



## Is Verbal Irony Special?

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### Abstract

The way we speak can reveal much about what we intend to communicate, but the words we use often only indirectly relate to the meanings we wish to convey. Verbal irony is a commonly studied form of indirect speech in which a speaker produces an explicit evaluative utterance that implicates an unstated, opposing evaluation. Producing and understanding ironic language, as well as many other types of indirect speech, requires the ability to recognize mental states in others, sometimes described as a capacity for metarepresentation. This article aims to connect common elements between the major theoretical approaches to verbal irony to recent psycholinguistic, developmental, and neuropsychological research demonstrating the necessity for metarepresentation in the effective use of verbal irony in social interaction. Here I will argue that verbal irony is one emergent, strategic possibility given the interface between people's ability to infer mental states, and use language. Rather than think of ironic communication as a specialized cognitive ability, I will claim that it arises from the same set of abilities that underlie a wide range of inferential communicative behaviors.

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Language interaction involves a complex interplay of many cognitive abilities. Theorists across many disciplines struggle with questions of how to carve up these abilities, and whether they can be carved up in the first place (e.g., Christiansen and Chater 2008). Among the most difficult questions to address are those that involve how people recognize intentions in others' behavior, and how that is achieved through language in the context of many other sources of information. The way we speak can reveal much about what we intend to communicate, but the words we use are often quite different from the meanings we wish to convey. People often speak indirectly for a variety of strategic reasons, and these strategies rely intrinsically on social cognition. One well-researched example of this is the phenomenon of verbal irony – a type of indirect speech in which a speaker produces an explicit evaluative utterance that implicates an unstated, opposing evaluation. As described below, this trope has been traditionally defined in rather vague terms, but has generated a great deal of research as a phenomenon in need of special theoretical explanation. Here I will argue that verbal irony is one emergent, strategic possibility given the interface between people's ability to infer the mental states of others, and use language. Rather than think of ironic communication as a unique skill or specialized cognitive ability, I suggest that it arises from the same set of abilities that underlie a wide range of inferential communicative behaviors.

The study of verbal irony production and comprehension has been a multidisciplinary effort lacking extensive interdisciplinary exchange. There have been various taxonomies and definitions of what constitutes irony, both verbal and situational – a struggling enterprise to say the least (Colston and Gibbs 2007). The traditional notion of verbal irony dates back at least to the Roman rhetorician Quintilian, who described irony as a kind of allegory expressing the opposite of what one means, often for mocking

communicative effects. Some of the assumptions of this early categorization have carried over into modern psycholinguistic research without proper consideration of underlying communicative functions (Kreuz 2000). Many scholars have linked verbal irony to situational irony – particularly in how both forms seem to involve, at some level, a contradiction between what is expected, and what occurs. While verbal irony often points to unexpected or unfortunate outcomes in people's actions (Kumon-Nakamura, Glucksberg, and Brown 1995; Pexman 2008), it does not do so necessarily. At present, most contemporary researchers of figurative language and inferential communication have settled on some version of the basic claim that verbal irony is a class of indirect language use where explicit sentence meanings are conceptually contradictory to a network of related implied propositions. Many other tropes, however, are not obviously distinct (e.g., parody, pretense, double entendre, litotes, etc). One common thread between many theoretical and empirical approaches to verbal irony is the distinction language users must make between layers of meaning. This could be the difference between actual and attributed beliefs (Kreuz and Glucksberg 1989; Sperber and Wilson 1986, 1995), real and imagined discourse acts (Clark and Gerrig 1984), relevant or inappropriate to a particular context (Attardo 2000), what is negated and what is implicated (Giora 1995), or failed expectations and attitudes toward those failures (Kumon-Nakamura, Glucksberg, and Brown 1995). Speakers implicitly highlight the contrasts between these different levels of meaning, and in doing so communicate an attitude toward an attributed belief (Sperber and Wilson 1986, 1995). This attitudinal dissociation is typically considered a hallmark of ironic communication, and necessarily requires an implicit understanding of others' mental states.

Consider the following exchange:

John: I got another virus on my laptop.

Mary: Aren't you glad you didn't switch to Mac?

In this example John and Mary are discussing John's computer problems. John reports that he got a virus on his computer – not his first. Mary asks an ironic rhetorical question expressing her negative opinion of Windows PCs. The literal question is in particular opposition to the implied evaluation – the essence of irony. In this example, the irony is largely contained in a single lexical opposition – “glad” instead of, for example, “sad,” but is also communicated by the rhetorical aspect of the question. The question form is one format speakers use to express ironic intentions, but ironic forms can manifest themselves in various ways linguistically, and in a variety of media including television, music, and visual art (Bryant 2011; El Refaie 2005; Etema and Glasser 1994; Nuolijarvi and Tiittula 2010; Scott 2003). Figurative language devices such as verbal irony can be quite powerful communicative tools. The sentences we speak are often produced in a manner that will allow our audience to derive certain unstated meanings, and the way we put them is often particularly economical because of our heavy reliance on others' inferential abilities. These meanings are not just efficient, but unique to indirect communication (Gibbs 2000a). The combination of affect directed toward some attributed belief, along with a direct utterance, makes ironic meanings difficult, if not impossible, to precisely capture. But this is due to inferential processes associated with mindreading and linguistic communication, not some distinct process of irony understanding. Similarly, it is difficult to capture, in linguistic terms, many kinds of inferences regarding others' intentions that people generate in social contexts.

In our example, Mary, of course, communicates much more than a negative opinion of PCs. For instance, she implicitly reminds John of previous interactions, some being debates, when their differences of opinion about computer platforms were discussed (i.e.,

she echoes previous opinions expressed, perhaps even through literal quotations) (Kreuz and Glucksberg 1989; Sperber and Wilson 1986, 1995). In doing so she reiterates her claim that John's decision was a mistake, and that he would regret it. By using an ironic rhetorical question, Mary efficiently conveys a complex set of implied meanings that are relevant to John. The irony is not necessarily obvious to an outsider, as is the case with most occurrences of irony in everyday conversations (Gibbs 2000b), but John understands Mary immediately, and Mary knew he would. In the process, Mary potentially reduces John's perception that she is being critical, and makes him laugh (while actually criticizing him) (Dews and Winner 1995). Alternatively, Mary might be accentuating her criticism by highlighting a contrast between John's current situation and his earlier stated preference (Colston 1997). Speakers attempt to fulfill particular communicative goals by using indirect language such as verbal irony, and different forms can result in quite different emotional reactions – we should expect it to be used strategically and variably (Bryant 2011; Bryant and Fox Tree 2005; Leggitt and Gibbs 2000). Scholars have suggested many functions for irony in discourse, including speakers' attempts to be humorous, create solidarity, appear clever, increase memorability, save face, be polite, or alter the valence of an attack or praise (Gibbs 1994; Roberts and Kreuz 1994; Toplak and Katz 2000). The pragmatic uses of ironic speech are far-reaching – “what can't irony do?” might be a better question.

One reason that irony can fulfill so many discourse goals is that includable tokens in the category need only satisfy a couple conditions; thus, an enormous variety of speech acts can qualify. Burgers, van Mulken, and Schellens (2011) recently proposed a procedure for identifying ironies in discourse, and for a basic definition, they looked at the commonalities between different contemporary theories. In their view, verbal irony involves an expressed evaluative utterance that implies an opposing evaluative appraisal. This implied meaning does not need to be the opposite of the stated meaning, but just differ in a scalar manner. For instance, an understatement might still be negative, but less negative than the intended meaning (e.g., when asked about a personal experience with a highly destructive wild fire, a person says “we had a little fire”). The main distinction of verbal irony, therefore, appears to be the manifestation of a scalar evaluative gap between what is said and what is meant. Recognizing this gap requires one to infer the mental state and thoughts of the speaker – a social-cognitive skill typically in place pre-verbally. The underlying ability for representing the thoughts of others is rooted in what many theorists have deemed “metarepresentation.”

### *1. Metarepresentation and Verbal Irony*

Metarepresentation is a newer term for a rather old concept – the notion of an idea about an idea. Assuming that animals generate internal constructs reflecting aspects of the world (i.e., representations), a metarepresentation is a second-order representation of a representation. Apparently rare in non-human animals, the ability to represent the objects of cognition distinctly from themselves provides people with an extraordinary capability likely underpinning many phenomena considered particularly human such as cooperation and empathy (Barrett, Cosmides, and Tooby 2010). Cognitive scientists study a variety of phenomena that require metarepresentation at their core, such as theory of mind (ToM), pretense, belief-desire reasoning, hindsight bias, and suppositions. Relatively recent multidisciplinary efforts have attempted to synthesize these ideas (see Sperber 2000). The central notion is that lower order representations (e.g., abstractions, thoughts, or utterances) are embedded in higher order mental representations (Wilson 2000).

ToM is a particularly well-studied and much discussed example. By this framework, the ToM system generates one type of metarepresentation that specifically involves the representation of thoughts (mental representations), as opposed to, for example, the representation of utterances (public representations). Currently, there is some debate about the specificity of these abilities, with some scholars arguing that metarepresentation underlies all of these abilities, and that supposed evidence for a specific ToM mechanism is confounded (Egeth and Kurzban 2009). Barrett et al. (2010) noted that mindreading ability, one construal of metarepresentation, is well-suited to infer hidden internal states – an ability needed to stabilize cooperative interactions over evolutionary time. This could well be the underlying adaptive significance of metarepresentation phenomena. Research now focuses on identifying to what degree variations of metarepresentation are specialized for different domains such as how it manifests itself in language, cooperation, and other reasoning. In any case, the adaptive impacts of this ability on our communicative and social behaviors are of considerable importance.

But what is the specific role of metarepresentation in the context of a conversational interaction? At a very fundamental level, and in an obligatory manner, conversationalists represent one another's thoughts and intentions on-line as they communicate, whether using language or some other means of communication. Specifically, a good deal of our language use relies on inferential processes. Early inferential theories (e.g., Austin 1962; Grice 1975, 1978), and more recently, relevance theory (Sperber and Wilson 1986, 1995), have revolutionized the way we think about linguistic communication. One important idea coming from relevance theory is that speakers strive to maximize communicative value for an intended audience and simultaneously aim to minimize hearers' efforts to recover intentional meaning. Sperber and Wilson (1986, 1995) make the argument that these are design principles of an ostensive-inferential communication system, and language is the predominant medium. It is not necessary to move far beyond this description of linguistic communication to account for the use of figurative devices like verbal irony. The constituent functional systems (e.g. conceptual-semantic systems, emotion systems, etc) underlying language in a broad sense (see Pinker and Jackendoff 2005) inevitably lead to phenomena where speakers can provide succinct evidence of communicative intentions by strategically producing sentence meanings in purposeful contradiction to ultimate meanings. Put simply, irony emerges from the foundational systems of inferential communication. If language users maintain on-line models of one another's mental states during conversational interaction, they are afforded a wealth of ways to convey meanings. Some strategies might incorporate different devices, such as metaphors, that require a systematic mapping between a source domain and a target domain (e.g., Bowdle and Gentner 2005), but do not require a model of the internal state of the speaker, *per se*, to understand the relations. Other strategies, however, more fully exploit the metarepresentational abilities of conversationalists, and require some kind of mindreading to be effective. This is the case with a number of tropes, including pretense, parody, and verbal irony, among others. During conversation, participants react to one another's use of tropes variably, often playing within particular "framings" set-up in coordinated ways between those engaged in the talk (Bryant 2011; Clark 1996; Clift 1999; Gibbs 2000a; Kotthoff 2003; Partington 2007). This process requires an active monitoring of the thoughts and feelings of fellow conversationalists in order to succeed.

An important effect of metarepresentation in communication is that it allows for the transmission of individual shared knowledge without it becoming common knowledge (Pinker, Nowak, and Lee 2008). By using indirect speech such as verbal irony, speakers imply intentions with plausible deniability. Shared individual knowledge refers to

mutually held beliefs that must be inferred, so there is some possibility that a person in an interaction actually does not hold the belief. Alternatively, when people speak directly, it is revealed what they believe, and conversationalists have mutually confirmed common knowledge (see Clark 1996 for the related concept of “common ground”). In our example, John knows Mary’s opinion, and Mary knows that John recognizes her opinion, but until it is spoken directly (e.g., “You should have bought a Mac”), Mary could potentially deny having that belief. In this example, because they are friends and the subject matter is not sensitive, we can assume Mary at some point has said something directly, and so the irony here might be used mainly as a vehicle for verbal play, for instance. But in other contexts, one might allude to any number of intentions while being able to plausibly deny them using ironic language.

Strategically, it can be quite useful to exploit shared knowledge, and avoid common knowledge, if establishing that common knowledge is potentially costly. Pinker et al. (2008) described this in the context of the rational briber, where the implied bribe is not subject to criminal penalty the way a direct bribe is. The rational briber example of indirect speech is directly analogous to the many ways people use verbal irony for conveying certain intentions, and arises from metarepresentation abilities interfacing with language. This emphasis on indirect speech as a communicative strategy with associated costs and benefits has been neglected in many studies of irony understanding in children and adults. One reason could be due to the cooperative principle used by pragmatics scholars (Grice 1975) that is quite different than models of cooperation and conflict in evolutionary biology (Lee and Pinker 2010; Pinker et al. 2008).

The structure of metarepresentation might help theorists better understand ironic communication: particular features of this ability have direct correspondences to the nature of irony comprehension. For example, a propositional attitude such as “believe” is likely to have originated from, and be a functional part of the metarepresentation system – a formulation that allows one to entertain some idea without assuming it is true. This “decoupling” allows one to generate inferences about some representation, but not integrate those inferences into one’s semantic network of information held to be true, or real (Cosmides and Tooby 2000). The nature of decoupling has clear importance for how people understand irony, as speakers essentially pretend to have certain attitudes or beliefs in their efforts to convey some alternative meaning, and listeners must engage in that pretense for the communication to succeed (see Clark 1996 for a pretense theory of irony).

Cosmides and Tooby (2000) further described the design features of M-representations, a type of metarepresentation introduced by Leslie (1987) and thought to form the basis of ToM abilities. These design features were developed largely in the context of how children learn to pretend. M-representations are proposed to contain an *agent slot* (for an actor; that is, who believes X), an *attitude slot* (for the affective attitude toward X), an *anchor slot* (for a referent representation that could be an object, event, or thought, etc.), a *proposition slot* (for the content of X), and a *time slot* (for when the agent held belief X). This information structure maps quite well onto the requisite structure of ironic utterances, and other figurative phenomena. In our example from the beginning, Mary asks John ironically, “Aren’t you glad you didn’t switch to Mac?” Here Mary generates the metarepresentation of John (the agent who prefers Mac over PC) feeling glad (the attitude) about a decision (an anchor) of preferring and choosing a Mac over a PC (the proposition) at a prior time (the time). This rhetorical question affords a critical interpretation (i.e., an evaluation), but because it is humorous, also denotes play, and might be taken by people as more polite (e.g., Pexman and Olineck 2002a). For Mary, it is an effective strategy for communicating her attitude, and it relied completely on a mutual capacity for representing one another’s

thoughts, and referring to them implicitly through language (Clark 1996; Gibbs 1987). In the following sections I will review a variety of recent psycholinguistic, developmental, and neuropsychological research demonstrating the necessity of metarepresentation in the use of verbal irony in language communication.

## *2. Psycholinguistic and Developmental Research*

Many factors affect normal adults' recognition and understanding of verbal irony, all of which at least indirectly relate to representing others' probable intentions, including the gender and occupation of the speaker (Colston and Lee 2004; Katz and Pexman 1997), perceived personality characteristics of the conversationalists (Pexman and Olineck 2002b), the degree of contrast between situational factors and ironic statements (Colston 2002; Kreuz and Glucksberg 1989; Kreuz and Roberts 1995), and whether the contrast is a matter of kind or magnitude (Colston and O'Brien 2000). Like most language use, ironic communication is highly context-dependent, and much research effort has been put toward pushing around known comprehension effects. And like all communication, irony understanding involves the integration of multiple sources of information in listeners' efforts to arrive at coherent communicative interpretations (Pexman 2008). Research suggests that language users can directly access speaker meaning without first processing the so-called literal meaning of an utterance – an assumption of the Gricean standard pragmatic model (Gibbs 1994, but see Dews and Winner 1999 for an alternative view). This speaks to the important role of metarepresentation in understanding inferential communication in general, and indirect speech in the case of verbal irony.

Speakers using verbal irony can achieve an enormous variety of pragmatic goals, many well-researched and described (e.g., Colston 2005; Gibbs 2000b; Kotthoff 2003; Roberts and Kreuz 1994; Toplak and Katz 2000). One advantage of emphasizing the strategic aspects of using figurative devices like verbal irony during discourse is that we can examine the relationship between what the device affords, and what speakers try to accomplish. For example, there is some debate about whether ironic criticism is perceived as more or less critical by third parties. Research with third party judges has shown that both of these outcomes are possible (e.g., Colston 1997; Dews and Winner 1995). Pexman and Olineck (2002a) examined the difference between ironic intentions and social impressions. Ironic insults and compliments were judged as more mocking, but the ironic insults were considered more polite, and the ironic compliments were thought to be less polite. However, an even greater emphasis could be placed on speakers' strategies and the relative costs and benefits of differential interpretative outcomes. Rather than thinking of irony specifically as having these properties of enhancing or muting the sting of criticism, for example, we could shift our focus to the more general issue of how indirectness, necessarily realized though a metarepresentational system, affords many strategies (including being implicitly evaluative) for alluding to specific phenomena (e.g., critiquing a person, sexual come-ons, signals of shared knowledge, etc) while maintaining plausible deniability. An evolutionary-based signaling perspective can help further refine these types of pragmatic functional analyses. As another example, consider the role of humor in ironic talk. Rather than thinking of humor as a function of irony, an alternative approach might be to view humor as one mechanism among many that compose a larger functional system of using indirect language and encryption as a strategic means for social assortment (Flamson and Barrett 2008; Flamson, Bryant, and Barrett 2011). In this sense, humor is not the ultimate function of the irony, just an associated phenomenon that plays a role in the overall communicative interplay.

There is a relative lack of work examining how people use verbal irony in actual discourse, but existing studies show clearly that the strategic possibilities are vast (e.g., Bryant 2010, 2011; Clift 1999; Gibbs 2000a; Kotthoff 2003). One common assumption is that when using irony, speakers typically use a particular tone of voice, and this claim relates directly to the prevailing notion that verbal irony is a special kind of language use. Recent work has shown that, in fact, spontaneous speakers using irony do not tend to use a particular tone of voice, but instead use prosodic signals that are closely related to many other emotional vocal signals (Attardo, Eisterhold, Hay, and Poggi 2003; Bryant and Fox Tree 2005; Bryant 2010, 2011). Bryant (2011) described how speakers' pragmatic goals related to different acoustic forms of ironic speech. For example, sarcasm, an often aggressive, critical form of irony is associated with vocal dominance manifesting as lowered pitch and noisy growl-like sounds (Cheang and Pell 2008), whereas praise-by-blame, a more light hearted kind of irony, is associated with rising pitch (Anolli, Ciceri, and Infantino 2002). Other possibilities are cases such as loud hyperbole to get a listener's attention, quiet understatement for semantic emphasis, or spectral contrasts to help imitate a person's voice to facilitate the mocking of a target individual (Bryant 2011). The multimodal nonverbal strategies that occur during ironic communication are consistent with the idea that irony is not unique in its necessary systems for implementation, but instead might be special only in its indirect and evaluative communicative effectiveness. In other words, verbal irony is not a specialized skill, or cognitive trait, but instead, one broad category of indirect speech governed by more fundamental inferential communication machinery, namely metarepresentation.

Developmental psychology research also demonstrates that in order to comprehend ironic utterances, children must have the ability to generate metarepresentational inferences. This capacity helps children distinguish verbal irony from white lies (Winner and Leekam 1991), and understand teasing and humor in irony (Pexman, Glenwright, Krol, and James 2005). Without the proper development of ToM, children are unable to recognize the attributed meanings in ironic utterances (Happé 1993). As children develop, they rely less on explicit disambiguating signals, and generate appropriate metarepresentations from multiple sources of information, many not perceptual or linguistic (Creusere 1999). Colston (2007) pointed out that at least some rudimentary ToM must be present to engage in any linguistic interaction, and research has shown that experimental methodology seems to be one limiting factor in identifying just how early this ability manifests in development (Bloom and German 2000).

Research on metarepresentation and children's language revealed that as early as 3 years, children used what researchers called "contrastives" which are utterances indicating a distinction between mental states (representations) and reality (Shatz, Wellman, and Silber 1983). For example, a child might remark on her previously held beliefs about a person or place, and how they differ from her current belief. Later work suggests, however, that the reliable production of such utterances does not generally occur until approximately 4 years of age (Sabbagh and Callanan 1998), which is consistent with the large body of work examining the development of ToM, as tested with verbal-based paradigms (Leslie 2000). Contrastive utterances reflect a developmental precursor to ironic language in that an explicit mention is made of an attributed belief. These proto-ironic utterances represent a naturally emerging characteristic of language skill interfacing with social cognition systems. Recent work (Happé and Loth 2002; Onishi and Baillargeon 2005; Surian, Caldi, and Sperber 2007) is now showing that infants as young as 13 months understand others' mental states even though they fail the traditional ToM test (i.e., the false-belief task). Different types of ToM systems might be specialized to

particular types of mental state inferences depending on the subsystems they serve (Leslie 2000; Onishi and Baillargeon 2005; Sperber and Wilson 2002).

Recently, Filippova and Astington (2008) found evidence that children between 7 and 9 years old can understand many pragmatic functions of ironic messages, but not have a fully developed sense of others' minds, suggesting differential developmental trajectories for these abilities. These authors suggested that the interpretative nature of pragmatic judgments might rely on different information than the deeper, more evaluative nature of judging people's motivations and intentions. This result relates to other findings showing that children can recognize ironies without really understanding what they mean (e.g., Andrews et al. 1986). One explanation is that children are able to use signals of indirect communication, but are not quite able to connect these signals to deeper understandings of internal states, possibly due to different timescales of the development of the relevant neuronal machinery (Singer 2006). This is similar to how people will recognize humor in conversational exchanges without knowing what is actually funny (Bryant and Gibbs forthcoming). One possibility is that people first develop sensitivities to relevant signals, and then learn to integrate these in their understanding of meaningful communicative events.

### *3. Neuropsychological Research*

Research in neuropsychology and neuroimaging provides some of the best evidence that ironic language use is dependent on metarepresentation. This research includes work with brain injured neurology patients, individuals with autistic spectrum disorders, and normal children and adults. Researchers have studied pragmatic language deficits in closed head injury (CHI) patients in an effort to examine the cognitive processes underlying social communication. McDonald (2000) reviewed a number of neuropsychological studies that examined the understanding of sarcasm (a sub type of verbal irony) in brain damaged individuals. This literature suggests that several abilities are linked to the recognition and understanding of ironic remarks, including appraising emotions, recognizing paralinguistic signals, and flexibility in conceptual thinking. McDonald claimed that none of these factors are prerequisites for understanding sarcasm however, and what seems to be most important, if not necessary, is the ability to make accurate judgments of people's intentions. This, of course, involves metarepresentation. Many studies converge on the finding that right-hemisphere (RH) damaged patients have trouble processing emotional information, and traumatic brain injured (TBI) individuals with frontal lobe damage cannot make second-order intentional inferences independent of emotional processing.

Channon, Pellijeff, and Rule (2005) found that CHI patients were impaired in their understanding of contextualized ironic remarks compared to control stimuli. Moreover, patients were selectively impaired in their ability to explain intentional behavior by people compared to cause-and-effect events in the world. Metarepresentational abilities seem to be compromised, while other causal attribution systems remain intact. Children with severe CHI were unable to understand intentionality in either deceptive praise or ironic criticism stimuli (Dennis, Purvis, Barnes, Wilkinson, and Winner 2001). Other work has also shown that an inability to attribute second-order mental states as a result of RH lesions is related to the ability to distinguish jokes from lies (Winner, Brownell, Happé, Blum, and Pincus 1998). These results support the hypothesis that second-order intentionality is needed for understanding verbal irony, and related cognitive phenomena such as understanding counterfactuals and nonironic indirect utterances.

Siegal and Varley (2002) concluded in a review that ToM abilities were the product of a widely distributed network in prefrontal and medial temporal lobe structures that interact with a core domain-specific amygdala system. For example, medial orbital frontal regions were differentially engaged in an emotional perspective-taking task (i.e., emotional attributions of characters after reading a vignette) relative to a cognitive-perspective task (cognitive attributions of characters), or control task (physical details of a scene after reading a vignette) (Hynes, Baird, and Grafton 2006). These regions have been linked with empathy, and as a subcomponent of ToM. In an earlier study (Shamay-Tsoory, Tomer, and Aharon-Peretz 2001), patients with prefrontal cortical lesions were impaired relative to controls in sarcasm understanding and empathy. These authors argued that the degree of empathy impairment might be a good predictor of deficits in sarcasm understanding. This study did not, however, find an effect for hemisphere side in the sarcasm task suggesting that something other than emotional processing (affecting empathy and verbal irony understanding) was responsible for these deficits. Many studies have shown impaired decision making, lack of empathy, and a diminished response to punishment related to ventromedial (VM) frontal lobe injury (reviewed in Adolphs 1999). In general, VM frontal damage is associated with a restriction of emotional integration in socially relevant processing, a crucial component of metarepresentation and the processing of social information, including implied meaning in conversation.

The task of identifying domain-specific deficits is arduous given the vast interconnections between neural systems supporting a range of abilities relying on understanding mental states. Frith and Frith (2003) described the developmental trajectory of a network of brain areas activated during mentalizing tasks: the medial prefrontal cortex, the posterior superior temporal sulcus, and the temporal poles. The combined activity of these areas results in mentalizing ability that incorporates the decoupling of mental state understanding from physical state, detecting agency, and accessing social knowledge. Other studies have confirmed the activation of these areas during tasks that involve these components (Channon et al. 2007; Shibata, Toyomura, Itoh, and Abe 2010; Uchiyama et al. 2006; Wang, Lee, Sigman, and Dapretto 2006). Individuals with prefrontal, right VM lesions had profound deficits in their understanding of verbal irony relative to both healthy controls and participants with posterior damage (Shamay-Tsoory, Tomer, and Aharon-Peretz 2005). These authors suggested that difficulties in understanding sarcasm could be the result of a general failure to integrate socially relevant cues in the rejection of literal forms of the utterances, and they attributed this to the decision making function of the VM region. This Gricean proposal contradicts their relevance-theoretic position, in that relevance theory does not predict that the analysis of a literal form is necessary in order to infer a sarcastic intention. But despite this oversight, Shamay-Tsoory et al. (2005) reasonably proposed that an integrative function of VM could be responsible for the results they report. This work is unique given the explicit integration of measures of ToM, affect, and indirect language understanding.

Researchers should not underestimate the problems associated with interpreting results obtained through methodologies that elicit responses to read stimuli presented in contextualized vignettes. Given that the input conditions of comprehension systems are presumably highly content-sensitive (Sperber and Wilson 1986, 1995, 2002) vignette studies and reading presentation paradigms are particularly worrisome due to the extraneous cognitive effects they must certainly induce. Subjects in these experiments are quite possibly generating hypotheses on the fly about the intentions of the authors of the vignettes (among other things) that is quite different from the desired inferential task of recognizing meaning in a natural communicative context. This problem could be contributing significantly

to the frequent finding that literal interpretations are often considered on-line in many of these tasks, especially when other sources of information are lacking. In other words, the contrived aspects of experimental contexts (e.g., they often feel like an intelligence test) coupled with purposefully ambiguous stimuli (often an experimental necessity) maximize the probability that subjects will generate multiple interpretations of utterances before deciding on some response. More ecologically valid tasks are needed in all areas of discourse comprehension research (see Colston 2005; Gibbs 1994; Kreuz 2000; Kreuz and Roberts 1993). In this spirit, methodologies need to be developed that move away from third party judgments, and move toward closer analysis of inferential processes on-line while subjects are engaged in discourse (see Gibbs and Bryant 2008 for a step in this direction). This is among the most serious challenges for researchers in the continued effort to study communication and cognition.

#### 4. Conclusion

Inferential communication is at the heart of conversational interaction, and indirect speech is a fundamental communicative medium in which this manifests itself. Conversationalists must monitor one another's hidden mental states during talk, and strategically use language to accomplish communicative goals. Verbal irony constitutes a widely studied, broad category of indirect speech in which speakers imply an evaluative meaning using explicit evaluative utterances that differ from the implied meaning in a scalar manner. But this core feature of ironic language use does not necessitate unique cognitive processing. Rather, this trope, like other associated tropes, affords communicative value through a reliance on inferential processes, that likely evolved for social mindreading purposes, to guide successful communication.

Overall, the oft-cited category of irony in language seems to be more due to its history in rhetoric and philosophy than to psychological and communicative function. This can explain, at least in part, why the trope has been so hard for researchers to define concretely and consistently. As researchers more elaborately describe the architecture of the capacity for metarepresentation, verbal irony and many other indirect language phenomena will likely become recognized as psychologically similar manifestations of ostensive-inferential communicative devices. That is not to say that categories of figurative language do not have unique properties that are based in psychological structure, but the role of metarepresentation will likely often play a differentiating role in understanding these tropes (Colston and Gibbs 2002). Addressing how these devices relate to our communicative strategies will elucidate the underlying cognitive machinery, and provide a window into the most mysterious aspects of human cognition and social interaction.

#### Short Biography

Gregory Bryant is an assistant professor in the Department of Communications Studies at University of California, Los Angeles. He received his Ph.D. in cognitive psychology at UC Santa Cruz in 2004, and then completed a postdoctoral fellowship at the Center for Culture, Brain, and Development at UCLA before taking his current position. In his research, Bryant examines the role of the voice in interpersonal communication from an interdisciplinary perspective. He has numerous cross-cultural studies on vocal communication of emotion and intention, and also has many papers exploring the intersection of prosody and pragmatics. His work has been published in the *Proceedings of the Royal Society*

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### Note

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