to quantifiers. Responses to noun phrase reprise clarification requests are exemplified by examples like

(7) A: A thief broke in here last night
     B: A thief?
     A: *a.* my ex-husband, actually (*witness*)
         b. burglar wearing a mask (*restriction*)
         c. got in through the bedroom window (*scope*)
         d. two, actually (*quantifier relation*)

Seeing as we are focussed on the clarification request *A thief?* whose content is such that the scope field is abstracted over we might expect the scope clarification above to be less acceptable than the others.

Examples of non-reprise clarification requests relating to a quantifier are

(8) A: Somebody broke in here last night

B: *a.* (not) your ex-husband? (*witness*)

b. burglar wearing a mask? (*restriction*)

c. got in through the bedroom window? (*scope*)

d. just one? (*quantifier relation*)

Note that the availability (or not) of the restriction clarification question here could be important for distinguishing between a theory where clarification options are based on the content (where the restriction field is available) and a theory where clarification options are based solely on syntactic constituents of the preceding utterance, where in this example there is no common noun phrase in the relevant noun phrase *somebody*.

Intuitively it seems that clarifications not corresponding to a witness for the quantifier or one of the three fields introduced by the quantifier are harder to interpret as a clarification of the quantifier. Consider

(9) A: Somebody broke in here last night

B: *a.* maroon?

b. maroon sweater?

c. police?

d. scar over the left eye?

It is hard to give examples of impossible dialogues since there is no notion of grammaticality as there is with single sentences. What we can examine is the most likely interpretation given what we gather about the context from what we know about the dialogue. (9a) seems hard to interpret at all unless, for example *maroon* is being used (innovatively) as a way of characterizing skin-colour, in which case it would be a clarification relating to the restriction. A natural way of interpreting (9b) would be as elliptical for *wearing a maroon sweater* which would in effect coerce it to be a clarification of the restriction. Depending on the political situation in the country the dialogue is about (9c) might be interpreted as a restriction clarification, i.e. *Was it the police who broke in?*, or as a very elliptical way of asking whether *A* called the police. This latter interpretation could be facilitated, for example, if *A*

and *B* routinely talked about break-ins and had a checklist of questions which they normally asked, among them whether the police was called. In this case, of course, (9c) would not be a clarification of the quantifier. Finally, (9d) is most naturally interpreted as elliptical for *with a scar over the left eye*, making it as a clarification of the restriction.

A central question is to what extent similar facts can be observed about generalized quantifiers which are not reducible to standard "referential" quantifiers and whether different classes of quantifiers behave differently with respect to the availability of clarification interpretations. Consider

(10) A: most thieves are opportunists
http://www.
accessmylibrary.com/coms2/
summary_0286-33299010_ITM,
accessed 18th January, 2010

B: most thieves?

A: *a.* successful ones (*witness/restriction*)

b. bide their time (*scope*)

c. 80%, actually (*quantifier relation*)

Here the witness and restriction clarifications appear to collapse since a witness set for the quantifier has to be a subset of thieves (i.e. the restriction) which contains most thieves. However, (10a) does appear to be ambiguous between an interpretation corresponding to "successful thieves are opportunists" (a witness reading) and "most successful thieves are opportunists" (a restriction reading). Thus while the form of the clarification is the same its interpretation is ambiguous between a witness clarification and a restriction clarification.

In all of these examples, it seems that potential clarifications relating to the scope are intuitively less likely as "clarifications", as opposed to "additional relevant information". This seems natural as the quantifier itself does not contain the scope and it is therefore difficult to see information about the scope as clarification of the quantifier as such as opposed to the sentence as a whole. Our prediction is thus that clarifications of quantified noun phrases will fall into one of the following three classes:

(11) **Predicted clarification classes for quantified noun phrases**

- witness clarifications

- restriction clarifications

- quantifier relation clarifications

4 Some data

In Section 3 we showed some predictions for clarification made by a generalized quantifier approach to NP interpretation. In this section we will look at the examples that have been presented in the literature by Purver and Ginzburg and see to what extent they provide examples of the kinds of clarification we have predicted. As expected the Purver-Ginzburg data divides into witness clarification, restriction clarifications and quantifier relation clarifications. The large majority of cases are restriction clarifications. Scope clarifications do not occur in their data. We give details of the relevant examples below.

4.1 Witness clarifications

(12)

Unknown:	And er they X-rayed me, and took a urine sample, took a blood sample. Er, the doctor
Unknown:	Chorlton?
Unknown:	**Chorlton**, mhm, he examined me, erm, he, he said now they were on about a slide ⟨unclear⟩ on my heart. Mhm, he couldn't find it.

BNC file KPY, sentences 1005–1008
(Purver and Ginzburg, 2004)

(13)

Terry:	Richard hit the ball on the car.
	. . .
Nick:	What ball?
Terry:	**James [last name]'s football**.

BNC file KR2, sentences 862, 865–866 (Purver and Ginzburg, 2004)

Intuitively both of these examples appear to be witness clarifications, although one might argue that this status is unclear. (13) might be arguably a combination of a restriction clarification

(*ball→football*) and a quantifier relation clarification if we analyze *James [last name]'s* as a determiner representing a quantifier relation. One might argue that (12) is also a restriction clarification if you have an analysis of the proper name *Chorlton* as something corresponding to "the person named Chorlton".

4.2 Restriction clarifications

The clear cases of restriction clarifications presented below exhibit a number of different strategies for relating the clarification to the clarification request or the original utterance which seem quite closely related to repair strategies that have been noted in the literature.

(14)

George:	You want to tell them, bring the tourist around show them the spot
Sam:	The spot?
George:	**where you spilled your blood**

BNC file KDU, sentences 728–730
(Purver and Ginzburg, 2004)

Here additional material is provided which is to be added as a modifier to the restriction. Often the entire noun phrase is repeated with the additional modifier inserted, as in the following examples:

(15)

Terry:	Richard hit the ball on the car.
Nick:	What car?
Terry:	**The car that was going past**.

BNC file KR2, sentences 862–864
(Purver and Ginzburg, 2004)

(16) Anon 1: In those days how many people were actually involved on the estate?

      Tommy: Well there was a lot of people involved on the estate because they had to repair paths. They had to keep the river streams all flowing and if there was any deluge of rain and stones they would have to keep all the pools in good order and they would

      Anon 1: The pools?

      Tommy: Yes the pools. That's **the salmon pools**

      Anon 1: Mm.

BNC file K7D, sentences 307–313
(Purver and Ginzburg, 2004)

(17) Eddie: I'm used to sa-, I'm used to being told that at school. I want you ⟨pause⟩ to write the names of these notes up here.

      Anon 1: The names?

      Eddie: **The names of them**.

      Anon 1: Right.

BNC file KPB, sentences 417–421
(Purver and Ginzburg, 2004)

(18) Nicola: We're just going to Beckenham because we have to go to a shop there.

      Oliver: What shop?

      Nicola: **A clothes shop**. ⟨pause⟩ and we need to go to the bank too.

BNC file KDE, sentences 2214–2217
(Purver and Ginzburg, 2004)

(19) is different in that it is the dialogue participant who contributes the original clarification request who provides alternative restrictions. Note that in this case the restrictions do not correspond to a syntactic constituent in the original utterance (*nothing*).

(19) Anon 1:   Er are you on any sort of medication at all Suzanne? Nothing?

      Suzanne: No. Nothing at all.

      Anon 1:   Nothing? **No er things from the chemists and cough mixtures or anything** ⟨unclear⟩?

BNC file H4T, sentences 43–48
(Purver and Ginzburg, 2004)

In (20) we have a case where a modifier in the original utterance is replaced by a new modifier in the clarification, thus changing what was said non-monotonically, not merely further specifying what was said.

(20) Elaine: what frightened you?

      Unknown: The bird in my bed.

      Elaine: The what?

      Audrey: The birdie?

      Unknown: **The bird in the window**.

BNC file KBC, sentences 1193–1197
(Purver and Ginzburg, 2004)

The whole of the restriction can be replaced in this way.

(21) Mum: What it ever since last August. I've been treating it as a wart.

      Vicky: A wart?

      Mum: **A corn** and I've been putting corn plasters on it

BNC file KE3, sentences 4678–4681
(Purver and Ginzburg, 2004)

Even though a different noun is chosen to express the restriction it can nevertheless be a refinement of the original utterance. In (22) the natural interpretation is the director is a woman.

(22) Stefan: Everything work which is contemporary it is decided

      Katherine: Is one man?

      Stefan: No it is a woman

      Katherine: A woman?

      Stefan: **A director who'll decide**.

BNC file KCV, sentences 3012–3016
(Purver and Ginzburg, 2004)

(23) seems to be a case where the speaker is searching for the right noun to express the restriction.

(23) Unknown: What are you making?
Anon 1: Erm, it's a do- it's a log.
Unknown: A log?
Anon 1: **Yeah a book, log book**.

BNC file KNV, sentences 188–191
(Purver and Ginzburg, 2004)

The final restriction clarification example is a little difficult to classify.

(24) Richard: No I'll commute every day
Anon 6: Every day?
Richard: **as if, er Saturday and Sunday**
Anon 6: And all holidays?
Richard: Yeah ⟨pause⟩

BNC file KSV, sentences 257–261
(Purver and Ginzburg, 2004)

We have interpreted it as if it involves a discussion of whether the restriction *day* is to mean weekdays or all days of the week and whether it is to include holidays. An alternative analysis might classify this as a quantifier relation clarification, that is, a discussion as to whether it really is *every* day that is meant.

4.3 Quantifier relation clarifications

In the data that Purver and Ginzburg present there appear to be two clear examples of quantifier relation clarifications.

(25) Anon 2: Was it nice there?
Anon 1: Oh yes, lovely.
Anon 2: Mm.
Anon 1: It had twenty rooms in it.
Anon 2: **Twenty rooms?**
Anon 1: **Yes**.
Anon 2: How many people worked there?

BNC file K6U, sentences 1493–1499
(Purver and Ginzburg (2004) cite it
without the last turn)

We included the final turn to strengthen the interpretation that it is the quantifier relation which is being clarified. It seems hardly likely that the restriction *rooms* is in need of clarification.

(26) Marsha: yeah that's it, this, she's got three rottweilers now and
Sarah: **three?**
Marsha: **yeah**, one died so only got three now ⟨laugh⟩

BNC file KP2, sentences 295–297
(Purver and Ginzburg, 2004)

5 Conclusion

The data that Purver and Ginzburg present seem to fit the predictions of the basic generalized quantifier anatomy quite well. Those cases whose classification is unclear still provide alternative analyses which are within the range of predictions of the analysis. What does this say about RCH? RCH is a hypothesis about the content of a reprise, not about the clarification in response to a reprise which is mainly what we have looked at. Nevertheless, it would seem that the response to the clarification question could provide clues as to how it can be interpreted. Perhaps this shows that even if we strip away the issues concerning the use of the lambda calculus as a glue language, the original generalized quantifier approach is only consistent with the weak version of RCH. But it is not clear to me that the Purver and Ginzburg approach fares any better with respect to the strong version of the RCH when you look at the clarifications themselves as opposed to just the clarification requests.

What conclusions can we draw from this? RCH is, of course, not just a hypothesis about the content of reprises. Purver and Ginzburg want to use it as a way to argue for what the compositional semantic content of quantified noun phrases should be in general. The fact that their analysis seems to encounter problems with quantifiers that are not monotone increasing thus represents a challenge. It seems unadvisable to introduce the RCH as a constraint on semantic interpretation in addition to compositionality if as a consequence you cannot cover all the basic compositional data. It probably is possible to find a more witness set oriented analysis for non monotonic increasing quantifiers (see for example the discussion of witness sets for monotone decreasing quantifiers in Barwise and Cooper (1981)) but it would probably involve a loss of generalization in the compositional semantics, namely the classical generalized quantifier analysis of all quantifiers in terms of relations between properties (or sets) no matter what their

monotonicity properties are.

One of the advantages of using TTR is that you get structured semantic contents. Instead of the unstructured sets and functions of classical model theoretic semantics, you get articulated record types with labels pointing to various components. What the clarifications discussed in this paper seem to show is that speakers pick up on these meaning components even when they are not represented by separate syntactic constituents. It seems to me that this is an important part of a semantic theory of dialogue which is perhaps being obscured if we adopt principles like RCH which seems to be pointing to contents which you cannot break apart.

Acknowledgments

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