On Heim's approach to the Projection Problem for Presuppositions

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1.   Introduction: Heim's antecedents

In a sequence of papers published in the 1970's, Robert Stalnaker (1970, 1973, 1974, 1978; see also 1999, 2002) developed a deeply influential picture of the relation between context and content. On this picture, discourse takes place relative to a context, a background of "given" information. Context has a dual function. It is the body of information to be updated with asserted content, but at the same time has a content-fixing role, for example, by fixing the referents of indexicals. And, as a representation of what the interlocutors currently take as given, it places constraints on what can felicitously be asserted.

Stalnaker's account of context and context change is entirely pragmatic: context change has the character it has by virtue of the uses to which people put linguistic forms. Heim 1983a, while not explicitly presented as a reformulation of Stalnaker's work, carries out a semanticization of context change, presenting a version of Stalnaker's program in which the conventional meanings of expressions are characterized by the "update effects" that they have on a context. At the same time, Heim's work cements a semantic view of presupposition as a property of linguistic forms.

Heim 1983a brings together and extends two earlier lines of work. The first is Heim's prior work on noun phrase semantics (Heim 1982, 1983b), developed in a more restricted dynamic framework. There, Heim introduces the idea of a File Change Potential, the antecedent of the Context Change Potentials of the current work.

The second source is Karttunen's work on presupposition projection, in particular Karttunen 1974. Karttunen there adopts Stalnaker's general picture of context update, but detaches it from its epistemological foundations. Karttunen defines a context as "a set of logical forms that describe the set of background assumptions, that is, whatever the speaker chooses to regard as being shared by him and his intended audience" (p.182). Each sentence is associated with a set of *admittance conditions*: conditions which must be satisfied by a context in order for the context to admit update with the content of that sentence. For a simple sentence S, the admittance condition is that the context entails the presuppositions of S. For compound sentences, "we define [admittance] recursively by associating each part of the sentence with a different context" (p.184; see also Stalnaker 1973). Karttunen

continues: "In case a sentence occurs as part of a larger compound, its presuppositions need not always be satisfied by the actual conversational context, as long as they are satisfied by a certain local extension of it" (p.185). On his account, a presupposition of a sentential constituent *projects* – becomes a presupposition of the sentence as a whole – when the admittance conditions of that constituent impose a requirement on the conversational, or *global*, context. But when admittance conditions can be met locally, without imposing any requirements on the global context, non-projecting readings ensue. In the case of a sentence of form *A and B*, the local context for *B* is the global context incremented with the content of *A*. Hence, if (the logical form of) *A* entails the presupposition of *B*, that presupposition will be satisfied in the local context for *B* regardless of the properties of the global context. In this case, the presuppositions of *B* are not judged to be shared by *A and B* as a whole.

This is the core of Karttunen's account. Heim adopts Karttunen's treatment of presuppositions as admittance conditions attached to clauses, as well as his account of projection. Heim, however, embeds this account within a general, formal theory of context update, to which we now turn.

2. Formal theory of context update

2.1. Context Change Potentials

Karttunen's projection rules stipulate the local contexts for constituents of compound sentences in order to derive the correct observations about presupposition projection and filtering. Stalnaker 1974 critiqued the explanatoriness of this model, arguing that context change is to be explained entirely in terms of the communicative effects of utterances. He argues that Karttunen's rules are an unneessary complication of the semantics, because the determination of the local contexts for embedded clauses follows from the pragmatics of context change. For example, he argues that the observations regarding conjunction simply follow from the pragmatic fact that after a speaker has uttered the first conjunct of a conjunction, she is entitled to assume that its content is part of the common ground relative to which the second conjunct will be interpreted.

Heim similarly aims for a non-stipulative theory of context change. However, she does not aim to ground the theory in pragmatic principles, but instead in the truth conditions of atomic and complex expressions. Like Karttunen's, her theory seeks to specify, for any sentence form, its Context Change Potential (CCP): the update that utterance of that sentence will effect on its context. In Heim's approach, a context is no longer identified with a set of logical forms, but (initially)

with a set of worlds. (In the next section, we'll see a modification of this treatment.) The CCP of any atomic sentence requires intersecting its content (the set of worlds compatible with it) with the current context; this adds the content of the atomic sentence to the context. The CCPs of complex sentences are, as in Karttunen's model, to be defined recursively.

In her paper, Heim argues that the CCPs for complex sentences are uniquely determined by their truth conditions, and thus that the projection behavior of complex sentences is predictable from their truth conditional content. However, this position was subsequently refuted by Soames 1989 (pp. 597-8).[1] Consider again the case of conjunction. In order to reflect the truth conditions of conjunction, update with *A and B* must eliminate from the context c all non-*A* worlds and all non-*B* worlds. According to Heim, this determines that conjunction must have the CCP in (1), where "+" indicates update:

(1)   c + A and B = (c+A)+B

This CCP has the desired output, while also characterizing the local contexts for each of the conjuncts: as per Karttunen's rule, the local context for *A* is the global context, while the local context for *B* is (c+A), i.e, the global context updated with the content of *A*. So, for example, updating a context with the sentence *Malia has a dog and her dog is loyal* involves first updating the context with *Malia has a dog*, and then updating the result with *Her dog is loyal*. As the first update guarantees that the presupposition of the second clause (that Malia has a dog) is entailed by its local context, the sentence as a whole imposes no presuppositional requirements on the starting context.

But as pointed out by Soames, the procedures in (2) below have the same output, but would each make different predictions about local contexts and hence about presupposition projection.

(2)   a.   (c + B) + A
        b.   (c+A) ∩ (c+B)

A CCP, then, does two things. It specifies the ultimate effect of a sentence on a context; but it also specifies a procedure for deriving that effect. The specification of the procedure does the same work as Karttunen's stipulations: it specifies the local context for each sentence constituent. Soames' observation shows that the procedures which Heim specifies are no less stipulative that Karttunen's original definitions of local contexts. In some simple cases – the CCPs for conjunction and negation, perhaps – it is plausible to think that CCPs could be motivated in terms

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[1] Rothschild 2011 reports that the same observation was made independently by Mats Rooth in private correspondence with Heim, acknowledged by Heim (1990). Rothschild also gives a careful articulation of how to best understand the position of Heim (1983a) on the predictive nature of her framework.

of pragmatics or even language processing, in line with Stalnaker's approach. But the CCPs for conditional sentences and for the quantificational sentences we'll consider below can really only be conceptualized as part of a formal semantic system, which is indeed the spirit in which Heim proposes them.

In later work, Heim (1992) extends the context change framework to the intensional domain, offering an account of the presuppositional behavior of attitude sentences. In this extension, local contexts are given intensional interpretations (e.g. as the belief states of agents). For other work extending and modifying Heim's approach, see Beaver 1992, 2001 and Zeevat 1992. In a rather different vein, Rothschild 2011 reformulates Heim's system with the goal of formalizing a systematic relation between the truth conditional properties of operators and their projection properties, as Heim originally hoped to do.

2.2. Extension to Quantification: Context as assignment-world pairs

The second formal innovation in Heim's work is the introduction of a more fine-grained model of context. Initially, as noted, Heim follows Gazdar 1979 and Stalnaker in modeling contexts as sets of possible worlds. In the refined model (originally developed in full detail in Heim 1982, 1983b), contexts become sets of assignment-world pairs. An assignment (also called a *sequence*) is a mapping from the set of natural numbers (corresponding in practice to the indices assigned to noun phrases and variables at the level of logical form) to entities.[2]

This extension of the model of context allows us, in effect, to treat variables as temporarily denoting entities, and hence to assign context update effects to open sentences as if they were proposition denoting. For example, consider the open sentence x3 barked. This can be assigned the CCP in (3):

(3) $c + [x_3 \text{ barked}] = \{<g,w> \in c : g(3) \text{ barked in } w\}$

Thus an open sentence, just like a complete sentence, can effect a proposition-like update to the context.

The importance of this move for Heim is that it enables her to provide a dynamic semantics for quantified sentences. Following Barwise and Cooper 1981, Heim assumes a generalized quantifier analysis of quantification, and so assumes tripartite logical forms for quantified sentences. For example, sentence (4) has the logical form shown in (5), where the restrictor (*dog*) and scope (*barks*) of the quantifier are each rendered as the predicate of an open sentence.

(4)   Every dog barks

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[2] The use of sequences is standard in mathematical logic, going back to Tarski 1933.

(5)   Every$_{x_2}$ [x_2 is a dog][x_2 barks]

Now, the machinery which allows her to specify CCPs for open sentences allows Heim to specify a CCP for the *every* sentence. These CCPs specifiy distinct local contexts for the restrictor and scope of the quantifier, and hence allow Heim to use the admittance conditions of each of these clauses to predict the presuppositional properties of quantified sentences containing presuppositional expressions.

Heim was the first to offer such predictions, and even to suggest that the presuppositional behavior of quantified sentences is governed by the same basic mechanism that governs projection in compound sentences. However, the accuracy of her predictions remains unclear. Experimental work exploring speakers' judgments about the presuppositions of quantified sentences suggests that presuppositions triggered by expressions which occur in the scope of universal quantifiers can project both existentially and universally. What this means is illustrated by the interpretations of sentence (6). When read with a universal presupposition, the sentence presupposes that everything satisfying the CN *students* satisfies the presupposition (reading 7a); but the sentence can also be understood with a weak existential presupposition, requiring only that at least one thing satisfying the CN also satisfies the presupposition (reading 7b).

(6)   None of the students stopped eating donuts.
(7)   a. Every student had been a donut-eater.
           (universal presupposition)
       b. At least one student had been a donut-eater
           (existential presupposition)

In addition, the sentence seems to allow for non-presuppositional readings with relative ease. The experimental work also suggsts that presuppositions project differently under different quantifiers. For details, see Chemla 2009, Sudo et al 2012, Geurts and van Tiel 2015, Zehr et al 2016, Cremers et al 2018. Similarly, one significant point of difference between the various theories of projection subsequent to Heim (see references in section 3 below) is in their predictions with respect to quantified sentences.

2.3. Accommodation, global and local

2.3.1.   Accommodation defined

On Heim's account, the presuppositions of a clause S must be satisfied (entailed) by any context c which admits S. The process of *accommodation* (Lewis

1979) provides an escape clause. Accommodation is a process whereby a context is updated with a required presupposition of S prior to update with the ordinary content of S, ensuring definedness of the update. But which context? In the case of complex sentences, each constituent clause updates its own local context; and this provides multiple options for accommodation. For illustration, consider the case of the negated sentence (8), with the CCP in (9):

(8)   The king of France does not have a son.
(9) $c+(8) = c \setminus c+$ The KoF has a son[3]

Suppose that c does not satisfy the presupposition of the definite, but is compatible with it. This context does not admit (8). Accommodation allows us to first update c with the required presupposition to create a revised context, c', and then to update the revised context with the sentence content. This sequence is illustrated in (10).

(10) i.   c' = c+there is a KoF
      ii. $c+(8) = c' \setminus c'+$The KoF has a son

The result will be a context which entails that there is a king of France, and that this king has no son.

However, the CCP for negation allows for a second possibility. We can accommodate into the local context to which the presupposing clause is added, leaving untouched the global context which is to be intersected with the complement of that operation. In other words, we proceed as follows:

(11) $c+(8) = c \setminus [c+$there is a KoF$]+$ The KoF has a son

Now, the local context which is required to satisfy the presupposition does so, but is different from the context being updated with the overall content of (8). The result will be the set of worlds from c where either there is no king of France, or where there is a king of France who has no son. This is a reading on which (8) may be true either because there is a king of France who has no son, or because there is no king of France to have a son in the first place. Note that here, as in all cases of local satisfaction, the apparent absence of a presupposition is a consequence of local satisfaction, not of cancellation or suspension of the presupposition of the definite.

The first strategy illustrated here is called *global accommodation*; the latter is called *local accommodation*. As Heim says, "[Global accommodation] is more like pretending that c&p obtained all along...; [local accommodation] is rather like adjusting the context only for the immediate purpose of evaluating the constituent sentence S." (p.120). The more complex the CCP, the more options there are for

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[3] A\B is the intersection of A with the complement of B.

local accommodation, and hence the more possible interpretations are generated (although sometimes distinct accommodation possibilities may have the same interpretational effect).

For a thorough discussion of accommodation in dynamic semantics, see Beaver and Zeevat 2006.

2.3.2. *Justifying accommodation*

Heim's notion of accommodation builds on prior work by Stalnaker and Lewis. From his earliest work on presupposition, Stalnaker has noted that the (speaker) presuppositions required by an utterance need not in fact be common ground at the time an utterance is made. In many circumstances, it suffices that the addressee can recognize that the speaker is *acting as if* the common ground is a particular way. By allowing the addressee to recognize this, the speaker brings about a change in the common ground, as long as the addressee does not object to what is manifestly being presupposed. For Stalnaker, this process of context change does not involve pretense on the part of the speaker, or "context fixing" by the addressee, but is rather the normal kind of belief change that "must take place as events take place, and people become aware that they have" (Stalnaker 2002, p.711) and is motivated by general considerations of cooperativity.

It is from related work by David Lewis (Lewis 1979) that we derive the notion of accommodation as context fixing, which Heim utilizes in her account. Lewis identifies a range of linguistic phenomena, including presupposition as understood in Stalnaker's sense, which impose requirements on the context of utterance, but notes that "it's not as easy as you might think to say something that will be unacceptable for lack of required presuppositions" or other contextual features. He proposes a (schematic) "rule of accommodation" for "fixing" the context so as to meet the requirements of utterances made. In contrast to Stalnaker, Lewis does not offer any broad pragmatic motivation for accommodation, and assumes that accommodation is driven by potential violations of linguistic rules associated with particular words or constructions.[4]

Both Stalnaker and Lewis take themselves to be modeling, at some level, actual conversational practice. When Heim introduces her version of accommodation, she similarly invokes what happens "in practice" (p.119). Her global accommodation strategy straightforwardly models the process of accommodation that Lewis envisions. But what about local accommodation? If this is also supposed to model something that people do, it seems to commit Heim to claiming that the update procedures encapsulated in CCPs have some degree of psychological reality; but,

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[4] See Simons 2003 for detailed discussion of Stalnaker's notion of accommodation and how it differs from Lewis's, and von Fintel 2008 for an extended defense of accommodation in a broadly Stalnakerian framework.

beyond the most basic cases, this seems rather implausible. An alternative interpretation is that the local accommodation case is *not* intended as a model of what people actually do, but simply provides a formal model of the variety of readings of complex sentences containing presupposition triggers. This leaves us with some open questions: for example, Heim's use of local contexts allows her to treat presuppositions as inviolable constraints on contexts; but if local contexts – at least, the local contexts required for her theory – have no cognitive correlates, then in actual interpretation it may be that presupposition triggers have a probabilistic interpretation, sometimes understood as imposing contextual constraints and sometimes not. In other words, this interpretation means that we cannot look to the context change model for an understanding of how presuppositional triggers are interpreted in practice.

3. Alternative approaches to context

3.1. Context in Discourse Representation Theory

Discourse Representation Theory (DRT; Kamp 1981, Kamp & Reyle 1993; see Geurts, Beaver and Maier 2016 for an overview, and Geurts's contribution to this volume) is, like Heim's Context Change Semantics, a dynamic semantic theory. DRT differs from Heim's theory in that it is a representationalist account, positing a level of semantic representation called Discourse Representation Structures. These structures are constructed from the linguistic input via Construction Rules, and are the input to interpretation rules. A DRS consists of two components: a universe (a set of discourse referents: roughly, representations of the entities under discussion in the discourse) and a set of conditions. The conditions contain information about the properties of, and relations between, discourse referents. Crucially, conditions can themselves contain (subordinate) DRSs, resulting in a hierarchical structure.

Van der Sandt 1992 (for elaboration, see Geurts 1999) develops an account of presupposition in DRT which is in many ways the DRT analogue of Heim's. In DRT, contexts are DRS's: the context for any clause is the DRS which has been constructed from the discourse so far. As in the Karttunen/Heim model, presuppositions are taken to impose constraints on the prior context. Specifically, presuppositions are taken to be *anaphors* which require an isomorphic antecedent in an accessible position within the DRS. This analysis is motivated by clear parallels between the availability of local satisfiers for presuppositions, and the availability of antecedents for anaphors, as illustrated for the case of conditionals in (12):

(12) a.   If France has a king, then Jane met the king of France.
      b.   If Frank was at the party, then Jane met him.

Just as in the Karttunen/Heim model, presuppositions can be satisfied either locally or globally (or in an intermediate position). Specifically, a presupposition can find its antecedent either in the global DRS or in a subordinate DRS. If a presupposition finds an antecedent in a subordinate position, the presuppositional information is not entered into the main DRS, and so does not become part of the content of the DRS as a whole. In (12)a. just above, the presupposition of the consequent finds an antecedent in the DRS for the antecedent of the conditional, and therefore fails to project.

In Heim's account, the CCP of the conditional guarantees that when the antecedent satisfies the presupposition of the consequent, that presupposition does not project. In van der Sandt's account, there is no analogue of the CCP. In principle, a potential antecedent anywhere along the accessibility path of the presupposition (between the sub-DRS in which it is introduced and the global DRS) is a possible resolution site of the presupposition. However, van der Sandt proposes that there is a preference for binding of presuppositions as close as possible to where they are introduced. This preference predicts that the non-presupposing reading of sentence (12)a. is preferred. But what if the presupposition does not find an antecedent anywhere? Like Heim, van der Sandt posits that presuppositions can be accommodated. Accommodation simply involves adding the required DRS condition into an accessible location. As with binding, there may be multiple locations in which the presupposition could be accommodated, resulting in multiple possible interpretations; but there is a presumed preference to accommodate in the highest possible location within the DRS (typically, the global DRS). This assumption echoes Heim's observation that global accommodation is preferred over local accommodation.

While there are obvious parallels between Heim's account and van der Sandt's, the two theories do not make identical predictions for all cases. For discussion of differences, see van der Sandt 1992, p.349ff; Geurts 1999, and Beaver 2002.

3.2. Schlenker on Local Contexts

Schlenker (2009, 2010) rejects the claim that an account of presupposition requires a dynamic framework. He develops an alternative notion of local contexts within a static semantic theory, in order to utilize the notion of local satisfaction of presuppositions without the dynamic commitments. Like Karttunen/Heim, Schlenker assumes that (i) presuppositions are compositionally associated with sentence subparts and (ii) the presupposition of any sentence constituent must be entailed by its local context. Hence, Schlenker derives projection facts in a way analogous to Heim. (For a closely related view, see George 2008.)

For Schlenker, the local context for the evaluation of any sentence S is the smallest (most restricted) set of worlds relevant for establishing the interpretation of S, that is, assigning to S a function from worlds to truth values. The function assigned, Schlenker suggests, should be sensitive in a particular way to the context in which S occurs: specifically, it should be indifferent to worlds which are already determined to be "not the way things are." So, suppose that a speaker utters S, where the established context is C (a set of possible worlds). Whatever function from worlds to truth values we assign to S, it can be one which maps all non-C worlds to false, because we have already excluded non-C worlds as not true.[5] This idea corresponds to the non-controversial claim that a sentence S uttered in context C is informationally equivalent to (C & S).

Now let's consider a more substantive case: a conditional of form *If A, B*. Like Heim, Schlenker 2010 assumes at least for purposes of illustration a material implication semantics for conditional sentences. To calculate the function corresponding to the sentence as a whole, the interpreter must calculate the functions corresponding to each constituent sentence. Let's assume that the interpreter has already interpreted the antecedent *A*, and now must interpret the consequent. The question is: which worlds must the interpreter treat as "undecided" parts of the domain of the corresponding function? As before, the interpreter can safely predetermine that the function should map all non-C worlds to false. In addition, she can predetermine that the function should map to true all worlds at which the antecedent of the conditional is false. That's because the truth conditions of the conditional as a whole guarantee that the conditional is true at all such worlds, regardless of the truth value of the consequent at those worlds. But for all other worlds – all C worlds where *A* is true – the interpreter must compute a value based on the actual meaning of *B*. Hence, the local context for *B* (the consequent) consists of C & *A*, just as in the Karttunen/Heim account.

Schlenker 2009 demonstrates that his account largely makes the same predictions as Heim's. (Schlenker accounts for the facts pertaining to quantified sentences by allowing the local context for a VP to be a set of properties.) The two central assumptions required for predicting local contexts are (i) the truth conditional requirements of complex sentences and (ii) the assumption that sentences are interpreted incrementally, left-to-right. This latter assumption means that the computation of the local context for a constituent K in a complex sentence can take into account the information already provided by constituents earlier in the sentence, as illustrated in the case of the conditional. Schlenker also, though, considers a symmetric variant of the account, one which also allows material which follows a constituent to be informative with respect to the local context. This approach is motivated by the observation that in some cases, presuppositions can be filtered by later material, as illustrated by disjunctions like (13)a. and conditionals with postposed antecedents, like (13)b.

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[5] A natural alternative would be to restrict the domain of the function to C worlds. Schlenker eschews this option in order to maintain a bivalent semantics.

(13) a.   Either John has stopped smoking, or he never smoked.
     b.   John has stopped smoking, if in fact he ever smoked.

Schlenker bills his account as pragmatic and static. It is static, in that it assumes straightforward static truth conditional contents for sentences. It is pragmatic in the sense that it makes no new claims about semantic content. It is perhaps also intended as a pragmatic account in the sense that local contexts are motivated by claims about what is easy for interpreters to do (2010: 381); but as Schlenker's model cannot possibly be taken as a processing model of any type, it is unclear what might ground such claims.

We noted earlier (section 2.1.) that the local contexts which play such a central role in the Karttunen/Heim account are motivated by the very observations which they are used to explain, opening these accounts to charges of being stipulative. Schlenker, while defining the notion of local context in a very different way, arrives (largely) at the same identification of local contexts; similarly, as we saw above, van der Sandt offers parallels with anaphora as further motivation for an analysis which has many commonalities with Karttunen/Heim. This convergence of results gives us good reason to believe that local contexts really are an important part of an explanatory semantic theory.

4.   Projection without lexical triggering

4.1. Contextual presupposition

All of the literature on projection that we have discussed so far, beginning with Karttunen 1974, shares a basic assumption: that presuppositions are lexically triggered, hence are associated with any constituent that contains the trigger. In contrast, Stalnaker 1974 conjectures "that one can explain many presupposition constraints in terms of general conversational rules without building anything about presuppositions into the meanings of particular words or constructions" (212).

Are there cases of presuppositions clearly not associated with a lexical trigger? Kadmon 2001: 213-217, and Simons 2004, 2013 have argued that there are, and that these presuppositions (which Simons calls *contextual presuppositions*) can show standard projection behavior. For example, consider the following:

(14) Ann: Shall we go on a picnic?
     Bud: It's raining.

Bud implicates an answer to Ann's question (no picnic); in order for Ann to recognize this implicature, she must assume that Bud assumes some relation between going on picnics, and rain – presumably, that rain excludes picnics. Bud's utterance signals that he takes this assumption to be part of the common ground, i.e. to be presupposed. Now, suppose that Bud had replied with any of the following:

(15) a.   It's not raining.
     b.   It might be raining.
     c.   Is it raining?

To establish any of these responses as relevant requires the same presupposition, that rain excludes picnics. So, in the context given, utterance of the atomic sentence *it's raining* generates a presupposition that it shares with utterances of the standard projection variants. Yet this presupposition clearly is not lexically triggered. It is generated by the need to make sense of the speaker's raising of the issue of rain in the context of the discussion of going on a picnic.

Kadmon is optimistic that the projection behavior of presuppositions of this type can be adequately handled within Heim's system. In particular, she suggests (p.216) that the familiar relevance constraints could be taken to operate at the level of local contexts. Working out this suggestion in full detail would require coming to grips with the questions raised earlier about the status of Heimian local contexts; for conversational principles cannot be applied to purely formal constructs.[6] More generally, the question is whether it is plausible to assume that contextual presuppositions are appropriately analyzed as properties of sentence subparts, or should instead be taken to be properties of the utterance. This remains an open question.

4.2. Projection and at-issueness

Kadmon, while entertaining the possibility that at least some presuppositions have a pragmatic source, remains committed to the view that projection is governed by (dynamic) semantic mechanims. Roberts et al. 2009 and Simons et al. 2010 argue instead that projection is a discourse based, pragmatic phenomenon, while agreeing that both conventional and pragmatic factors play a role in determining what components of meaning have the capacity to project. In their approach to projection, these authors argue that accounts of projection should take

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[6] In a similar vein, Abrusan (2011a,b) proposes a pragmatic account of verbal presuppositions, but assumes that her pragmatic principles will generate presuppositions that associate with atomic clauses, whose projection behavior can be accounted for by an independent projection mechanism.

seriously the observation that many kinds of contents can project. (See e.g. Potts 2005 on projection of Conventional Implicatures.) Rather than developing an account of projection properly applicable only to (purported) presuppositional contents, and looking for alternative accounts of "special cases," Roberts and Simons (together with their collaborators David Beaver and Judith Tonhauser) argue that projection should be recognized as a broad linguistic phenomenon which cross-cuts the standard distinctions among content types. They argue further that there is one unifying property of projective content: roughly, the property of being non-main-point, or *not-at-issue*, content (Potts 2005, Amaral et al. 2007; see Abbott 2000 for a related view). In this work, at-issueness is characterized in terms drawn from Roberts' 1998/2012 model of discourse: not-at-issue content is content which is not presented as intended to address the Question Under Discussion. Some content is signalled as not-at-issue by virtue of linguistic form; for example, the use of a non-restrictive relative clause may have this function. Some content is signalled as not-at-issue by virtue of intonation (see Beaver 2010, Tonhauser 2016, Simons et al. 2017, Stevens et al. 2017). And sometimes, content is recognized as not-at-issue through conversational inference (again, see Simons et al. 2017). Typically presuppositional contents project when not-at-issue; in special cases where those contents become at-issue, they fail to project, and instead fall under the scope of the relevant sentence embedder. For experimental investigation of the correlation between projection and at-issueness, see Xue and Onea 2011, Destruel et al. 2015, Tonhauser, Beaver and Degen 2018.

Beaver, Roberts, Simons and Tonhauser have not, as yet, provided a fully general and predictive account of projection and filtering. This is at least partly due to the very different approach of this group to the phenomenon. On the standard view, theories of projection are theories of properties of sentence types. Sentences are reasonably well behaved objects, and it is relatively easy to identify some well defined class of them to theorize about. On the BRST view, a theory of projection is a theory of properties of utterances and discourses. Utterances and discourses are difficult to individuate or to organize into clearly defined classes. Nonetheless, work on the ways in which context and discourse contribute to projection behavior is ongoing.

5. Final Remarks

Heim 1983a is, of course, a paper about presupposition projection. But perhaps its major significance lies in its role in launching the dynamic turn in formal semantics. The fundamental ideas of context and context change that Heim presented in this brief paper are now part of the basic toolkit of semantics. At the same time, the paper established presupposition and presupposition projection as a topic of central concern for dynamic semantics.

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