4 Seeing and Hearing Meanings

A Non-Inferential Approach to Speech Comprehension

Berit Brogaard

1. Introduction

When I tell my dog James to sit, most of the time he sits. When I tell him to stay, most of the time he stays. When I tell him to come, most of the time he comes. When I say 'good boy!', he wags his tail. A loud 'stop it!' when he barks at inappropriate times usually makes him stop barking. Does James understand the commands 'sit', 'stay' and 'come'? Does he understand that 'Good boy!' conveys that he is being good? Does he understand that 'Stop it!' conveys that he is engaging in bad behavior? Judging from the reliability of his behavioral responses to my commands and words of praise or criticism, he does indeed understand these phrases on some level. But what is the nature of this type of understanding?

It may be thought that dogs come to understand commands, praise, and criticism by engaging in instrumental reasoning that take the form of a conscious or consciously accessible inference. We will probably never know for sure whether they do. But it seems unlikely (Millikan, 2006). Certainly, prior to James' behavioral responses to the command 'come', James is not in the business of performing a practical inference that has any semblance of the following piece of reasoning: 'My owner said 'come.' When she says 'come' she wants me to run to where she is. I want to satisfy her desires. So, it is in my best interest to run to where she is'. Although it is difficult to know exactly how sophisticated non-human animal minds are, it is almost certain that James did not perform a conscious or consciously accessible inference of this sort.[1] But if he did not, in what sense does he understand the phrases to which he responds?

There is a simple and an initially plausible answer to this question: Dogs and other sophisticated non-human animals are capable of perceiving the distinct sound patterns of the phrases that people use with them. The distinct sound patterns trigger specific behavioral responses, as predicted by the phenomena of classical as well as operant conditioning (Rescorla, 1988; Bouton, 2016). So, understanding in dogs and other sophisticated non-human animals amounts to no more than a sensory detection of

sounds and associative learning via classical or operant conditioning. No mystery here. Or so the envisaged explanation goes. When I want James to sit, I use the word 'sit'. Usually he responds by sitting. But I could have trained him differently. Instead of using the word 'sit' I could have used a hand signal, a whistle, a clicker or a flute and received the same result. James could easily have been trained to perform the intended behavior using any kind of audible sound device.

Compare the case of speech 'comprehension' in domestic dogs to that of speech comprehension in neurotypical children who have learned to respond to common phrases and sentences in English. Consider this case. During dinner I notice that my daughter has finished all her French fries but has barely touched her vegetables or chicken. I request that she eat at least some of what is left on her plate. There are a number of distinct ways in which she can satisfy my request. She can eat everything left on her plate, all of her vegetables but no chicken, all of her chicken but none of the vegetables, some but not all of her vegetables, some but not all of her chicken, or some of the chicken and some of the vegetables. Although my daughter must carry out one of the actions in order to satisfy my request, she has a choice as to which of the six possible actions she chooses to perform. She might even put some conscious thought into the options before she decides what to do. However, she likely does not *need* to perform any conscious or consciously accessible inference in order for her to understand what I want her to do.

Despite the fact that children can grasp what is said to them without engaging in inference, their level of understanding seems notably different from what we find in domestic dogs. When I make the request 'Please eat at least some of what is left on your plate!', my daughter most likely doesn't satisfy my request as a result of classical or operant conditioning. That is, she does not merely respond to an experience of a particular pattern of sounds. But if she does not, then how is she capable of understanding what I am saying?

In this chapter I will argue that we typically comprehend speech by sensorily experiencing meanings and without having to rely on conscious, or consciously accessible, inferences.[2] Call this view 'the non-inferential view of speech comprehension'. The meaning experienced may or may not be a meaning the speaker intended to convey or a meaning she successfully conveyed to someone else. When it is not, what is experienced is – with some exceptions – a case of misperception.[3] Misperceiving what a speaker intended to convey or successfully conveyed need not result in miscommunication, however. For example, it may appear to me that you said 'Do you have any *beer*?' when in reality you said 'Do you have anything to drink *here*?'. If my grasping the meaning of 'Do you have any beer?' is a case of perception, it is a case of misperception. However, it needn't be a case of miscommunication – at least not if communication is

miscommunication only insofar as it leads to practical misunderstanding. If I nod and go to the fridge and bring you a beer, you may be perfectly happy. No further questions asked.

The non-inferential view is a view about the nature of understanding. As such, it need not be combined with any particular epistemological theory. As I have argued in previous work (Brogaard, 2016), however, the non-inferential view is particularly attractive when combined with phenomenal dogmatism – the view that phenomenal seemings (or experiences) can confer immediate prima facie justification on belief (Brogaard, 2016, 2017). Here I will defend the non-inferential view on epistemically neutral grounds. That is, I will provide a number of considerations in favor of the non-inferential view that are independent of whether or not one accepts phenomenal dogmatism.

The plan for the chapter is as follows. In Section 2 I specify what I mean by the term 'inference' and look at the types of valid or otherwise legitimate inferences speakers typically make. In Section 3 I look closer at what it means to say that a meaning property is presented in experience. In Section 4 I provide my main arguments for thinking that we frequently perceive apparently conveyed meanings.

2. Linguistic Inferences

Before examining what exactly it means to say that a meaning property is presented in sensory experience and defending the view that they are sometimes thus presented, let's have a closer look at the nature of linguistic inference. Before saying something about *linguistic* inference, however, we need to be clear on what an inference is.

One might suggest that an inference is a process during which a system transitions from the informational content of a state (e.g., a computational, mental or neurological state) to the informational content of another – in accordance with a particular rule set.[4] This definition is clearly too broad. It allows us to truly say of an unconscious machine that it makes inferences as long as it computes information. It also classifies many brain computations that intuitively are not inferences as inferences. Here is an example of a process that is not consciously accessible yet would count as an inference on the broad definition of 'inference' (for discussion, see Brogaard, 2011a). When you reach to and grasp your coffee mug, you automatically fold your fingers in a particular way that fits the handle of the mug. This folding of your fingers is also known as 'the hand aperture'. Your brain calculates the hand aperture it assumes will fit the mug. But there is no way you could reproduce these calculations on a conscious level. The process takes place below the level of conscious awareness and is inaccessible to consciousness. The calculation of the correct hand aperture does not involve *you* making inferences about how to bend your fingers.

'Inference', as the phrase ought to be used, refers to processes performed by entities that at least sometimes are (phenomenally) conscious in the sense of having (phenomenally) conscious mental states (Valaris, 2017).[5] If a transitioning from the content of one mental state or dispositional structure to the content of another is inaccessible to consciousness, then the process takes place only on a subpersonal level and hence does not count as an inference.

Following Daniel Dennett (1969:93), the distinction between the personal level and subpersonal level is grounded in distinct kinds of explanations one can provide for why people behave the way they do. The distinction is that between 'the explanatory level of people and their sensations and activities and the subpersonal level of brains and events in the nervous system' (196, p. 93). Personal level explanations are distinctive kinds of explanation for persons:

> When we've said that a person's in pain, that she knows which bit of her hurts and that this is what's made her react in a certain way, we've said all that there is to say within the scope of the personal vocabulary. . . . If we look for alternative modes of explanation, we must abandon the explanatory level of people and their sensations and activities and turn to the sub-personal level of brains and events in the nervous system.
>
> (1969, p. 93)

Although personal-level explanations may refer to arational mental states like pain, they can also refer to mental states, such as 'needs, desires, intentions, and beliefs', that can be evaluated in terms of rationality, (Dennett, 1969, p. 164). Subpersonal-level explanations, on the other hand, are not concerned with normative properties such as that of being rational; they merely make reference to causal relations and mechanisms.

Inference is a type of process that contributes to making behavior intelligible in terms of norms of rationality. For example, I might make the following inference. 'Otávio turned off the air conditioning in the seminar room. When Otávio turns off the air conditioning, he is cold. Hence, Otávio is cold'. Since the process of transitioning from the content of a mental state or dispositional structure that is inaccessible to consciousness to the content of another (perhaps in accordance with a particular rule set) does not and cannot make behavior intelligible in terms of norms of rationality, these types of processes do not count as inferences.

To recap: 'inference', as the phrase ought to be used, refers to a process of transitioning from the content of one personal-level state to the content of another personal-level state (perhaps in accordance with a particular rule-set). Because unconscious machines do not make computations that transition from the content of a personal-level state to the content of another, they do not make inferences. This definition of

'inference' restricts inferences to those that are either explicit (i.e., the subject is consciously aware of making them) or consciously accessible (i.e., the subject could – under different psychological or environmental conditions of the sort that can obtain in this world – have been aware of making them). This definition leaves out 'inferences' that are subpersonal and therefore not consciously accessible. It also rules out that cognitive penetration – the phenomenon according to which the content of a cognitive state is semantically impacting the content of a sensory experience – is a case of inference, even if it could be likened to inference (Brogaard and Chomanski, 2015). This is because cognitive penetration, as commonly conceived, is not a process accessible to consciousness. It occurs at a subpersonal level. Although it has been argued that cognitive penetration can result in a downgrade of the justificatory status of experiences, the subject would not ordinarily be able to tell whether an experience has been cognitively penetrated (Siegel, 2017; Chudnoff, 2018).

Turning now to linguistic inference, a linguistic inference made by a listener or addressee, then, is a conscious or unconscious (but consciously accessible) process that transitions from the content of one mental state about what was conveyed to the content of another state concerning what was conveyed – in accordance with a particular rule set. When linguistic inferences are valid, the rule set is derived from principles governing inductive or deductive inferences or inferences to the best explanation.

Paul Grice (1975) suggested that when rational agents engage in conversation, all participants in the conversation stand to gain if they all adhere to a super-maxim known as 'the cooperative principle' as well as four sub-maxims:

> *The cooperative principle (super-maxim):* Make your contribution as is required, when it is required, by the conversation in which you are engaged.
> *Quality:* Contribute only what you know to be true. Do not say false things. Do not say things for which you lack evidence.
> *Quantity:* Make your contribution as informative as is required. Do not say more than is required.
> *Relation:* (Relevance): Make your contribution relevant.
> *Manner:* (i) Avoid obscurity; (ii) avoid ambiguity; (iii) be brief; (iv) be orderly.

Grice cites four types of cases in which a conversationalist fails to adhere to the maxims:

(1) *Violation*: A speaker may violate a maxim without making it explicit that she is doing so, for instance, by lying or providing misleading information.

(2) *Opting out*: A speaker may opt out of the conversation by explicitly saying or signaling that she refuses to be cooperative, for instance, by giving the speaker the silent treatment.
(3) *Flouting*: A speaker may flout a maxim. The speaker still adheres to the cooperative principle but she is blatantly violating a maxim to achieve a particular communicative effect.
(4) *Clash*: If two maxims cannot both be satisfied, the speaker is then forced to choose between the two, thus violating a maxim but only because there is no way not to do so.

Grice thought of apparently conveyed meanings as derived from inferences that presume that the speaker knows the conversational maxims. He calls these derived meanings 'conversational implicatures'.

In some cases, conversational implicatures are derived on the assumption that the speaker adheres by all maxims. Consider the following case. Jill points to a group of people at a function she is attending and informs Jack that her friend is the one with glasses. Jack looks at the group and spots a person without glasses, a person with glasses, and a person with a hat and glasses. He assumes that Jill is cooperative and hence is providing all information needed in order for him to unequivocally identify her friend. According to the Gricean model, Jack then infers that if Jill's friend had been the one with both hat and glasses, Jill would have mentioned the hat in addition to the glasses (see Figure 4.1). Since she didn't mention the hat, and since she is cooperative, the friend must be the person with glasses but no hat.

In other cases, implicatures are derived by an inference from a presumed violation of a maxim. Consider the following discourse fragment:

Jill:	I am upset because this student of mine keeps complaining about the grade I gave him in my logic class and now his mother has gotten involved too. She has been calling me three times to try to get me to change his grade.
Jack [sarcastically]:	Yeah, UM students are so independent.

The implicature here is that UM students are not very independent. Here is how Jill might infer this implicature from what Jack said. Jill presupposes that Jack is obeying the cooperative principle. But Jack blatantly violated the maxim of Quality by saying something that he believes to be false. He has done nothing to make Jill think he accidentally violated the maxim. So Jack must be attempting to convey a claim that is different from but related to the one that he semantically expressed. Since he said what he believes is false, he must be attempting to convey that UM students are *not* very independent.

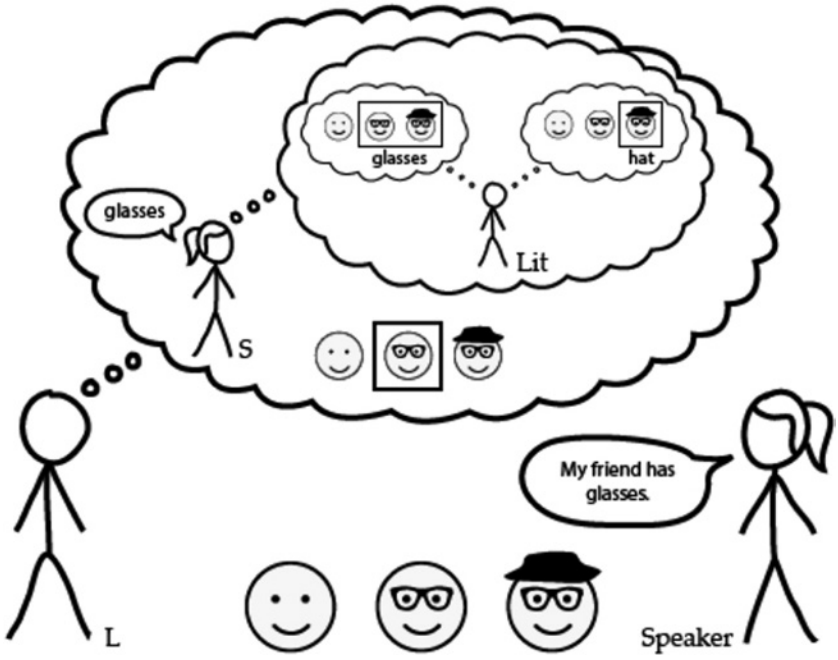

Figure 4.1 Gricean Implicature

The speaker points to a group of people at a function and states that her friend is the one with glasses. The listener looks at the group and spots one person without glasses, one person with glasses and one person with a hat and glasses. He assumes that the speaker is cooperative and hence is providing all relevant information for identifying her friend. According to the Gricean model, he then infers that if the friend was the one with both hat and glasses, the speaker would have mentioned the hat in addition to the glasses. Since she didn't mention the hat, and since she is cooperative, her friend must be the person with glasses but no hat.

Grice's own description of his notion of conversational implicature makes it clear that he thinks conversational implicatures are derived inferentially rather than at a subpersonal level:

> I am now in a position to characterize the notion of conversational implicature. A man who, by (in, when) saying (or making as if to say) that p has implicated that q, may be said to have conversationally implicated that q, PROVIDED THAT (1) he is to be presumed to be observing the conversational maxims, or at least the cooperative principle; (2) the supposition that he is aware that, or thinks that, q is required in order to make his saying or making as if to say p (or doing so in THOSE terms) consistent with this presumption; and

> (3) the speaker thinks (and would expect the hearer to think that the speaker thinks) that it is within the competence of the hearer to work out, or grasp intuitively, that the supposition mentioned in (2) IS required.
>
> (Grice, 1975, pp. 49–50)

Note that Grice here assumes that the listener is aware of, or thinks about, what is required in order for an utterance to satisfy the conversational maxims or the cooperative principle. This view strongly suggests the inferential view, at least with respect to conversational implicature. In the following section, I will provide a number of considerations against an inferential view of speech comprehension.

3. Experiencing Apparently Conveyed Meanings

If the non-inferential view of speech comprehension is correct, then we sometimes experience apparently conveyed meanings, i.e., meanings that appear to us to be conveyed by the speaker who is addressing us (see, however, O'Callaghan, 2011). Consider this case: Jack informs Jill that the rain stopped. Assuming Jill has an accurate experience of the meaning conveyed by Jack's utterance, the meaning *the rain stopped* is presented in Jill's auditory experience. Because Jill believes Jack is a reliable witness, she comes to believe that the rain stopped.

Contrast this with the following case: Jill already believes it is raining. But she looks out the window and sees a sunny sky. Jill forms the belief that that the rain stopped on the basis of her visual experience of the sunny sky, without ever reflecting on the reliability of her visual system.

The two cases differ in how easily Jill forms the belief that the rain stopped. Of course, Jill may not trust her senses, and this may block the formation of belief. But it is safe to say that neurotypical individuals ordinarily are more likely to form belief on the basis of what they visually experience than on the basis of what they hear others say. One belief Jill is very likely to form on the basis of hearing Jack utter 'the rain stopped', however, is the belief that *Jack said that* the rain stopped. So, if Jill auditorily perceives the meaning *the rain stopped* but she comes to believe that Jack said that the rain stopped, then there is an asymmetry between experiencing what is apparently conveyed and forming a belief about what is apparently conveyed on the basis of hearing the utterance.

But what is the difference between a visual experience as of, say, a sunny sky and an auditory experience of, say, the meaning *it's sunny*? The most natural answer to this question is that these meanings are experienced in different ways. A visual experience represents its content under a visual manner of representation (Chalmers, 2004). A tactile experience represents its content under a tactile manner of representation (e.g., the roundness of a ball is represented differently visually and tactually).

Likewise, it is safe to assume that an auditory experience of an apparently conveyed meaning will be represented under its own manner of representation – a manner of representation that is different from the visual manner, the tactile manner, etc.

Now it is tempting to think of the perception of meanings as something that occurs only when a sentence is expressed verbally or in ordinary writing. But I do not want to restrict the term 'apparently conveyed meaning' in this way. If speech comprehension can be a perceptual process, then a person fluent in braille can probably touch meanings. Perceiving what appears to be conveyed by a sequence of signs in American Sign Language is a way of seeing meanings that are not necessarily written down. There are also a plethora of linguistic and non-linguistic *signals* that convey meanings, for instance: emojis – or the corresponding behavior (e.g., thumbs up) or facial expressions (e.g., surprise), punctuation and intonation (e.g., 'Mary went to the store' versus 'Mary went to the store?'), demonstrations (e.g., pointing to or gazing at something), linguistic conventions (e.g., replying 'good' to 'how are you?', uttered by a relative stranger, even if you are not good.), back channeling (e.g., replying with 'mhm,' 'uhuh,' 'sure,' 'OMG,' 'No kidding' to indicate that you are listening and/or are still interested in the content of the conversation).

As these cases demonstrate, understanding what a person means often relies on what is also known as 'mind reading' (Carruthers et al., 1996). Mind reading is the grasping of what a person appears to be thinking, feeling, or intending to do. If mind reading requires actually possessing a theory and making inferences about what people think, feel and intend, then the *non-inferential* view may be false. However, even advocates of the so-called 'theory theory', which takes us to rely on folk psychology when reading other people's minds, denies that mind-reading is typically inferential (Gopnik, 2003, 2012). In any event, the purposes of the rest of the chapter, I will assume that an inferential view of mind-reading is incorrect.

A further remark of clarification about the experience of meanings is in order here. There is a vast body of literature discussing how presuppositions in conversational contexts can influence meaning (see e.g., Stalnaker, 1973). For instance, if it is presupposed in the conversational context that bank robbers are more likely than police officers to wear masks, then an utterance of the discourse fragment in (1) means something entirely different from what it means in conversational contexts where police officers are more likely than bank robbers to wear masks (the example is borrowed from Pettit, 2010; see also Stanley, 2005):

(1) The police officer caught the bank robber. He was wearing a mask.

It may be thought that the context dependence of conveyed meanings is in direct opposition to the non-inferential view. This, however, is not

so (Brogaard, 2016b). The presupposed fact (or alleged fact) that bank robbers wear masks is information 'stored' in what is known as 'semantic memory' (memory of facts and apparent facts, such as the fact that Obama was the 44th President of the United States).

If semantic memory is distributed across the neocortex, as some argue (Price, Bonner, and Grossman, 2015), then semantic memory may influence perceptual processing via top-down influences. There is a long-standing debate about whether top-down influences on sensory perception constitute cognitive penetration (Pylyshyn, 1999; Firestone and Scholl, 2016). The outcome of this debate does not matter for our purposes here. Even if the distributed semantic memory model is correct, (implicitly) retrieved (reassembled) semantic memory may still be able to influence the experience of apparently conveyed meaning. Such top-down influences, however, would not be inferences for the same reason that cognitive penetration is not an inference.

Another possibility is that semantic memory makes an imprint on the mechanisms of the language center via a phenomenon known as 'perceptual learning' (Brogaard, 2016b). Perceptual learning, unlike other forms of learning, can be defined as 'experience-induced changes in the way perceivers pick up information' (Kellman and Garrigan, 2009) or as extracting perceptual information that was previously unused (Gibson and Gibson, 1955). In perceptual learning, semantic information indirectly influences the content of experiences but it does so by altering the mechanisms for computing experiences. In perceptual learning, our sensory system is transformed in a way that affects how things appear to us.

If speech comprehension is a result of top-down influences on perception or a kind of perceptual learning where semantic memory alters the neural processing in the language center, then the fact that speech comprehension depends heavily on context is perfectly consistent with the non-inferential view (Brogaard, 2016b).

A question here arises: if meaning properties are presented in experience, what is the nature of these properties? Meaning properties are a type of high-level property like artificial kind properties (e.g., *being a house*, *being a table* or *a being laptop*) or emotional properties (e.g., *being angry*, *being afraid* or *being surprised*). We can take the high-level properties that are presented in experience to be the result of an instantiation of particular configurations of lower-level properties (e.g., *being watery* or *looking like a zebra*). Call high-level properties of this kind 'Gestalt properties' (Brogaard, 2018).[6] To see what the nature of Gestalt properties is, consider the image of the three squares in Figure 4.2.[7]

The three figures are all perceived as possessing the Gestalt property of looking square. But none of the configurations of lower-level properties that we visually detect suffices for squareness to be present in our perceptual experience. In the first figure the property of looking square presented in our experience is a result of us visually detecting a solid black

Figure 4.2 The Gestalt Property of Looking Square

The three figures all possess the property of looking square, but that property is not metaphysically determined by any of the low-level properties of the figures.

mass. In the second figure the property of looking a square presented in experience is a result of us visually detecting a particular configuration of dots. In the third figure the property of looking square presented is the result of us visually detecting a particular configuration of line segments.

The relationship between the Gestalt property presented in experience and the low-level properties visually detected is not one of metaphysical entailment but rather one of causation. To capture the relation of causality, let's exploit Mackie's (1965) famous INUS condition. 'INUS' stands for 'an insufficient but necessary part of a condition which is itself unnecessary but sufficient for the result'. For example, an electrical short-circuit may cause a fire but the short-circuit is not necessary for the fire to occur. The fire could have been the result of arson rather than a short circuit. Nor is the short-circuit sufficient for the fire to occur. If there is no oxidizing agent, a short-circuit does not result in a fire. The occurrence of the short circuit is a necessary member of a set of conditions that is itself unnecessary but sufficient for the fire. Other members of that set include the presence of oxygen, the presence of flammable material, the absence of flooding, etc.

Now, we can take Gestalt properties presented in experience to be caused by sets of sensorily processed INUS conditions (e.g., configurations of dots or line segments). These sets of sensorily processed configurations of low-level properties (together with other INUS conditions) are sufficient but not necessary for the Gestalt property to be presented in the resulting sensory experience. For example, in the case of looking angry, sensory processing of the properties that are universally characteristic of an angry face (together with other INUS conditions), is sufficient but not necessary for the property of being angry to be presented in the resulting sensory experience of anger.

The meaning properties that are presented in experience, I want to suggest, are Gestalt properties. For the case of auditory perception,

the meaning properties presented in experience are caused by auditory information – for instance, information taken in from the external environment or information possessed from birth or acquired through past perception or testimony. This pre-existing information must either affect sensory processing through feedback mechanisms or be the result of altered computational mechanisms in sensory areas. Sensorily processed information sufficient for meaning properties to be presented in experience may include information about:

- The sound properties produced by the utterance
- The grammatical structure of language
- Consciously accessible or inaccessible semantic memory such as knowledge of the semantic meaning of lexical items, pragmatic principles, and cultural habits
- The identity of the speaker
- Conversation preceding the utterance

Possession of this experienced or stored information (that influences the processing of perceptual contents) is sufficient but not necessary for particular meaning properties to be presented in experience. It is not necessary because different chunks of information can result in the same meaning property being experientially presented. For instance, exposure to utterances of 'Homo sapiens evolved 200,000 years ago' and 'Human beings evolved 200,000 years ago' may result in experiences that represent different sound properties but the same meaning properties.

4. Theoretical and Empirical Considerations in Favor of the Non-Inferential View

There are several considerations in favor of the non-inferential view of speech comprehension: empirical as well as theoretical. Each of these considerations merely indicates that apparently conveyed meanings can be sensorily perceived. Together, however, they make a decent case for the non-inferential view.

4.1. Neuroanatomical Evidence

There is broad consensus that speech comprehension is closely tied to processing in Wernicke's area, sitting in the superior temporal gyrus close to the auditory cortex, usually on the left side of the brain (sometimes on the right) (Bogen and Bogen, 1976).[8] Being located in a lower region of the brain, Wernicke's area may be considered a sensory area for language comprehension, neuroanatomically speaking.

The hypothesis that Wernicke's area is central to language comprehension does not rule out that many other areas of the brain are also involved

in speech comprehension. As noted earlier, one theory of semantic memory is that semantic memory is distributed across the entire neocortex (outer layer) of the brain. Since semantic memory is a strong influence on speech comprehension, the entire brain may be dedicated to the understanding of language.

But even on this theory, meaning processing may take place primarily in Wernicke's area in the temporal lobe – subsequent to feedback entry from other brain regions. If this is indeed the case, then brain regions often correlated with inferential processes (such as the prefrontal cortex) do not play a direct role in the neural processes involved in speech comprehension.

One of the things we cannot rule out on the basis of neuroanatomical evidence is that the brain regions in the left temporal lobe (together with parts of the frontal lobe) – constituting the so-called 'language center' – are a neural substrate for *linguistic* inference. It could be that linguistic inference and other types of inference have anatomically distinct neural correlates.

4.2. Semantic Satiation

Semantic satiation (also known as 'semantic saturation' and 'semantic adaptation') is a phenomenon in which a repeated phrase may lose its meaning for the listener. Leon Jakobovits James, who coined the term in his dissertation in 1962, found that repeating a phrase prior to completing a task depending on its meaning resulted in response inaccuracy or a delayed response time (James, 1962).

Semantic satiation is a special case of stimulus satiation (which is also sometimes called 'sensory adaptation'; see Block, 2014; Nes, 2016). Stimulus satiation is different from habituation, a method in behavioral therapy that seeks to eliminate an emotional response to a particular stimulus by repeating exposure to the stimulus (Glanzer, 1953). This is a slow process that likely has a different neural mechanism from the fast process of stimulus satiation.

Stimulus satiation is generally believed to be a sensory phenomenon that involves a change in the responsiveness of the sensory system to a repeated or constant stimulus (Glanzer, 1953). If you put your hand on a textured pillow, you will initially feel the texture on the palm of your hand. But it only takes a few seconds before the intensity of the feeling of the texture subsides. What happens is that the neurons that process tactile experience provide a significant response at first but the neural response of the sensory neurons then slowly diminishes.

Stimulus satiation occurs in all sensory modalities. If you live right next to the runways of an airport, you will quickly cease to hear the noise of the departing planes. Your visitors, on the other hand, will initially get startled by the loudness of the engines. Likewise, if your house

smells of old garbage or cigarette smoke, your olfactory sensory system will quickly adapt to the smell to the point where you no longer notice it.

The dominant hypothesis concerning the mechanism underlying stimulus satiation is that the transmission from the thalamus to the sensory cortical brain regions decreases with constant exposure, leading to a partial or full closure of the gateway in the thalamus that is responsible for blocking irrelevant information from entering cortical areas of the brain while letting relevant information enter. Information that doesn't enter the cortical areas of the brain will not generate any conscious mental states.

The phenomenon Leon Jakobovits James (1962) identified when he coined the term 'semantic satiation' is that we have a similar tendency to quickly adapt to repeated phrases, quickly tuning out on what they mean. The phenomenon of semantic satiation is another indicator that meanings typically are sensorily comprehended rather than being the result of an inferential process.[9]

4.3. Stroop Effect

Another piece of evidence for the non-inferential view comes from the standard Stroop effect (Stroop, 1935). The Stroop effect, in its classical form, is interference found when attention-grabbing word meanings interfere with the naming of the ink color the words are printed in. It typically takes longer to name the ink color when it does not match the word meaning. We are also more prone to mistakes when the ink color is contrary to the color depicted by the word. For example, if the word 'red' is printed in the ink color green, then it is harder to name the color than if it had been printed in red (or black).

A common explanation of this effect is that because grasping the meaning of color words is far more automatized than color naming, the meaning of the color word captures our attention and thereby distracts us from the color naming task we were supposed to carry out (see e.g., Brown, Gore, and Carr, 2002).

On a widely received view, this kind of attentional bias can be explained by the fact that the processing of meaning in sensory cortical brain regions interferes in a feedforward fashion with the intellectual naming task in the prefrontal cortex (Brown, Gore, and Carr, 2002). The effect thus appears to indicate that the grasp of meanings occurs automatically as a result of sensory processing, which points to the non-inferential view of meaning comprehension.

4.4. Pop Out Effect

A further piece of evidence in favor of the non-inferential view comes from a variation on a standard visual search paradigm. Visual search paradigms can be used to test whether visual detection of a target item

Figure 4.3 Stroop Effect

The word 'red' is here displayed in the color black (left) and the word 'green' is displayed as the color gray (right). It takes longer for subjects to name the color of the ink when the word is printed in a color that differs from the color designated by the word than when it is printed in black or the same color as the color designated.

occurs early on in the visual system. If a target captures our attention, the visual detection of the target is thought to be processed early on in the visual system.

A visual search test that consists of words or pseudowords can likewise serve as a test of whether we sensorily experience meanings. In visual search paradigms of this kind, subjects are exposed to an array containing a meaningful word (the target) and meaningless variations on that word (the distractors).

If comprehension of apparently conveyed meanings is a sensory phenomenon, then we should expect the target item to capture attention bottom-up either prior to, or simultaneously with us, becoming aware of the target (Beck, 1966; Treisman, 1982). When attention is automatically drawn to a target, strenuous efforts is unnecessary for the identification of the target. Thus, identification of the target should be highly efficient (i.e., fast and accurate). This is also known as a 'pop-out effect'. If, on the other hand, experience of conveyed meaning requires systematic search and systematically applied top-down attention, then the target word should not capture attention bottom-up and the identification process should be less efficient (slower and less accurate).

A pop-out effect in visual search paradigms thus suggests that a property of the target item is sensorily presented in the early visual system. So if a visual search for a real word (the target) among pseudowords (the distractors) yields a pop-out effect, then this indicates that the apparently conveyed meanings is presented in visual experience.

This is indeed what we find. When subjects are shown an array of a meaningful word (the target) and meaningless variations on that word (the distractors), the meaningful word pops out and immediately grabs their attention (Brogaard, 2017) (Figure 4.4).[10]

When subjects are presented with a target word that may appear to be meaningful ('phonetele'), a pop-out effect can be observed but the average response time is radically decreased compared to the response time in the experimental case (Figure 4.5).

Finally, when subjects are asked to search for a pseudoword within an array of other pseudowords, there is no pop-out effect (Figure 4.6).

phleteone	enlehpoet	telephone
ohleetenp	tlhepeone	eelehonpt
honetelep	letenepho	eeetlponh

Figure 4.4 Experimental Case

The word 'telephone' pops out in an array of words and pseudowords. This test indicates that grasping meanings or at least meaningfulness is a sensory phenomenon.

phleteone	enlehpoet	tlhepeone
ohleetenp	tlhepeone	phonetele
honetelep	letenepho	eeetlponh

Figure 4.5 First Control Case

The word 'phonetele' hidden in an array of meaningless pseudowords yields only a weak pop-out effect.

phleteone	enlehpoet	ophntleee
ohleetenp	tlhepeone	eelehonpt
honetelep	letenepho	eeetlponh

Figure 4.6 Second Control Case

When the array consists of pseudowords and no meaningful or quasi-meaningful words, there is no pop-out effect.

It should be noted that the experimental paradigm used here doesn't aim at showing directly that we perceive word meanings but rather whether the property of being meaningful is presented in experience. However, there is good reason to think that the ability to perceptually determine meaningfulness normally depends on the ability to perceptually identify particular meanings. For example, in order to experience 'telephone' as meaningful, you would likely need to have implicit knowledge of the semantic meaning of 'telephone'. If this is so, however, then the pop-out effects indicate that apparently conveyed meanings are presented in sensory experience.

This suggestion yields an empirically testable prediction: we should expect to find that we are capable of quickly and accurately detecting a target word that belongs to one domain, say, the domain of sea animals (e.g., 'Nemo'. – 'fish' – 'squid') when hidden among distractor words (matched in length, frequency, level of abstraction, prototypicality, etc.) that derive from a rather different domain, say that of land animals or

mammals (e.g., 'Elmo', 'Lilo', 'Dora', 'Bart', 'Hulk'. – 'bear', 'goat', 'wolf', 'lion', 'mule' – 'camel', 'zebra', 'tiger', 'horse', 'panda').

One limitation of the present data, but not the research paradigm as such, is that they do not eliminate the possibility that we would get the same effect with any familiar string of letters, including nonsensical words, like 'mimsy'.

4.5. Immediacy, Automaticity, and Amodal Completion

The non-inferential view gains further support from the speed and automaticity of language comprehension. Average college students can read about 255 words per minute, which would be an impossible feat if they were to slow down and make inferences about what the writer intended to convey (Christianson, Luke, and Ferreira, 2010; Ferreira, Bailey, and Ferraro, 2002; Swets et al., 2008).

The speed and automaticity of language comprehension may be due in part to our ability to amodally complete partially perceived meanings. Suppose you see the following sentences in a newspaper that contains some ink stains:

(2) (a) Plus spacious 1554 sq. ft. home with large lot, family room with fireplace and huge [redacted] for entertaining and enjoying the views.
(b) Local guitarist Jon Henninger announced yesterday that the track features Henninger on guitar and Henninger's band mate Eric Lyday on [redacted].
(c) Charlie's hiccups were cured through the use of carbon [redacted] xide.
(d) Recipe ingredients: 3 cups chopped tomatoes, 1/2 cup chopped green bell pepper. 1 cup diced onion, 2 tablespoons chopped fresh [redacted]. 2 tablespoons fresh lime juice.

We naturally fill in 'deck' or 'terrace' in 2(a), 'drums' or another word designating a musical instrument in 2(b), 'carbon dioxide' in 2(c) and 'cilantro' or some other edible ingredient in 2(d). However, errors have a tendency to creep in in unfortunate ways. The original version of 2(a) is shown in Figure 4.7.

The original version of 2(b) contained a typing error, which the Illinois newspaper *The Morning Sentinel* later announced: 'Due to a typing error, Saturday's story on local artist Jon Henninger mistakenly reported that Henninger's band mate, Eric Lyday, was on drugs. The story should have read Lyday was on drums'.

2(c) too contains a spelling error – in this case one that potentially could lead people to kill themselves instead of curing their hiccups (Figure 4.8).

The original version of the recipe in 2(d) recommended adding two tablespoons of cement. A correction was later issued: 'Recipe correction: in a recipe for salsa published recently, one of the ingredients was

Figure 4.7 Unfortunate Typo: Newspaper Advertisement for Real Estate

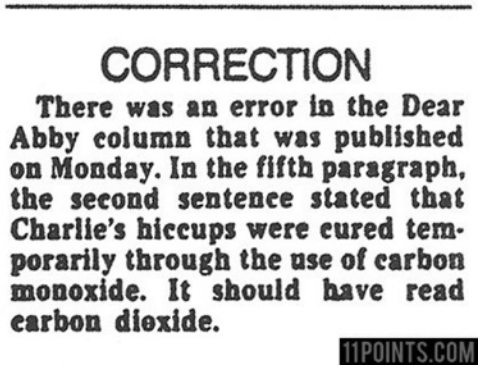

Figure 4.8 Unfortunate Typo: Correction of Unfortunate Typo on Website

misstated due to an error. The correct ingredient is 'two tablespoons of cilantro' instead of 'two tablespoons of cement'.

While the envisaged ink stains force us to fill in words in the cases in (2), this 'good-enough' approach naturally employed here is, in fact, the normal way we comprehend language, even when there are no occluders. We usually process only part of what we read or hear and fill in the rest through top-down processing or amodal completion (Christianson, Luke, and Ferreira, 2010; Ferreira, Bailey, and Ferraro, 2002; Swets et al., 2008).

The speed and automaticity of language comprehension suggests that the processes involved in grasping conveyed meaning are not typically personal-level processes. Hence, they are not typically the result of inferences but are more likely to be the result of processes akin to the sensory processes involved in producing low-level sensory mental states.

4.6. Evidence Insensitivity

Perceptual experiences can be appropriate or inappropriate but they are not assessable for rationality – as I am using the term in this chapter. Granted, if the perceptual view of emotions is correct, then emotions can be said to be rational or irrational only to the extent that perceptual experiences can be said to be rational or irrational (Brogaard and Chudnoff, 2016).[11]

But experiences are not assessable for rationality in the sense in which, say, beliefs are. To a first approximation, a rational belief is a belief that is based on good reasons and does not stand in opposition to other beliefs indicating that it may be inaccurate. For instance, if I see water pouring down outside the window, this may give me a good reason to believe that it is raining. If, however, I also believe that the water is due to a new sprinkler system that has been installed on the rooftop, then that second belief defeats my belief that it is raining. In that case, my belief that it is raining is not rational. It may be prima facie justified. But the justification is defeated by my second belief.

Unlike beliefs, sensory experiences retain their prima-facie justifying power in light of evidence that they may be inaccurate. They are relatively informationally encapsulated (Fodor, 1983). For example, in the case of amodal completion, partially occluded figures are not perceived as the fragments of the foregrounded figures but as hidden behind or covered by the occluder (Figure 4.9).

In the case of vision, the process of amodal completion proceeds in accordance with its own rules, viz. intra-perceptual principles, or 'organizing principles of vision', that modulate early visual processes (Pylyshyn, 1999; Fodor, 1983; Raftopoulos, 2001).[12] These intra-perceptual principles are not rational principles, such as maximum likelihood or semantic coherence. The visual system employs them to compensate for the inherent ambiguity of proximal stimuli. In Figure 4.9, for example, the proximity of the regular octagons to the occluded figure should make it more likely that the occluded figure is also a regular octagon. But the principles of amodal completion work according to their own algorithms and the occluded object is not experienced as a regular octagon.

In recent work, Susanna Siegel (2017) has argued that perceptual experience can be epistemically downgraded. Here is one of her examples. Jill fears that John is angry at her. This causes her to experience his neutral face as an angry face. Hence, her experience is epistemically downgraded,

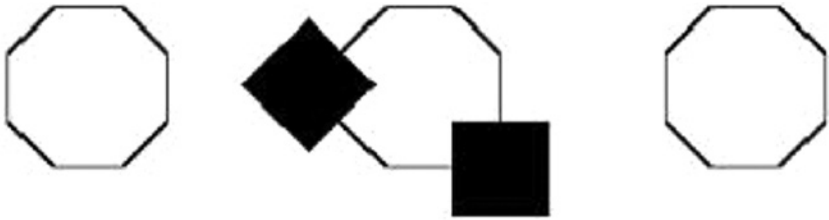

Figure 4.9 Kanizsa Amodal Completion

Despite the flanking cases of octagons, the occluded figure is not seen as a regular octagon. Source: Pylyshyn 1999

according to Siegel. In her view, 'both perceptual experience and the processes by which they arise can be rational or irrational' (2007, p. 15).

I am not going to dispute this hypothesis here (for a counterargument, see Chudnoff, this volume; Brogaard, 2019). Even if it's true, this does not challenge Pylyshyn's (1999) claim that intra-perceptual principles are not rational principles.

The question that remains is whether our (apparent) comprehension of what is said is immune to defeaters in the same way as uncontroversial cases of sensory experience. It appears that they are. If I hear John ask me whether Brian has remembered to pick up beer for the bachelor party in Miami, but I subsequently learn that he actually asked whether Brian had remembered to pick up headgear for the bachelor party, I may come to believe that I was wrong about what I heard but the auditory appearance of what I initially heard appears to be immune to this belief.

Here is a further consideration in favor of this thesis. This is intended to be analogous to Pylyshyn's (1999) octagon case. Imagine you are talking to one of your frenemies Ben. I hear you say 'leave me alone'. I am likely going to get the impression that you intended to convey to Ben that he should leave you alone. Suppose, however, that several other people in your group start crying out loud: 'Please don't leave me alone in this god forsaken place'. In this case, the appearance of you having said 'leave me alone' may well be immune to the possibility that you said something that is partially occluded but similar to what others in your group were saying (i.e., 'please [. . .] leave me alone [. . .]).

We can easily conjure up other examples of the same kind. Suppose I hear you say to your friends Jill and Jack 'I have not had breakfast' and it comes to seem to me that you are informing them that you have not had breakfast on the day in question. But I then hear Jack exclaim: 'Two weeks! That's nothing. Susan and I have not had breakfast together since she started her new job with the MPD'. If I know I only heard a fragment of what you and your friends were talking about, the possibility that you said something to

the effect that you had not had breakfast with such-and-such a person for two week now ought to cast doubt on what I initially thought you said. But in spite of the fact that there is reason to doubt my initial appearance of what you said, that appearance is likely to stick with me.

It seems plausible then that apparently conveyed meanings are immune to defeat in the same way that uncontroversial cases of visual experience are. Since this kind of evidence insensitivity is a mark of uncontroversial cases of visual experience, the intuition that appearances of conveyed meanings can also be immune to defeat provides some support for thinking that appearances of conveyed meanings are sensory in nature.

5. Perception or Type-1 Reasoning?

In this chapter I have provided psychological and philosophical considerations in favor of a non-inferential view of speech comprehension. On this view, speech comprehension need not require personal-level inferences on the part of the hearer.

Let me end the chapter by pointing to a limitation of my argument. The argument does not show that we can auditorily (or visually or tactually) experience the meanings that it would seem that the author or speaker was intending to convey. Indeed, the findings reviewed in this chapter are compatible with the idea that a hearer (or reader or viewer) comes to understand what the speaker (or writer) apparently intended to convey by employing type-1 cognitive processes that make use of semantic associations and heuristics rather than, say, probability theory or logic.

The hypothesis that cognitive processing can be divided into two types is a postulate of dual-processing theory. According to this view, there are two distinct ways in which we make decisions or come to conclusions in daily life. Type-1 cognitive processes are fast and rely on semantic associations and heuristics ('rules of thumb'), whereas type-2 processes are slow and rely on careful reflection and inference (Tversky and Kahneman, 1973, 1983; Samuelson and Church, 2014; Roberts and West, 2015). If indeed we often rely on type-1 cognitive processes in order to understand speech, then it's possible that grasping what a speaker appears to want to communicate is neither inferential nor perceptual. But it is also possible that at least some of the fast and automatic type-1 processes are in fact perceptual processes.

To see this, consider judgments of personality in thin-slicing conditions (i.e., conditions in which you are only exposed to a person or a still-photo of the person for a very brief period of time). It is widely agreed in cognitive science that these types of judgment rely on type-1 cognitive processing (Gigerenzer, 2007). However, there are independent grounds for thinking that the processes that support personality judgments in these conditions are the exact same processes that produce perceptual appearances (Brogaard, 2016a).

Likewise, it remains a possibility that if we rely on type-1 cognitive processes in trying to understand language, these processes give rise to perceptual appearances. This is a topic I hope to deal with on a future occasion.[13]

Notes

1. There may, of course, be other forms of instrumental reasoning that non-human animals do engage in. See e.g., Camp and Shupe (2018).
2. Note that the non-inferential view does not imply that we never rely on inferences when engaging in speech comprehension. When the speaker intentions are not immediately clear to the addressee, the addressee may engage in an inference before forming a belief about what the speaker might possibly have intended to convey. The non-inferential view is thus consistent with the occasional reliance on inference in order to derive the meaning of what the speaker intended to convey. Consider the following case. Marianne is a foreigner with very little familiarity with the meaning of slurs in English. She does not automatically grasp their meanings. One day Marianne accidentally bumps into a stranger Jennifer. This makes Jennifer angry and she screams: 'Bitch!' We can imagine that Marianne, who is not very familiar with the meaning of slurs in English, engages in the following inference on a conscious level: ' 'Bitch' literally means a female fox but there is no good reason to think the angry lady thinks I am female fox. So, she was probably using the term in its derogatory sense, thereby conveying to me that I have some negative traits that caused me to intentionally bump into her in order to harm her'.
3. The exceptions I have in mind include cases in which the speaker intends to convey that *p* but actually conveys that *q*, or fails to convey anything at all. While visiting Spain I ask someone where I can buy some groceries. Or so I think. What I actually asked, using the Spanish word 'groserias', was where I could buy some vulgarities. In this case, what I intended to convey is not what native speakers hear me say. Arguably, in cases like this, what is conveyed is what the naive speakers think I convey. In that case, the perceptions of the native speakers are not misperceptions.
4. Note that the rules need not specify valid inferences, as a rule set could be any set of rules. For example, the rules that govern transitions between neurological states might be computational in a non-standard sense (see Piccinini and Bahar, 2013). The rules that govern transitions between mental states are probably psychological laws of a kind that rules out mere associative transitions, such as the associative transition from 'doctor' to 'nurse'.
5. Markos Valaris (2017) is primarily interested in reasoning, but his notion of reasoning is closely related to the notion of 'inference' in the narrow sense (in the wide sense, any rule-based transition between quantities of information can count as an inference; in the wide sense, my MacBook Pro is capable of making inferences).
6. Gestalt properties are different from high-level properties that constitute the essence of a thing, for instance, *being* H_2O, *having tiger-DNA* or *being made of this or that piece of clay*.
7. This is just an analogy. I will remain neutral on the issue of whether shape-like properties can reasonably be considered high-level properties.
8. The location of Wernicke's area remains controversial.

9. Anders Nes (2016) also invokes semantic satiation and the kinship of the latter with sensory adaptation to suggest that utterance comprehension has an important similarity, in this respect, to perceptual processes.
10. Pilot study, Brogaard Lab for Multisensory Research.
11. On the perceptual view, emotions are bodily sensations produced in response to value objects (e.g., fearfulness of tiger) (Brogaard and Chudnoff, 2016). Bodily sensations (or bodily feelings–also known as 'interoception') have not traditionally been construed as sensory experiences. However, one might argue that the modality that produces bodily feelings just is a sensory modality closely related to proprioception, our sense of balance (the vestibular system) and nociception (pain and spice perception), which arguably are *sensory* modalities unlike intuition and introspection (Macpherson, 2011; Schwenkler, 2013; Briscoe, 2016).
12. These principles are akin to what Helmholtz called 'unconscious inferences' (Gordon, 2004), what Gregory (1968) calls 'hypotheses', or what Bayesians call 'implicit assumptions' (Rescorla, 2015). See also Brogaard (2011b).
13. For helpful comments on previous versions of this paper, I am grateful to an anonymous reviewer for this volume, Tim Bayne, Jake Beck, Ned Block, Elijah Chudnoff, Jack Lyons, Fiona Macpherson, Mike Martin, Michelle Montague, Anders Nes, Pär Sundström, Charles Travis, Sebastian Watzl, and audiences at Humboldt University, Kirschberg, Miami, NYU, and the 2017 Meeting of the SPP.

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