

Experimental Pragmatics: a Gricean turn in the study of language

Ira A. Noveck and Anne Reboul

Laboratoire sur le Langage, le Cerveau et la Cognition (L2C2), Institut des Sciences Cognitives, UMR5230 CNRS-Université de Lyon 1, 67 Boulevard Pinel, 69675 Bron, France

Discerning the meaning of an utterance requires not only mastering grammar and knowing the meanings of words but also understanding the communicative (i.e. pragmatic) features of language. Although it has been an ever present aspect of linguistic analyses and discussions, it is only over the last ten years or so that cognitive scientists have been investigating – in a concerted fashion – the pragmatic features of language experimentally. We begin by highlighting Paul Grice’s contributions to ordinary language philosophy and show how it has led to this active area of experimental investigation. We then focus on two exemplary phenomena – ‘scalar inference’ and ‘reference resolution’ – before considering other topics that fit into the paradigm known as ‘experimental pragmatics’.

Discerning the meaning of an utterance requires more than just knowing the meaning of words and having a mastery of grammar. Understanding a speaker’s meaning involves, among other things, inferring conclusions, acceding to indirect requests and referring to objects in (or out of) view. More importantly, understanding an utterance requires access to, or hypotheses about, the speaker’s intention. In other words, understanding utterances involves understanding the communicative (i.e. pragmatic) features of language. Although it has been an ever present aspect of linguistic analyses and discussions, it is only over the last ten years or so that cognitive scientists have been investigating pragmatic features experimentally in a concerted fashion.

This relatively recent turn can be traced back further, namely to Paul Grice and his philosophical approach to utterance understanding. Here, we focus on Grice’s contributions to ordinary language philosophy and show how they have led to experimental investigations in the cognitive sciences. We then briefly review two areas of experimental investigation – ‘scalar inference’ and ‘reference resolution’ – that have been influenced by Gricean analyses. The first, which has been investigated more intensively in Europe, concerns the way the use of one – typically logical – term seems to imply the rejection of another stronger, related term (e.g. how ‘some’ implies ‘not all’). The second, which has been pursued mostly in North America, covers the way references to objects are made. We then turn to other topics that can or do fall under the rubric of what is often referred to as ‘experimental pragmatics’

[1]. To conclude, we underline how this scientific development is not entirely unexpected.

What does ‘mean’ mean?

Grice’s [2] initial contribution was to propose a novel analysis of meaning. He distinguished ‘sentence meaning’ (the semantic properties of a sentence assigned to it by the grammar) and ‘speaker’s meaning’ (what the speaker actually intended to communicate by uttering a sentence). Retrieving a sentence meaning from an actual utterance is a matter of decoding that sentence, that is, of discovering the semantic properties that the grammar pairs to its acoustic form. Retrieving the speaker’s meaning involves attributing to him or her a special kind of intention, the intention of producing a cognitive effect in an audience and of doing so by causing the audience to recognize that very intention. In other words, although linguistic communication is partly code-based, it cannot be reduced to a mere encoding–decoding process. It involves the attribution of mental states to the speaker.

Beginning in his William James lectures, Grice [2] went further by proposing that conversation rested on a ‘principle of cooperation’, requiring interlocutors to ‘make (their) conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which (they) are engaged’. This principle was explicated in several maxims of conversation, which the speakers are supposed to follow. For example, the ‘Maxims of Quantity’ are ‘make your contribution as informative as is required and not more informative than is required’ and the Maxims of Quality basically say be truthful – ‘do not give information that is false or that is not supported by evidence’. The passage from sentence meaning to speaker’s meaning can then be explained by an inferential process that is guided by the expectation that the speaker has complied with the maxims. In this way, Grice [2] laid out philosophical foundations to communication.

Gricean principles were soon considered to explain experimental results, for example, with respect to metaphor [3], the development of sarcasm [4], survey responses [5] and reasoning problems [6,7]. However, it soon became apparent that Grice’s [2] theory was not designed to make specific experimental predictions, but rather to make interesting distinctions between utterances. It would take offshoots having a cognitive theoretic bent to achieve experimental viability. This can be demonstrated best with our first case study, which often falls under the rubric of ‘scalar implicatures’.

Corresponding author: Noveck, I.A. (noveck@isc.cnrs.fr).

Scales and Inference

John Stuart Mill noted (as cited in Ref. [8]), that utterances such as ‘I saw some of your children today’ are often interpreted as ‘I didn’t see all of your children today’ because if the speaker meant the more informative ‘all’, he would have said so. Although intuitive, this interpretation raises an inconsistency because the semantic meaning of ‘some’ is, in fact, compatible with ‘all’. (To appreciate this, consider a teacher who coyly tells her students ‘some of you passed the exam’ when in fact she knows they all did; although speaking truthfully, she is guilty only of not being forthcoming.) Explanations aside, this sort of narrowing of ‘some’ to mean ‘some but not all’ can seem so common that many believe that ‘some’ actually means ‘some but not all’. Grice [2] coined a term for this sort of inference – ‘generalized conversational implicatures’ – which are pragmatic inferences linked to propositions that seem to be common, making them valid pragmatically, but not logically. How exactly can Grice’s notion be put to work to be amenable to linguistic analysis?

One class of proposals has been influenced by an account developed by Laurence Horn (as summarized in Ref. [8]), a self-described neo-Gricean who aimed to streamline Grice’s maxims. For those cases like ‘some’, he argues that the derivation of generalized implicatures relies on pre-existing linguistic scales consisting in a set of expressions ranked by order of informativeness (e.g. <some, all>) where the former is less informative than the latter. When a speaker uses a term that is low in order of informativeness (e.g. ‘some’ in John Stuart Mill’s example earlier), the speaker can be perceived to implicate that the proposition that would have been expressed by the stronger term in the scale (all) is false. This can be generalized to a host of scales. Consider one for the logical terms ‘or’ and ‘and’ (where the former is less informative than the latter). If a speaker says that her suitor brought ‘flowers or champagne’, it can implicate that it is false that he brought both because the speaker would have been more appropriately informative by saying ‘flowers and champagne’. It is the ubiquity of scales that led many to dub narrowing a ‘scalar implicature’.

Following up on this approach, Stephen Levinson [9], a fellow neo-Gricean, proposes that these so-called scalar implicatures are generated automatically every time weak terms (on the scale of informativeness) are used. Furthermore, he proposes that these implicatures can be cancelled to provide the hearer with the semantic meaning in certain contexts. An even more circumscribed view comes from Chierchia and colleagues [10] who propose that scalar implicatures always occur, except in a specific grammatical category (referred to as ‘downward entailing’) that includes negations, question forms and antecedents of conditionals. This would predict that a phrase containing ‘or’ in the consequent of a conditional (the clause following ‘then’ in ‘if A then B or C’) should be read as exclusive (as ‘B or C but not both’), whereas a phrase containing ‘or’ in the antecedent of a conditional (the clause preceding ‘then’ in ‘if A or B then C’) would not (thus, ‘A or B’ here would be read as ‘A or B and perhaps both’) [11].

In contrast to this class of proposals that assumes that narrowings are omnipresent, relevance theory, an alterna-

tive post-Gricean theory, defends a diametrically opposing view. According to this account, the semantic reading of a term such as ‘some’ could very well be good enough, not needing narrowing at all, and when there is narrowing it is determined by context every time. In other words, relevance theory does not assume that a semantic reading of ‘some’ relies on a general and automatic mechanism that first narrows ‘some’ to ‘not all’. It also follows that relevance theory does not assume that access to the semantic meaning of ‘some’ requires an extra step that cancels the implicature. Furthermore, all other things being equal, relevance theory predicts that utterances understood with a narrowed meaning of ‘some’ ought to require more effort than those that are not [12].

It is in this post-Gricean theoretical environment that experimental work has been carried out on so-called scalar implicatures with both children and adults, producing robust results. Developmentally speaking, one finds that narrowed readings occur more frequently with age, indicating that interpretations from younger participants rely on semantic readings. Part of this claim comes from findings showing that children are less likely than adults to reject underinformative sentences such as ‘Some elephants have trunks’ [13]. Although the youngest ages at which one reliably finds evidence of narrowed interpretations in a given experiment changes according to the (difficulty of the) task, the developmental trajectory (from semantic to narrowed) is present consistently, even as languages and types of underinformative sentences vary [14,15]. **Box 1** presents the set up and results from a recent task that relies on non-verbal responses [16].

Among adults, pragmatic enrichments are linked with processing effort. Bott and Noveck [17] used a categorization task that included underinformative statements such as ‘Some cats are mammals’ and controls such as ‘All cats are mammals’, ‘All mammals are cats’ and ‘Some mammals are cats’. Again, the underinformative items are crucial because these can be considered true with a semantic (‘some and perhaps all’) reading and false with a narrowed (‘some but not all’) reading. Usually, false responses to underinformative statements are slower than true responses in addition to all the (true and false) control statements. In the same vein, responses reflecting narrowed interpretations become more frequent as response latency increases. When participants are limited to 900 ms in which to respond, they provide significantly more true responses (which are indicative of semantic readings) to a statement such as ‘Some cats are mammals’ than when the allowable response time is increased to 3 s (i.e. false responses, which point to narrowed readings, increase with time). Similar response-time results have been reported among adults with respect to the underinformative items described earlier (‘Some elephants have trunks’) [18] and with underinformative disjunctions [19]. To appreciate the latter, consider a situation where a participant sees a five letter word, such as ‘TABLE’, and then hears ‘There is an A or B’, which is to be evaluated as true or false; this is true with a semantic reading and false with a narrowed one. Moreover, responses pointing to narrowed readings are less likely to occur when participants are required to simultaneously carry out a second task [20].

Box 1. Young children's abilities at computing scalar inferences

In an effort to show that children are usually able to carry out scalar inferences but are still more likely to do so as they become older, Pouscoulous *et al.* [16] simplified previous versions of the task and avoided verbal judgements (Table I). They presented 4-year-olds, 5-year-olds, 7-year-olds and adults with three kinds of scenarios: one in which two of five open boxes contain a token (the 'subset' scenario), one in which all five boxes contain a token (the 'all' scenario) and a third in which no boxes contain a token (the 'none' scenario). A puppet presents four utterances for each of the contexts. The critical item in the experiment occurred when the puppet said (in French) 'I would like some boxes to contain a token' in the 'all' scenario. If a participant narrows 'some' to mean 'some but not all' then one would expect the participant to remove items. If the

participant maintains a semantic reading (where 'some' is compatible with 'all'), one would expect children to leave things as they were. The control items (only one of which is shown in Table I) demonstrate that the participants have no difficulty correctly adding and removing items as a response to the puppet's request. In fact, the 'some' utterance in the 'subset' scenario showed that participants tend to add tokens even though this is optional (the 100% figure in each set of parentheses essentially indicates that anywhere from 11% to 36% of each age group added one or two tokens without changing the truth value). When it comes to the 'some' utterance in the 'all' scenario, the majority of children make a change (i.e. a minority keep the scenario as is). Nevertheless, the likelihood of applying a change increases monotonically with age.

Table I. The three scenarios presented in Pouscoulous *et al.* [16] and the responses to two (of four) presented utterances

	Age	Number	Subset scenario ■□□■□	All scenario ■□□□■	None scenario □□□□□
'some' utterance:			^a (LR: Keep as is)	(LR: Keep as is)	(LR: Change)
I would like some boxes to contain a token	4	66	64 (100)	32	100
	5	30	67 (100)	27	100
	7	54	89 (100)	17	100
	A	21	80 (100)	14	100
'all' utterance:			(LR: Change)	(LR: Keep as is)	(LR: Change)
I would like all the boxes to contain a token	4		95	97	100
	5		100	97	100
	7		100	100	100
	A		100	100	100

Reproduced, with permission, from Ref. [16], see <http://www.informaworld.com>.

^aLR, Logical Response

One does not need to rely on underinformative statements to investigate narrowings. A self-paced reading task can also be employed [21]. Consider the disjunctive phrases in the examples (i) and (ii) (a slash bar indicates where readers are required to hit a key to advance). Although the semantic reading ('class notes or summary or perhaps both') of the disjunctive phrase is appropriate for the lower-bound context of (i), the narrowed reading ('class notes or summary but not both') is more felicitous for the context of upper-bound contexts of (ii):

(i) Lower-bound context

John heard that / the textbook for Geophysics / was very advanced. / Nobody understood it properly. / He heard that / if he wanted to pass the course / he should read / the class notes or the summary.

(ii) Upper-bound context

John was taking a university course / and working at the same time. / For the exams / he had to study / from short and comprehensive sources. / Depending on the course, / he decided to read / the class notes or the summary.

That the disjunctive phrase takes significantly longer to process in (ii) than in (i) is consistent with the findings reported earlier, in which narrowed readings appear to be more effortful than semantic ones.

Interestingly, several papers in development and categorization in the 70's and 80's parenthetically reported results consistent with those just described [22,23]. Nevertheless, their authors often expressed scepticism about their findings because they seemed counter-intuitive. The modern experiments not only confirm these results but also can

determine which Gricean-inspired theory can best make sense of them. In line with relevance theory, the current data show that semantic meanings of weak terms are the ones that are readily accessible to children and adults, whereas the narrowed meanings are associated with extra effort, leading to the intriguing developmental trends and the reaction-time slowdowns. This argues against default accounts that would expect narrowed meanings to be primary and to occur automatically, and would expect semantic meanings to be the result of cancellations.

Definite Reference

In referring to an object, interpretation is usually semantically underdetermined. For example, when an interlocutor says 'I used to work for that paper' (while pointing to the latest edition of a newspaper), the addressee's interpretation relies heavily on identifying the speaker's intention. 'Reference' is, thus, another natural area of utterance interpretation that fits into a Gricean framework and one that has inspired much experimental work. One constraint advanced to determine the speaker's meaning when using reference is 'common ground' (also called 'mutual knowledge'), which is knowledge common to both interlocutors and known by both to be common [24]. The question this literature poses is a familiar one: does common ground directly constrain linguistic interpretation or does it intervene only when needed?

One side of the debate assumes that common ground is so intrinsic to mutual comprehension that it is all that is needed to resolve reference [25]. Two seminal paradigms from Herb Clark and colleagues [25,26] laid the groundwork for this position. In the first, which used repeated references as a measure of production, two separated

Box 2. Investigating the extent to which theory of mind intervenes in reference resolution

This 4x4 array comes from Keysar *et al.* [28]. Figure 1a shows an addressee's perspective on the objects in the grid, whereas Figure 1b shows the speaker's (director's) view. Note how three objects are occluded from the speaker's view. Now, consider a director's request to 'pick up the small candle.' It ought to refer to what is actually the medium sized candle (Figure 1a) because the director cannot know that there is another, even smaller candle around. Nevertheless, the gaze to the 'intended' object (the medium sized candle) was delayed

by over 500 ms when compared to cases in which the smallest candle was replaced by a control (a non-candle). In a more recent study, Keysar, Lin and Barr [29] showed how this effect persists under more extreme conditions (with a grid having five occluded slots). When a cassette tape is placed in a non-occluded box, a roll of scotch tape in a bag is placed in an occluded box and the director says 'pass the tape,' addressees still demonstrate delays in picking out the cassette tape, even though the potential alternative is not at all visible.

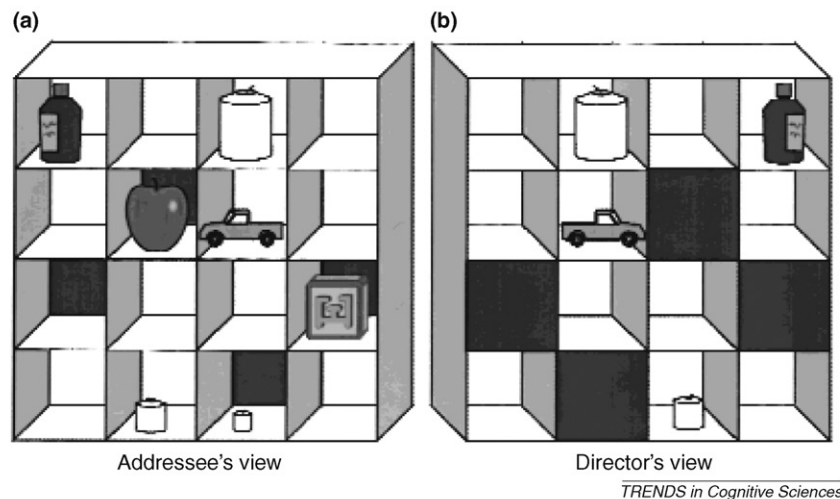


Figure 1. A 4x4 grid containing seven items, as viewed by (a) an addressee and (b) a director (in which the director's view is blocked from seeing four of the slots). Adapted, with permission, from Ref. [28].

interlocutors exchange descriptions and information to organize their (identical) sets of 12 pictures into a particular order [26]. When the 12 pictures represent basic objects (e.g. dog, toy, car and so on), participants refer to these with their common names, but when a second set of 12 pictures is introduced which includes four objects of the same category (e.g. 4 dogs or 4 cars), they are likely to use more specific references (e.g. 'red Labrador' instead of 'dog'), indicating that the specificity of reference is modified by context. Interestingly, when given one of the specifically described (more informative) items from the second set as part of a third phase – which returns to using 12 common basic objects – participants continue to use the more specific reference they established in the second round. This persistence is said to exploit 'lexical entrainment' [27], which is the idea that once interlocutors hit upon a common expression to refer to a specific object, they continue to do so even if it seems overinformative. This indicates that a conceptual pact between interlocutors takes precedence over being just informative enough on each occasion.

In the second, which relies on measures of comprehension, addressees are required to pick out a reference based on presented questions. For example, Clark and his colleagues [25] presented a photo containing Ronald Reagan (a well known figure) and David Stockman (less well known) to unsuspecting strollers on the Stanford University campus and said 'You know who this man is, don't you?' or 'Do you have any idea who this man is?'. The first question led most participants to choose Ronald Reagan with confidence and the second led no one to choose Ronald Reagan with confidence, with most indicating David Stockman as a first approximation. The authors claimed that the

form used by the questioner presupposes what is part of common ground and enables the author to pick out the salient reference.

Much debate has swirled around addressee's reference resolution and mostly with respect to comprehension, making it a current topic for experimental pragmatics. Notably, Keysar and colleagues [28] maintain that a listener does not immediately take into consideration the speaker's point of view, indicating that theory of mind is not the only constraint that drives reference resolution. This claim is based on a scenario that has several objects distributed in the slots of a 4x4 grid. Whereas addressees can see all the objects in the grid, speakers can see only 12 of the slots and, thus, not all of the objects (see Box 2). Keysar *et al.*'s [29,30] eye-tracking data indicate that – for situations in which a speaker's intended reference could only be an object that is commonly viewed – listeners cannot prevent themselves from first fixating on a non-intended item (one that matches the speaker's description even though it is out of speaker view) before fixating on the intended referent.

These claims have not gone unheeded. In defence of a strong common ground approach, other eye-tracking studies on definite reference with adults and children claim that participants can indeed be shown to integrate common ground information on-line [31,32]. In a study with adults, Hanna *et al.* [31] show that when a scene is limited to four described and pictorially represented objects – say two martini glasses and two jars – only one of which has olives in it (e.g. a martini glass), a definite reference to a martini glass such as 'Pick up the empty martini glass and put it. . .' leads to a rather early focus on the one empty martini glass

(i.e. as soon as the speaker says ‘the empty’). This is taken to indicate that participants are exploiting linguistic cues (because the definite article points to a contrast with the full glass) and that theory-of-mind constraints must be accessed practically on line.

In a developmental study, Nadig and Sedivy [33] placed a 2x2 grid (having one of its four slots occluded from the speaker) between a confederate-speaker and 6-year-old participant-listeners. The critical test item always concerned a request, for example, ‘Pick up the glass’ said about a tall glass sitting in one of the mutually visible slots. Three different configurations of four objects can be made visible to the children, yielding three conditions: in one condition there is another, smaller glass in an open slot (visible to both interlocutors) creating a ‘referential ambiguity’; in a second condition, called the ‘privileged ground condition’, the second smaller glass is in the occluded slot, and; in the baseline condition, there are three other objects, none of which is a glass. Their results show that, unlike the case that creates referential ambiguity (in which children indeed look at one or the other glass until they ask for further clarification), the privileged ground condition prompts children to focus exclusively on the mutually

visible glass within 760 ms after the word ‘glass’ is spoken. Although it is the baseline condition that provides the most efficient means for prompting exclusive looks to the tall glass among the children, the data indicate that children readily take into account the speaker’s point of view.

Regardless of one’s view on common ground, one can see how Grice’s [2] distinction between sentence meaning and speaker meaning yields fruit in this area of research as well. A sentence indicating a reference cannot in itself provide the listener with relevant clues. Some amount of inference is needed to close the gap between sentence meaning and speaker meaning. To pick out a reference, the addressee needs to take into account the speaker’s intention. This literature shows that this gap-closing is not always free.

What is at stake?

Taken together, these two phenomena reveal what factors are in play when discussing utterance interpretation, which are ‘code’ (the words used), the (non-demonstrative) inferences they engender in context and a role for intentions (theory of mind). In the case of scalars, the theoretical tension has focused on the relative importance of code and inference, in which some researchers aim to include narrowing into the code (e.g. by making the distinction based on downward entailment) and others defend a role for non-grammatical factors such as theory of mind and effort (relevance theory). In the case of definite reference, the tension concerns the extent to which theory of mind, or perspective, matters in sentence interpretation. Some argue that theory of mind actually leads to preferential treatment (as part of privileged ground) and others point out that theory of mind constrains reference, but without it being primary. What is common to both debates is that, on the one hand, there are those who defend an effortful inferential approach to determining speaker’s meaning and, on the other, there are those who ascribe to language a way to resolve meaning (without recourse to extra effort). Both literatures indicate that a given inference (whether it be a scalar or a referential one) is more accessible as a scenario is made simpler and clearer.

The promise of experimental pragmatics is threefold. First, it can inform the field of linguistic-pragmatics, which has historically relied on linguistic intuition and armchair theorizing. Second, by incorporating experimental paradigms, one can better characterize the cognitive factors at play in communicative exchanges, which include features (e.g. theory of mind and scalars) that are not traditionally associated with psycholinguistics. Finally, Gricean pragmatics can be extended to a wide variety of topics. **Box 3** briefly describes three other active areas of investigation – indirect requests, word learning and aspectual coercion – that naturally fit into the experimental pragmatic approach (or arguably ought to). There are many more current topics to choose from (e.g. metaphor [34,35], disambiguation [36–38], jokes [39] and idioms [40]) and presumably even more to be discovered (see **Box 4**).

To conclude, we point out how the experimental pragmatic paradigm is exemplary of how the cognitive sciences can work together in harmony. The ideas here were defined by philosophers and elaborated upon further by linguists

Box 3. Brief descriptions of three other topics for the domain of experimental pragmatics

Indirect requests

Consider how often one is asked, ‘Do you have the time?’. Even though the addressee is not actually asked to provide the time, the listener probably will anyway. Also, consider how often one rounds up or down when responding to such requests. A small literature has cropped up around such indirect requests and it shows that participants (most of whom are unaware that they are part of an experiment) readily go beyond the explicit meaning of the requests [42]. Moreover, participants become more precise as the implicit importance of the request increases (e.g. when the confederate says ‘I have a meeting at 4 o’clock, do you have the time?’, addressees are more likely to become precise as 4 o’clock approaches) [43,44].

Word learning

How do children learn new words? Based on empirical data, the principle of ‘mutual exclusivity’ (when faced with a new word and two objects, one nameless and one for which she already has a word, a child will link the new name with the nameless object) has been used to account for the fact that more than 30% of words are not learned through association based on spatiotemporal contiguity [45]. It has also been given a pragmatic interpretation. Diesendruck and colleagues [46] have proposed support for an account based on speaker’s intention and knowledge. Their data show that, when 2-year-olds are presented with two new objects (A and B) and given information (either a ‘label’ or a ‘fact’) regarding only one object, they usually attribute a new name to the non-described object.

Aspectual coercion

Consider the sentence ‘The journalist began the article before his coffee break’. This could mean he began reading the article or, more likely, that he began writing it. Although it is a felicitous sentence, it typically takes longer to read than a control sentence such as ‘The journalist wrote the article before his coffee break’ [47]. Moreover, a study using techniques from Magnetoencephalography indicates that to coerce a meaning out of the first sentence, it takes longer to judge (as makes sense) and invokes unique activity in the anterior medial frontal lobes, which are areas usually associated with social cognition and theory of mind [48]. This area of investigation is not traditionally associated with pragmatics, but the data fit nicely into such a perspective.

Box 4. Outstanding questions

- When adult responses reveal equivocality (between semantic and narrowed readings) to scalar tasks, does this indicate more access to pragmatic responses (compared to children) or perhaps an awareness of both types of response?
- How can one reconcile the developmental progression of narrowing with respect to scalar implicatures and the apparent facility with which young children make definite reference in eye-tracking studies?
- If lexical entrainment does not rely on assumptions about the specific referring intentions of the speaker, but on a linguistic heuristic (general expectations about language use) [49], how can such a heuristic be described?
- Can metaphor be viewed as a process of narrowing the way scalars are?
- To what extent does the disambiguation of a sentence such as 'Every horse did not jump over the fence' rely on pragmatic processes?
- Given that children who cannot yet pass standard false belief tests can nevertheless rely on a speaker's false belief to acquire new words [50], to what extent does this early ability among word-learners support the thesis that there is a Theory-of-Mind (ToM) module specific to (linguistic) communication [51] or throw doubt on claims [52] about non-precocious false belief development?

and psychologists before being investigated experimentally by linguists, psychologists and neuroscientists alike. This is the kind of concerted effort that was anticipated by scholars at the dawn of the modern cognitive science era (e.g. see Ref. [41]).

Acknowledgements

We thank Dan Sperber, Edmundo Kronmuller and three anonymous reviewers for their helpful comments.

References

- 1 Noveck, I.A. and Sperber, D. (2004) *Experimental Pragmatics*, Palgrave Macmillan
- 2 Grice, P. (1989) *Studies in the Way of Words*, Harvard University Press
- 3 Glucksberg, S. et al. (1982) On understanding nonliteral speech: can people ignore metaphors? *J. Verbal Learn. Verbal Behav.* 21, 85–98
- 4 Ackerman, B.P. (1982) Contextual integration and utterance interpretation: the ability of children and adults to interpret sarcastic utterances. *Child Dev.* 53, 1075–1083
- 5 Schwarz, N. (1996) *Cognition and Communication: Judgmental Biases, Research Methods and the Logic of Conversation*, Erlbaum
- 6 Tversky, A. and Kahneman, D. (1983) Extension versus intuitive reasoning: the conjunction fallacy in probability judgment. *Psychol. Rev.* 90, 293–315
- 7 Politzer, G. and Noveck, I.A. (1991) Are conjunction rule violations the result of conversational rule violations? *J. Psycholinguist. Res.* 20, 83–103
- 8 Horn, L. (2004) Implicature. In *Handbook of Pragmatics* (Horn, L. and Ward, G., eds), pp. 3–28, Blackwell
- 9 Levinson, S. (2000) *Presumptive Meanings*, MIT Press
- 10 Chierchia, G. (2004) Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In *Structures and Beyond* (Belletti, A., ed.), pp. 39–103, Oxford University Press
- 11 Noveck, I.A. et al. (2002) Linguistic-pragmatic factors in interpreting disjunctions. *Think. Reason.* 8, 297–326
- 12 Sperber, D. and Wilson, D. (1995) *Relevance: Communication and Cognition*, Basil Blackwell
- 13 Noveck, I.A. (2001) When children are more logical than adults: investigations of scalar implicature. *Cognition* 78, 165–188
- 14 Papafragou, A. and Musolino, J. (2003) Scalar implicatures: experiments at the semantics-pragmatics interface. *Cognition* 86, 253–282
- 15 Guasti, M.T. et al. (2005) Why children and adults sometimes (but not always) compute implicatures. *Lang. Cogn. Process.* 20, 667–696
- 16 Pouscoulous, N. et al. (2007) Processing costs and implicature development. *Lang. Acquis.* 14, 347–375
- 17 Bott, L. and Noveck, I.A. (2004) Some utterances are underinformative: the onset and time course of scalar inferences. *J. Mem. Lang.* 51, 437–457
- 18 Noveck, I.A. and Posada, A. (2003) Characterizing the time course of an implicature: an evoked potentials study. *Brain Lang.* 85, 203–210
- 19 Chevallier, C. et al. (2008) Making Or exclusive. *Q. J. Exp. Psychol.* 61, 1741–1760
- 20 De Neys, W. and Schaeken, W. (2007) When people are more logical under cognitive load: dual task impact on scalar implicature. *Exp. Psychol.* 54, 128–133
- 21 Breheny, R. et al. (2006) Are generalized scalar implicatures generated by default? An on-line investigation into the role of context in generating pragmatic inferences. *Cognition* 100, 434–463
- 22 Braine, M.D. and Romain, B. (1981) Development of comprehension of 'or': evidence for a sequence of competencies. *J. Exp. Child Psychol.* 31, 46–70
- 23 Rips, L.J. (1975) Quantification and semantic memory. *Cognit. Psychol.* 7, 307–340
- 24 Clark, H. (1996) *Using Language*, Cambridge University Press
- 25 Clark, H.H. et al. (1983) Common ground and the understanding of demonstrative reference. *J. Verbal Learn. Verbal Behav.* 22, 245–258
- 26 Brennan, S.E. and Clark, H.H. (1996) Conceptual pacts and lexical choice in conversation. *J. Exp. Psychol. Learn. Mem. Cogn.* 22, 1482–1493
- 27 Garrod, S. and Anderson, A. (1987) Saying what you mean in dialog: a study in conceptual and semantic co-ordination. *Cognition* 27, 181–218
- 28 Keysar, B. et al. (2000) Taking perspective in conversation: the role of mutual knowledge in comprehension. *Psychol. Sci.* 11, 32–38
- 29 Keysar, B. et al. (2003) Limits on theory of mind use in adults. *Cognition* 89, 25–41
- 30 Keysar, B. et al. (1998) Definite reference and mutual knowledge: process models of common ground in comprehension. *J. Mem. Lang.* 39, 1–20
- 31 Hanna, J.E. et al. (2003) The effects of common ground and perspective on domains of referential interpretation. *J. Mem. Lang.* 49, 43–61
- 32 Sedivy, J.C. (2003) Pragmatic versus form-based accounts of referential contrast: evidence for effects of informativity expectations. *J. Psycholinguist. Res.* 32, 3–23
- 33 Nadig, A. and Sedivy, J. (2002) Evidence of perspective-taking constraints in children's on-line reference resolution. *Psychol. Sci.* 13, 329–336
- 34 Rubio Fernández, P. (2007) Suppression in metaphor interpretation: differences between meaning selection and meaning construction. *J. Semant.* 24, 345–371
- 35 Wilson, D. and Carston, R. (2006) Metaphor, Relevance and the 'emergent property' issue. *Mind Lang.* 21, 404–433
- 36 Musolino, J. and Lidz, J. (2006) Why children are not universally successful with quantification. *Linguistics* 44, 4817–4852
- 37 Gualmini, A. (2005/2006) Some facts about quantification and negation one simply cannot deny: a reply to Gennari and MacDonald. *Lang. Acquis.* 13, 363–370
- 38 Noveck, I.A. et al. (2007) What autism can tell us about *Every...not* sentences. *J. Semant.* 24, 73–90
- 39 Coulson, S. et al. (2006) Looking back: joke comprehension and the space structuring model. *Humor* 19, 229–250
- 40 Laurent, J.P. et al. (2006) On understanding idiomatic language: the salience hypothesis assessed by ERP's. *Brain Res.* 1068, 151–160
- 41 Austin, J.L. (1956) Ifs and cans. *Proc. Br. Acad.* 42, 109–132
- 42 Clark, H. (1979) Responding to indirect speech acts. *Cognit. Psychol.* 11, 430–477
- 43 Van der Henst, J.B. et al. (2002) Truthfulness and relevance in telling the time. *Mind Lang.* 17, 457–466
- 44 Gibbs, R. and Bryant, G.A. (2008) Striving for optimal relevance when answering questions. *Cognition* 106, 345–369
- 45 Clark, H.H. and Clark, E.V. (1977). *Psychology and Language*, Harcourt, Brace, Jovanovich
- 46 Diesendruck, G. et al. (2004) Two-year-olds' sensitivity to speakers' intent: an alternative account of Samuelson and Smith. *Dev. Sci.* 7, 33–41
- 47 Frisson, S. and McElree, B. (2008) Complement coercion is not modulated by competition: evidence from eye movements. *J. Exp. Psychol. Learn. Mem. Cogn.* 34, 1–11
- 48 Pylkkänen, L. and McElree, B. (2007) An MEG study of silent meaning. *J. Cogn. Neurosci.* 19, 1905–1921

- 49 Kronmüller, E. and Barr, D.J. (2007) Perspective-free pragmatics: broken precedents and the recovery-from-preemption hypothesis. *J. Mem. Lang.* 56, 436–455
- 50 Happé, F. and Loth, E. (2002) 'Theory of Mind' and Tracking Speakers' Intentions. *Mind Lang.* 17, 24–36
- 51 Sperber, D. and Wilson, D. (2002) Pragmatics, Modularity and Mind-reading. *Mind Lang.* 17, 3–23
- 52 Perner, J. *et al.* (2007) Objects of desire, thought, and reality: problems of anchoring discourse referents in development. *Mind Lang.* 22, 475–513