Processing Deliberate Ambiguity in Newspaper Headlines: Double Grounding

Geert Brône
Department of Linguistics
University of Leuven, Belgium

Seana Coulson
Cognitive Science Department
University of California, San Diego

Two experiments investigated the processing and appreciation of double grounding, a form of intentional ambiguity often used in the construction of headlines. For example, in “Russia takes the froth off Carlsberg results,” the key element, “takes the froth off,” is significant both metaphorically, where it refers to the detrimental impact of Russia, and metonymically via a contextual link between the company Carlsberg and beer, its best-known product. This study predicted that double-grounded metaphors would be more cognitively demanding than comparable single-grounded metaphors (where there is no such contextual link) and that, consequently, they would result in greater cognitive effects. Experiment 1 found longer reading times for headlines that employed double-grounded metaphors than for headlines that employed single-grounded metaphors with a similar meaning. Results suggested the re-profiling of the literal interpretation in double-grounded metaphors is cognitively demanding. Experiment 2 found that double-grounded metaphors were rated higher on a wittiness scale than single-grounded ones, revealing the aesthetic effect of double grounding. Results of Experiment 2 also suggest that participants in Experiment 1 were aware of the local ambiguity, ruling out the possibility that increased reading times observed in that experiment indexed failure of comprehension. Results of both experiments are discussed in terms of ideas from cognitive semantics.

Correspondence concerning this article should be addressed to Geert Brône, Department of Linguistics, University of Leuven, Research Unit Creativity, Humor and Imagery in Language, Blijde-Inkomststraat 21, B-3000 Leuven, Belgium. E-mail: geert.brone@arts.kuleuven.be
Ever since the emergence of linguistics as a cognitive science in the 1960s, creativity has been a key concept in the discipline. In Chomskyan linguistics, for example, the notion of a “universal grammar” is rooted in a particular property of language—that is, “that it provides the means for expressing indefinitely many thoughts and for reacting appropriately in an indefinite range of new situations” (Chomsky, 1965, p. 6). On this definition, creativity resides in the ability to produce a potentially infinite number of novel utterances on the basis of existing structures (grammatical competence), the output of which is in essence predictable. Obviously, however, linguistic creativity is not restricted to the level of predictable grammatical creativity. Rather, creativity is often associated with inexplicability (von Humboldt, 1836) or deliberate nonconformity (Guilford, 1967). So, at a different level, creativity entails aspects of novelty that go beyond the level of innovation generated by purely productive creativity in the Chomskyan sense. At the level of full creativity (Bergen & Binsted, 2004), novelty is associated with an element of unexpectedness, emergence, and insightfulness.

In recent years, cognitive and discourse linguists have developed an increased interest in the cognitive particularities of creative language use, as can be witnessed by the fast-growing body of publications in creative metaphor research (Câmara Pereira, 2007; Fauconnier & Turner, 2002; Gibbs, 1994; Grady, Oakley, & Coulson, 1999; Veale, 2006), cognitive poetics (Brône & Vandaele, 2009; Gavins & Steen, 2003; Semino & Culpeper, 2002; Stockwell, 2002; Werth, 1999), and cognitive humor research (Attardo, 2001; Binsted, 2006; Chafe, 2007; Partington, 2006; Ritchie, 2004). This emerging interest has been most notable in cognitive linguistics, which from its very onset discarded the generativist notion of creativity as combinatorial productivity in favor of a dynamic model that views linguistic production and processing as an active process of construing meaning on the basis of an underspecified meaning potential (Fauconnier, 1997). Cognitive linguists investigate the linguistic manifestations of general cognitive mechanisms like schematization and extension, which are drawn upon to construe contextualized and purpose-specific meaning (Langacker, 1990). This view on meaning construction as an inherently creative process opens up new perspectives for the study of linguistic creativity, as it treats conventional and ad hoc meanings on a par.

The sub-branch of cognitive linguistics that has dealt most widely with the issue of the creative aspects of meaning construction is conceptual blending theory (CBT; Fauconnier & Turner, 1998, 2002; see also Coulson, 2001), which accounts for hybrid cognitive models that emerge through a (largely unconscious) process of conceptual integration in online cognition and language use. CBT posits a set of partially compositional processes that guide the integration of conceptual content in a range of cognitive phenomena including analogy, metaphor, metonymy, and counterfactual reasoning. Much like Koestler’s (1964/1989) notion of bisociation, which is generally regarded as an early forerunner
of the theory, CBT aims to uncover an underlying mental operation in various manifestations of creative or imaginative cognition. Different “acts of creation,” from wit and humor to the scientific and artistic genius, involve the integration of input from different sources to yield novel conceptualizations.

This article focuses on one specific linguistic manifestation of creative cognition involving the blending of cognitive content from different knowledge domains (viz. deliberate or purposive ambiguity; Kittay, 1987). We propose an account of verbal wittiness as double grounding, using insights from CBT, and empirically test the impact of double-grounded meanings on both cognitive processing and subjective appreciation. First, we introduce the basic pattern of double grounding. We compare the proposed model, which focuses on the interaction of semantic mechanisms and contextual grounding, to a recently developed cognitive model of aesthetic creativity: the optimal innovation hypothesis (Giora, 2003; Giora et al., 2004). Second, we discuss the semantic–pragmatic functions of double grounding with respect to one specific type of language use that makes frequent use of this strategy (viz. newspaper headlines).

In the third and main part of the article, we present empirical evidence for the psychological reality of a process of double grounding, using reading-time data and wittiness ratings for double-grounded headlines.

### DOUBLE GROUNDING

Verbal creativity or wittiness is commonly defined as an unusual and striking association of ideas that produces surprise and pleasure (Merriam-Webster’s Collegiate Dictionary). One of the first attempts at a cognitive definition of wittiness can be found in Koestler’s (1964/1989) concept of bisociation, according to which humor and wittiness both involve

> the perceiving of a situation or idea, L, in two self-consistent but habitually incompatible frames of reference, M1 and M2. . . . I have coined the term “bisociation” in order to make a distinction between the routine skills of thinking on a single “plane,” as it were, and the creative act, which . . . always operates on more than one plane. The former may be called single-minded, the latter a double-minded, transitory state of unstable equilibrium. (p. 35f)

Koestler’s somewhat pre-theoretical account of bisociation has recently been developed more systematically in cognitive linguistics, both for jokes and wordplay. Coulson (2001) argued that the forced reinterpretation at the punchline of jokes of the type in Example 1, which follows, requires a process of frame shifting, and she provided empirical evidence for the psychological reality of such a process (see also Coulson, Urbach, & Kutas, 2006). In Example 1, for instance, the unexpected final noun phrase, “his wife,” forces the reader to backtrack and
reconstrue (part of) the preceding text (in this case, “something cold and full of rum”), using background knowledge to construe the particular frame of a frigid alcoholic instead of the initially activated scenario of ordering a drink at a bar (cf. Koestler’s, 1964/1989, “habitually incompatible frames of reference,” p. 35).

Cognitive linguistic research on the bisociative character of wordplay, on the other hand, has mainly focused on patterns of deliberate ambiguity or purposive ambiguity (Kittay, 1987; Nerlich & Clarke, 2001). With regard to wittiness effects of wordplay, Brône and Feyaerts (2005), Coulson and Oakley (2003), and Feyaerts and Brône (2002, 2005) presented a conceptual blending account of a frequently employed strategy of ambiguation that involves the activation of both a contextually dominant metaphorical interpretation and a metonymically guided literal reading. Examples of this strategy are given in Example 2:

1. When I asked the bartender for something cold and full of rum, he recommended his wife.
2a. Boeing shares are going sky-high since last February.
2b. Goodyear figures are flat in the first quarter.
2c. Russia takes the froth off Carlsberg results.

An analysis of these examples in terms of conceptual metaphor theory (Johnson, 1987; Lakoff, 1987; Lakoff & Johnson, 1980) and CBT (Coulson, 2001; Fauconnier & Turner, 1998, 2002) reveals a complex interaction of metaphorical and metonymic construal, yielding a local ambiguity. On a first level, all three examples are instantiations of the conventional orientation metaphor, quantity is verticality, which motivates the sub-metaphors, more is up and less is down. In 2a, “to go sky-high” profiles a spectacular increase in share prices of the Boeing company (more is up). In 2b, on the other hand, the lack of such an increase is described as flat (i.e., horizontally level). Following the same basic metaphorical construal, loss of profit margins is conceptualized in 2c as “taking the froth off” otherwise positive results (less is down).

On a second level, the choice of the specific metaphorical image in these examples is motivated not only by the cognitive need to conceptualize abstract economic developments, but also by its relation to another element in the immediate context (viz. the company that is the main topic of the economic report). Taken literally, only physical objects (and not company shares) can be said to go sky-high (i.e., 2a). In the context of a report on the market status of an aircraft manufacturer, the otherwise “irrelevant” literal interpretation of the metaphorical element is re-profiled through the conventional metonymic link between the company and its product (company: Boeing; product: airplanes). The resulting local, contextually motivated ambiguity offers an additional effect of wit to the one-liner. In 2b and 2c, a similar pattern can be identified. One of the salient literal meanings of flat in 2b is “deflated” or “punctured,” which
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is typically used with reference to tires, the main product of the company, Goodyear. In 2c, the image of taking away foam or froth in the context of the beer-producing company, Carlsberg, prompts a metonymic shift of Carlsberg toward the brewery’s product. This type of ambiguity, generated by the interplay of a contextually appropriate conventional metaphor and a covered metonymy, has been referred to as double grounding (Feyaerts & Brône, 2002).¹

The dynamic semantic construal underlying double-grounding examples has been described in blending theory as the multidirectional interaction of several knowledge domains. The meaning of an example like 2c, represented schematically in Figure 1a, emerges as a result of the integration of knowledge structure from at least three input spaces. Two of these inputs represent the source and target concept (Inputs 1 and 2, respectively) of the conventional orientational metaphor quantity is verticality and, more specifically, less is down (the double lines represent a relation of specification). The specific image of taking the froth off something to refer to the cause of a decrease is used as a creative instantiation of that conventional metaphorical construal. Both input spaces are connected by

¹Note that grounding is intended here in the classical sense of symbol grounding and not, for instance, in the sense of Clark’s (1996) interactional grounding as interlocutors’ efforts to establish joint linguistic actions as common ground.
cross-space mappings, which link counterparts in both domains (e.g., the cause of the decrease in the target space is linked to the action of taking the froth off, e.g., a glass of beer). Next to these two basic inputs, a third, “representational” input space contains knowledge elements related to the particular company in question (the producer, Carlsberg; its product, beer; economic development; etc.). This input elaborates the target of the conventional metaphor.

Crucial to the double-grounding effect, however, is one element in the integrated space, which is projected along the lines of the metaphorical construal (take froth off), but which can be additionally motivated with respect to the third input space (elaborated target), thus giving rise to a blend of two interpretations. In 2c, the verb phrase, “to take the froth off,” also relates to the representational space, Carlsberg, where its literal meaning is triggered by the metonymic interpretation of Carlsberg in terms of its product. In Figure 1a,
this additional reading is schematically represented as a dashed arrow from the blended space to the elaborated target input. The key to double grounding is that through *metonymic mediation*, the central metaphorical element activates its literal meaning next to the contextually dominant metaphorical one. A blueprint for the double-grounding phenomenon, which accounts for all cases of the type in 2a through 2c, is represented in Figure 1b.

**DOUBLE GROUNDING AND OPTIMAL INNOVATION**

Up to this point, we have provided a semantic-pragmatic account of the cognitive construal of double-grounded metaphors. What remains largely unaccounted for at this point is the question how double grounding relates to existing research on the aesthetics of creative, witty, and humorous language use. For the sake of the argument in the previous section, it sufficed to note, generally, that the wittiness of double grounding is related to the activation of both the metaphorical and literal reading of a key element. In this section, the phenomenon is compared to some existing cognitive research on aesthetics.

The concepts of creativity, innovation, and expressivity have a long tradition in linguistics and stylistics, spanning from Russian Formalism (Šklovskij’s, 1917/1965, notion of *ostranenie* or defamiliarization), Prague School Structuralism (Mukařovský & Havránek’s, 1964, notions of *aktualisace* or foregrounding; Jakobson’s, 1960, emotive and poetic functions of language), and pragmatics, to functional and cognitive linguistic approaches to language use (Halliday & Hassan, 1976; Lakoff & Turner, 1989; Martinet, 1991; Traugott, 1982). Rather than reviewing the internal differences and similarities between all these different views, we focus on a leading account of aesthetics in humorous language, Giora’s (2003) optimal innovation thesis. We take this account as a reference point, both because of its explicit positioning vis-à-vis the aforementioned tradition in stylistics and because it is well-supported by existing experimental evidence on this topic.

Giora (2003) and Giora et al. (2004) described the tension between the pursuit of expressivity and the need for referential accuracy, which marks creative language use in terms of *optimal innovation*. Pleasure, it is argued, is not the effect of pure novelty but, rather, novelty that allows for the recoverability of the familiar and salient²:

²The research on optimal innovation is embedded in a larger research project by Rachel Giora et al. (2004) on the role of *salience* and accessibility in language comprehension and production, with a special focus on a range of language constructs generally labelled as figurative language. Salience or prominence of a particular meaning of a word or construction, on Giora’s account, is a feature coded in the mental lexicon, and is determined by a number of parameters including frequency, familiarity, conventionality, and prototypicality.
A stimulus would be optimally innovative if it involves (a) a novel—less or non-salient—response to a given stimulus, which differs not only quantitatively but primarily qualitatively from the salient response associated with the stimulus and (b) at the same time, allows for the recoverability of a salient response related to that stimulus so that both responses make sense (Giora et al., 2004, p. 116).

The equilibrium between novelty and familiarity that is the defining feature of the optimal innovation hypothesis can best be illustrated using the Example 3 (from Giora et al., 2004, p. 117):

3a. A piece of paper.
3b. A single piece of paper.
3c. A peace of paper.
3d. A pill of pepper.

The familiar collocation in 3a has a salient reading that is coded in the mental lexicon (a sheet of paper). Aesthetic creativity emerges through variation and deautomatization (Miall & Kuiken, 1994; Mukařovský, 1964; Renan, 1984; Sabban, 1998). This variation, however, is principled: It has to involve a qualitatively different response than the one triggered by the familiar stimulus. Although 3b provides some novel information in comparison to the salient response, it does not activate a conceptually different meaning (it remains within the same semantic domain; cf. Coulson, 2001) and, hence, does not have a significant aesthetic effect.

Example 3c, on the other hand, differs qualitatively from the salient response because it evokes the domain of politics (worthless peace agreements). In other words, the manipulation triggers a completely new reading, without losing track of the original phrase and its salient meaning. This idea of the recoverability of the salient response (point (b) in the previous definition) is the essential feature of the optimal innovation hypothesis. Although creativity is of obvious relevance to the pursuit of aesthetic effects, it needs to be constrained by salience. In the case of 3c, the linguistic innovation triggers a novel meaning while simultaneously activating the salient one. Example 3d, by contrast, has a rhythmic and phonetic structure that is comparable to 3a, but the novel phrase does not allow for the recoverability of the salient 3a. Hence, only example 3c satisfies both conditions for optimal innovation: a response that (a) is conceptually different from the salient response and (b) provides access (transparency) to that salient meaning.

A series of experiments, reported in Giora (2003) and Giora et al. (2004), provide empirical evidence for the optimal innovation hypothesis. First, ratings show that the optimally innovative stimuli (i.e., 3c) are considered to be more “pleasurable” (the term used by Giora et al., 2004) than the three other conditions.  

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1In addition, the optimal innovation hypothesis gives significant weight to the familiar stimulus (see 3a). According to the hypothesis, these stimuli should score higher on pleasurability than pure innovations (see 3d). This claim is also supported by the same rating experiment.
Second, reading-time data strongly suggest that optimally innovative stimuli involve the activation of both the novel and salient response.

At first sight, the phenomenon of double grounding seems to fit neatly into the pattern described by the optimal innovation hypothesis. It involves the deautomatization of a prominent reading in a context that allows for a secondary construal. However, we suggest that current incarnations of the optimal innovation thesis do not fully account for the aesthetic impact of the cognitive operations involved in double grounding. Before we report the results of two experiments on the cognitive processing and appreciation of double grounding and discuss how these results relate to the optimal innovation hypothesis, we briefly review the semantic–pragmatic function of double grounding in one of its most natural linguistic settings: the newspaper headline. Because our two studies were conducted using existing newspaper headlines, some discussion of the discursive function of “headlines” (Mårdh, 1980) is in order.

**DOUBLE GROUNDING AND THE SEMANTIC–PRAGMATIC FUNCTIONS OF HEADLINES**

Headlines are deceptively simple, fragile linguistic constructs. Although comprised of only a few words, they serve a whole range of communicative purposes. One of these functions is that of summarizing the content of the article in an extremely concise manner (Bell, 1991; Mårdh, 1980; Van Dijk, 1988). Apart from this basic referential function, however, headlines serve an additional purpose as eye-catchers (Alexander, 1997) or punchlines. They attract attention and persuade readers to actually read the article that the headline is accompanying. Dor (2003) described the tension between the semantic and pragmatic function of headlines (Iarovici & Amel, 1989) in relevance theoretic terms: “Newspaper headlines are relevance optimizers: They are designed to optimize the relevance of their stories for the readers” (Dor, 2003, p. 696). On Dor’s account, newspaper headlines serve to negotiate between the story and its readers: They aim to realize the optimal ratio of contextual effects and processing cost.

Despite the theoretically interesting integration of the range of semantic and pragmatic functions that headlines have into the higher-level functional principle of relevance optimization, Dor’s (2003) account is problematic in some respects. Most strikingly, Dor’s list of 10 “properties of the appropriate headline” (p. 708) does not provide a sufficient account of the expressive function of headlines. Rather, he seems to restrict the “attractive” feature of headlines to the way in which they prompt readers to continue reading the article. In doing so, he relegates one significant and common rhetorical feature of headlines to the background: its expressive power (De Knop, 1985; Lagerwerf, 2002). A corpus study of business headlines from *The Economist* (Alexander, 1997, p. 94) illustrates,
however, that linguistic foregrounding techniques (such as puns, alliterations, novel metaphors, etc.) are pervasive in headlines (more than one third of all headlines featured some form of wordplay). It is not entirely clear how this finding could be reconciled with Dor’s relevance theoretic account, which lists as one of the 10 headline imperatives “avoid ambiguity” (Dor, 2003, p. 709).

The cognitive–semantic analysis of double grounding in the previous sections raises the question what function this phenomenon serves in the context of a newspaper headline. To what extent does the local ambiguity that is triggered by the combined activation of metaphorical and metonymic frames contribute to the information value of the headline? Recent research into the pragmatic functions of headlines provides a number of clues.

Double grounding, in fact, reveals an interesting trade-off between contextual effect and cognitive processing. Although it could be argued that bringing in a locally ambiguous element serves no other purpose than drawing the reader’s attention to the headline, this does not fully capture the effect of double grounding. By selecting a key metaphorical element that can be related metonymically to the thematic concept of the newspaper article, that concept is highlighted in a supplementary way. For example, in the case of Example 2c, the reference to froth additionally brings “on stage” (Langacker, 1987) basic information about the company as part of the general setting before the development of the actual discourse has even started.

This additional “topic-priming” effect of double grounding can be described in terms of models of framing (Hallahan, 1999). According to these models, “to frame is to select some aspects of perceived reality and make them more salient in the communicating text” (Entman, 1993, p. 55, as cited in Hallahan, 1999, p. 207). In other words, framing involves the intentional biasing of cognitive processing by priming relevant information (Hallahan, 1999, p. 208). In this sense, double grounding may serve as a framing technique in that it triggers the retrieval or relevant stored knowledge. In sum, the effect of double grounding can be argued to be twofold: attractive and topic-highlighting.

To empirically investigate the cognitive and aesthetic impact of double grounding, we conducted two experiments. In Experiment 1, reading-time data for double-grounded metaphors are compared to those for single-grounded ones. In Experiment 2, participants were asked to rate double- and single-grounded metaphors for wittiness. The results of these two experiments are then discussed in relation to Giora’s (2003) optimal innovation hypothesis, as well as a model based on CBT (the space structuring model).

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4The imperative can best be understood in the sense of unintentional ambiguity (e.g., like syntactic ambiguity; Bucaria 2004, Perfetti, Beverly, Bell, Rodgers, & Faux, 1987). However, even in the case of intentional ambiguity, it is not clear which context effect (at least an effect relevant to the interpretation of the article) Dor (2003) would attribute to the use of novel metaphors, puns, and wordplay.
In Experiment 1, we tested the hypothesis that double grounding common in headlines imposes a processing cost relative to headlines that employ comparable metaphors, but that do not allow a local double interpretation. To take the example in 2a, the local competition between the two readings of sky-high is argued to require more processing effort than unambiguous metaphors like, “Google™ shares go sky-high,” where there is no producer–product metonymy that ties in with the element sky-high. We also predicted that it would take participants longer to read double-grounded examples, such as 2a, than headlines such as “Boeing shares go through the roof,” in which the metaphorical element is not tightly linked to the company’s activities. We hypothesized that the contextually triggered ambiguity that arises through the metonymic back projection in double grounding involves a greater processing load than, for example, purely (single grounded) metaphorical cases, and that this processing load would be detectable in a self-paced reading task.

To test this hypothesis, we used headlines that allowed for a double-grounding interpretation (as in 4a, which follows), and constructed three additional variants (as in 4b–4d):

4a. U.S. slowdown punctures Bridgestone’s profits.
4c. U.S. slowdown narrows Bridgestone’s profits.
4d. U.S. slowdown narrows Cold Stone’s profits.

Thus, our headlines varied along two dimensions: verb choice (predicative metaphor) and company name. In 4b, the appearance of a different company name (Cold Stone in 4b is an American ice cream company) blocks the possibility of double grounding, so that only the single-grounded metaphorical reading remains. In 4c, the predicative metaphor of 4a is replaced by a (near-)synonym that is matched for lexical factors affecting reading times. The third variation (i.e., 4d) involves a combination of the two alterations in 4b and 4c.

Although there are relatively few studies on the cognitive processing of predicative metaphors in comparison to nominal metaphors, it is generally assumed that they function similarly. Glucksberg (2001, 2003) argued that both nominal metaphors (of the type “his bike was an arrow”) and predicative metaphors (“He hopped on his bike and flew home”) involve the use of prototypical members of a category to attribute properties to the metaphorical target (arrows as prototypical members of the category of fast things; flying as a prototypical member of the category of fast travel). For this study, metaphorical verb pairs were chosen that symbolize similar categories of events. In Example 4, puncture and narrow both entail a reduction in size and can be viewed as members of the category of physical constriction.
If double grounding imposes a processing cost, it should take participants longer to read double-grounding sentences such as 4a than sentences such as 4b through 4d, which do not allow for double grounding. Thus, we predict an interaction between verb choice and company name, as company name is expected to impact reading times in the comparison of double-grounded metaphors such as 4a with single-grounded metaphors such as 4b, but should not impact reading times in the comparison of the single-grounded metaphors in 4c and 4d because both have the exact same metaphorical construal and only differ in the company name being referred to. In sum, we expect company name to increase reading times only when it promotes an additional metonymic interpretation of the verb phrase.

Method

Participants. Thirty-six undergraduate students (aged 18–22) attending the University of California, San Diego were awarded credit for cognitive science or psychology course requirements in exchange for their participation. All participants were native English speakers.

Materials. Experimental stimuli were constructed from newspaper headlines found in online newspapers (including Financial Times, The Wall Street Journal, and BusinessWeek). We designed 40 quartets of the type like Examples 4a through 4d and divided them into four experimental lists, each containing only one version of each quartet. We replaced the metaphorical verb in the a and b versions of each quartet by a near-synonym in the c and d versions that was matched for number of syllables, frequency, imageability, and familiarity using the MRC (Medical Research Council) Psycholinguistic Database (Coltheart, 1981; Wilson, 1988). As the MRC Database only includes familiarity scores for stimuli and not specific meanings of stimuli (e.g., as the literal vs. metaphorical use of verbs), it cannot control for the cognitive impact of participants’ experience with the meaning of the metaphorically used verbs (Giora, 2003). Therefore, we tested participants’ familiarity with the metaphorical use of the variant verbs by means of a rating task. Fourteen undergraduate students attending the University of California, San Diego (none of whom participated in Experiments 1 or 2) were asked to rate on a 5-point scale how familiar they were with the verb used in the experimental trials of the type like 4b and 4c (the single-grounded condition with the original verb and the condition with the alternative predicative metaphor). The results of the pretest reveal no significant difference in familiarity scores between the two verb variants: an average score of 3.57 for the original verb (4a–4b) and 3.68 for the near-synonym that was used in the other conditions (4c–4d). It can, therefore, be assumed that
any differences in reading times between the 4a and 4b versus the 4c and 4d conditions cannot be reduced to an effect of the familiarity of the predicative metaphors.

For the reading-time experiment, we employed a $2 \times 2$ within-subjects design with factors *verb choice* and *company name*. As noted earlier, we used four lists so that, although no individual participant saw more than one version of each quartet, all four versions of each headline occurred across lists. Each list consisted of 40 experimental trials (10 in each condition) and 40 filler sentences similar in style to the experimental trials.

To control for the participants’ familiarity with the company names and their products, we gave participants a survey after completing the reading-time experiment (see the Procedure section). In this survey, participants were presented with a list of the company names they had read in the experiment, and were asked to name the product they typically associate with them. Because all company names had a minimum score of 80% correct associations (i.e., for each company name, the correct product name was filled out by at least 80% of the participants), we performed no further filtering of the data.

**Procedure**

We used the E-Prime software package (Schneider, Eschman, & Zuccolotto, 2002a, 2002b) to present the headlines on a personal computer screen and to collect reading-time data. We asked participants to read single sentences on a computer screen and press a key as soon as they had read and understood the sentence. To keep the participants alert to the experimental materials, all sentences (both experimental trials and filler sentences) were followed by a short comprehension question (of the true–false type). After each comprehension question, a feedback screen was shown for 1,000 ms. A practice block of five sentences of the same type as the experimental stimuli, including comprehension questions and feedback, preceded the actual experiment.

**Results and Discussion**

The results for the comprehension questions revealed that, on average, participants understood 91.3% of all trial sentences correctly. Furthermore, we observed no significant difference between comprehension scores between the four conditions: 92.2% for conditions of type 4a, 90.3% for 4b, 91.7% for 4c, and 91.0% for 4d. It can, therefore, be concluded that participants had no significant problems understanding the test stimuli; and, taken separately, the four conditions exhibited highly similar comprehension scores. The trials on which the participants failed the comprehension test were removed from the analysis.
Reading times in each condition were averaged and compared, using both participants and items analysis. The mean reading times and standard deviations are presented in Table 1. In general, participants read sentences with the original verbs (e.g., “punctures”) more slowly than sentences with the control verbs (e.g., “narrows”), respectively: $F_1(1, 35) = 37.08, p < .0001$; and $F_2(1, 39) = 20.48, p < .001$. More important, when verbs allowed a double-grounded reading, participants read sentences with the company name that led to double grounding (e.g., Bridgestone; 4,486.63 ms) reliably more slowly than they read sentences with a company name that did not lead to double grounding (e.g., Cold Stone; 4,200.25 ms); however, there was no difference for the control verbs (4,021.57 ms vs. 4,018.66 ms)—that is, we observed an interaction between verb choice and company name: $F_1(1, 35) = 6.24, p < .05$; and $F_2(1, 39) = 3.70, p = .06$, respectively.

Overall, the results of this experiment are, at least partially, consistent with predictions made by constraint satisfaction models (Katz & Ferretti, 2001; McRae, Spivey-Knowlton, & Tanenhaus, 1998; Spivey-Knowlton & Sedivy, 1995), which account for the integration of different sources of information by assuming a local competition for activation between alternative possibilities (e.g., syntactic, lexical, and conceptual) over time, in parallel. In the case of double grounding, these models predict that a subtle competition will take place between the literal and the metaphorical meanings. Because there is more support for the literal meaning in the first of the experimental conditions tested here (i.e., 4a), the competition might be expected to last longer and, thus, explain the longer reading times we observed in this study.

However, it should be stressed that competition or parallel activation, as such, does not fully explain the increased cognitive cost. Katz and Ferretti (2001) and Ferretti, Schwint, and Katz (2007) showed, by means of self-paced reading data, that there is no significant difference in the processing cost of familiar proverbs embedded in literal and figurative biasing contexts. These data suggest that participants do not need more processing time to read figurative (metaphorical, proverbial, etc.) utterances in a figurative than in a literal biasing context, and further underscore the importance of metonymic mediation in the processing of

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Double-Grounded “Punctures”</th>
<th>Single-Grounded “Narrows”</th>
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<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Bridgestone</td>
<td>4,486.63</td>
<td>1,246.06</td>
</tr>
<tr>
<td>Cold Stone</td>
<td>4,200.25</td>
<td>971.21</td>
</tr>
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double grounding. If it does not take longer to process a metaphorical statement in a context that supports the literal interpretation (or both the metaphorical and literal; Keysar, 1989), as such, then the increased processing load for the double grounding examples cannot be simply explained as an effect of “literal biasing contextual elements” (the company names in the double-grounding examples of the type in 4a). Rather, the metonymic mediation required for re-profiling the literal interpretation of the key element in double grounding seems critical for the increased processing cost.

**EXPERIMENT 2**

Experiment 1 suggested that understanding headlines that employed double-grounded metaphors was more cognitively demanding than comparable single-grounded metaphors. However, in accordance with Relevance Theory (Sperber & Wilson, 1995), we predict that the increased processing cost of double grounding coincides with offsetting cognitive effects at the level of the discourse model. In particular, we suggest that the added effect of double grounding consists, at least partially, in its aesthetic impact. To test this prediction, we asked participants to rate the materials used in Experiment 1 on a 5-point wittiness scale, ranging from 1 (*not at all witty*) to 5 (*very witty*). We predicted that the double-grounded headlines such as those in 4a would be rated as being wittier than the other three variants such as those in 4b through 4d.

Moreover, results of Experiment 2 may also prove useful in ruling out an alternative interpretation of Experiment 1. In particular, it could be argued that the longer reading times for variant 4a were not necessarily related to the reactivation of a literal reading of the contextually dominant metaphorical one. Rather than the co-activation of the metaphoric and metonymic readings, those data might instead reflect more problematic integration of the metaphor and the company name in the critical double-grounding headlines than in the other conditions. Experiment 2 was partially motivated by the desire to show that our double-grounded metaphors (i.e., 4a) were indeed understood as intended. If the results of Experiment 1 reflected the cost of constructing a double-grounding interpretation, and not merely processing difficulties associated with an unsuccessful or partial interpretation, examples such as 4a should be rated higher on a scale of wittiness than the other three conditions.

**Method**

**Participants.** Forty undergraduate students (aged 18–23) attending the University of California, San Diego were awarded credit for cognitive science or
psychology course requirements in exchange for their participation. All participants were native English speakers.

**Materials.** We used the same stimuli as in Experiment 1. Again, four experimental lists were compiled, so that each list contained one version of each of the four conditions. Each list consisted of 40 experimental trials (10 for each variant).

**Procedure**

Ratings and reaction-time data were collected using E-Prime software (Schneider et al., 2002a, 2002b). Participants were asked to read single sentences on a computer screen and rate those sentences for wittiness by pressing a key from one to five (1 = *not at all witty* to 5 = *very witty*). A practice block of three sentences of the same type as the experimental trials preceded the experiment to familiarize the participants with the procedure. The practice block was preceded by a screen showing an example of a witty headline (“Bush’s Brain is Leaking,” referring to Karl Rove’s involvement in the leak of the name of a Central Intelligence Agency agent). This example was used to clarify the notion of wittiness without making explicit the double-grounding pattern.

**Results and Discussion**

Wittiness ratings in each condition were averaged and compared, using both participants and items as random factors in the analyses. We present the findings of Experiment 2 in Table 2. The results show that, on average, participants rate the double-grounded sentences significantly higher for wittiness (*M* = 3.51 on a 5-point wittiness scale) than the three other conditions—4b (*M* = 1.89), 4c (*M* = 1.90), and 4d (*M* = 1.75)—which did not reliably differ from one another in rated wittiness. Repeated-measures analyses of variance (ANOVAs) for participants

| TABLE 2
| Wittiness Ratings: Experiment 2 |
|------------------|------------------|
| **Variable**     | **Double-Grounded** | **Single-Grounded** |
|                  | "Punctures" | "Narrows" |
| Metonymic link: Bridgestone | 3.51 0.71 | 1.90 0.52 |
| No metonymic link: Cold Stone  | 1.89 0.46 | 1.75 0.62 |

*Note.* Ratings were on a 5-point scale ranging from 1 (*not at all witty*) to 5 (*very witty*).
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(F_1) and items (F_2) both revealed a significant interaction between verb choice and company name: F_1(1, 39) = 175.16, p < .0001; and F_2(1, 39) = 108.44, p < .0001.

The results of the rating task, in combination with those of Experiment 1, suggest an interesting trade-off between cognitive processing load and contextual effect (along the lines of Sperber & Wilson’s, 1995, Relevance Theory). The higher wittiness ratings for the 4a condition suggest that the longer reading times measured for this condition were, in fact, the result of a local co-activation of two readings. Because this co-activation yields a number of contextual effects (topic highlighting and expressive), it justifies the higher processing cost in comparison with single-grounded metaphors.

In addition to the wittiness ratings, we measured reaction times from the onset of the stimulus to the moment participants entered a numeric value (the wittiness rating from 1–5). Not surprisingly, it took participants overall longer to read the trial sentences than in Experiment 1 (5,568.20 ms vs. 4,181.78 ms). This difference can be attributed to the conscious experimental task of rating trial sentences. It is interesting to note that the nature of the rating task has an additional effect on reaction times. Whereas Experiment 1 revealed longer reading times for double-grounding sentences, participants in Experiment 2 were faster in rating type 4a variants (M = 5,123.60 ms) than the three other conditions: 4b (M = 5,769.52 ms), 4c (M = 5,757.60 ms), and 4d (M = 5,622.05 ms). These results are presented in Table 3. Repeated-measures ANOVAs for participants (F_1) and items (F_2) show an interaction between stimulus type (Metaphor Type × Company Name) and reaction times: F_1(1, 39) = 7.71, p < .01; and F_2(1, 39) = 9.45, p < .005. This effect of experimental task on reaction times is neither surprising nor in conflict with the latency data of Experiment 1, given the conscious nature of the rating experiment (in contrast to Experiment 1). Whereas double-grounding cases are overtly ambiguous and, hence, relatively easy to rate, the other variants may prompt participants to look (additionally) for an effect of wit, although no such effect is intended. In those cases, longer reaction times are a meta-priming effect of a conscious search for wittiness.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Double-Grounded “Punctures”</th>
<th>Single-Grounded “Narrows”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metonymic link: Bridgestone</td>
<td>5,123.60, 1,041.72</td>
<td>5,757.60, 1,535.01</td>
</tr>
<tr>
<td>No metonymic link: Cold Stone</td>
<td>5,769.52, 1,289.45</td>
<td>5,622.05, 1,319.61</td>
</tr>
</tbody>
</table>
This study focused on a specific subtype of intentional ambiguity frequently employed in newspaper headlines. Known as double grounding, this phenomenon revolves around one word or phrase in the headline with a contextually appropriate metaphorical reading, as well as a contextually relevant literal meaning that is brought onto stage through a metonymically motivated association between the literal referent and the topic element of the headline. For example, in “Russia takes the froth off Carlsberg results,” the key element “takes the froth off” is significant both metaphorically, where it refers to the detrimental impact of Russia; and metonymically, via a contextual link between the company, Carlsberg, and beer, its best-known product. This intentional ambiguity was argued to have a double communicative function: Apart from the obvious expressive function of attracting reader attention through foregrounded language use, double grounding also serves to highlight the article topic. Double functionality stems from the choice of a metaphorical element whose literal interpretation ties in indirectly with the article topic.

We hypothesized that double grounding (a) involves an increase in processing load in comparison to single-grounded metaphors and (b) is rated higher for wittiness than unambiguous metaphors because of the relevant local ambiguity. In Experiment 1, we found that when the task was reading for comprehension, participants spent more time reading double- than single-grounded metaphors, as predicted in our first hypothesis. In the second experiment, participants were asked to rate single- and double-grounded metaphors for wittiness. The results of this experiment revealed significantly higher wittiness ratings for double grounding, as predicted in our second hypothesis. Moreover, in showing that participants found the double-grounded metaphors to be interpretable, results of the second experiment argue against an interpretation of the longer reading times in Experiment 1 as reflecting confusion over the meaning of those sentences.

Overall, results of this study are partially consistent with recent cognitive research in aesthetics. According to the best-developed cognitive model of aesthetic creativity, the optimal innovation hypothesis, the highest effect of pleasure is attained through a trade-off between novelty and familiarity. More specifically, optimal innovation involves a novel meaning that allows for the recoverability of the salient. On this definition, optimal innovation excludes familiar stimuli (Giora et al., 2004, p. 117), and includes innovations such as formal variants of familiar constructions that trigger a radically different reading (e.g., peace of paper, weapons of mass distraction), novel metaphors (e.g., a chronic headache as a metaphor for long-term problems), and the deautomatization of entrenched form-meaning pairs (e.g., in a joke such as, “How do you get holy water? Boil the hell out of it!”). In all cases, a figure-ground constellation seems to be at work between the novel and the salient (Attardo & Raskin, 1991; Giora, 1991; Veale, 2005).
These findings are broadly consistent with those reported by Giora et al. (2004)—that is, both double grounding and optimal innovation elicit longer reading times and higher ratings than their relevant control conditions. However, the stimulus-driven definition of optimal innovation in terms of novel and salient responses does not fully cover double grounding. First, Giora’s account does not make an explicit distinction between variations of the type in 4a and 4b, which are both instantiations of the same novel metaphor puncture, and predicts both will be equally witty. According to the optimal innovation hypothesis, novel metaphor readings are always optimally innovative, regardless of any other contextual links. However, just as conventional metaphors can appear in contexts that promote either a single- or a double-grounded reading, so too may novel metaphors (e.g., “Recession may cause chronic headache for Merck”). This account predicts a difference between these cases, and this difference was reflected in the experimental data reported.\(^6\) Double-grounded metaphors took longer to read and were consistently rated as wittier than single-grounded ones.

This level of gradation has not been covered by the existing empirical work on optimal innovation because the role of context in that account is largely confined to the selection of appropriate lexical meanings.\(^7\) Second, because double grounding hinges primarily on contextual information for its effect, no novel or non-salient response needs to be construed to realize the phenomenon. Rather, the double-grounding effect revolves around the tension between a contextually appropriate reading (which may be either novel or salient) and a metonymically motivated opportunistic secondary reading (which is almost always salient). For instance, in Example 5a, which follows, neither the literal nor the metaphorical reading of soar is novel (“fly high” vs. “reach a high level”). Rather, the witty effect arises by bringing the literal (salient) reading onto stage next to the contextually appropriate (but not novel or non-salient) metaphorical reading. If the same metaphor is used in the context of a different company (not related to air traffic), the salient literal interpretation may be recoverable, but is not brought onto stage:

5a. British Airways shares are soaring since last month’s results.
5b. The contract with Sappi is just a piece of paper.

\(^6\)It should be noted that Giora’s studies (Giora, 2003; Giora et al., 2004) are not based on wittiness ratings but, rather, on the broader notion of pleasurability. Intuitively, however, it seems unlikely that variants like 4a and 4b would have identical scores on pleasurability because wittiness can be argued to be a factor influencing the more general category of pleasurability (cf. Lagerwerf 2002).

\(^7\)Further gradation is possible for the double-grounding hypothesis, as well, so as to account for the impact of multiple connections (triple grounding, quadruple grounding, etc.) on cognitive processing and appreciation. Given processing limitations, however, differences between triple and double grounding are likely to be negligible.
Likewise, optimal innovation cannot account for the processing cost and increased wittiness induced by the double grounding in 5b because there is no apparent tension between two different readings of the lexical element *paper* (literal vs. metaphorical, idiomatic vs. componential, etc.). In this case, it is the contextually available metonymic link between Sappi and paper (producer–product) that triggers the witty effect. It appears that the aesthetic appeal of double grounding is less related to the tension between novel and salient meanings than to the way in which those meanings contribute to the discourse model as described in CBT (Fauconnier & Turner, 2002).

We suggest that results of this study are more consistent with the framework adopted in the *space structuring model*, an account of meaning construction in discourse that assumes that lexical and contextual processing are integrally connected (Coulson, 2001; Coulson et al., 2006; Coulson & Van Petten, 2002). This model, which is inspired by cognitive linguistics in general, and more specifically by blending theory, hypothesizes that both in literal and nonliteral language, comprehension involves the construction of a contextualized meaning through the integration of and mapping between cognitive models. Linguistic information (including salient meanings) is important for figurative language comprehension, as speakers use the coded meaning to guide their construction of the conceptual integration network; full interpretation, however, requires the application of background and contextual knowledge to build the cognitive models in the different mental spaces of the network (Coulson & Oakley, 2005).

For example, according to the space structuring model, metaphor interpretation requires the construction of a number of cognitive models in a conceptual integration network. Grammatically cued processes involve construction of a cognitive model of the source domain of the metaphor—what would be dubbed a literal interpretation of the metaphoric expression—and occurs, more or less, in parallel with the structuring of other spaces in the network. In contrast to many models of metaphor comprehension, parallel activation of meaning does not reflect a lexical activation process followed by selection of the correct meaning. Rather, parallel activation reflects the construction of cognitive models in various spaces in the network; that is, it results from discourse-level processing. The space structuring model thus attempts to capture the commonalities in literal and nonliteral language comprehension without ignoring the dynamic and context sensitive way that people construct meaning.

Coulson and Matlock (2001) conducted an offline feature listing study that revealed that context can alter the information that is activated by a given word. More specifically, the study shows that participants activate different conceptual structure for a sentence-final word, depending on the sentential context in which it was embedded: (a) a context that promotes a literal reading (“Last time he went sailing he almost forgot about the anchor”), (b) a metaphorical context (“Amidst all the trappings of success, his wife was his anchor”), or (c) a context
requiring a literal mapping (“We were able to use a barbell for an anchor”).
The results of this study are consistent with those of Coulson and Matlock and,
more generally, with the space structuring model because the double-grounding
effect revolves around the impact of a local context (company name) on word
sense (literal or metaphorical). In other words, the space structuring model can
naturally account for the reactivation of the literal interpretation of an otherwise
prominent metaphorical element in the context of a company headline.

Conversely, the space structuring model has been used to account for the
impact of a single word on message-level representation. In one-line jokes
of the type in Example 1 (“When I asked the bartender for something cold
and full of rum, he recommended his wife”), the final word is incompatible
with the discourse representation that was constructed up to that point, and
forces the reader–hearer to map the elements of the representation into a new
frame retrieved from long-term memory. Known as frame shifting (Coulson,
2001), this reanalysis process can be viewed as a pragmatic version of the
garden-path sentences studied by researchers in sentence processing. However,
whereas garden-path sentences result from syntactic ambiguity and their re-
analysis is grammatically cued, the reanalysis involved in frame shifting is
typically supported by the same syntactic representation used in the initial parse.
Further, although frame shifting does sometimes require the listener to instantiate
alternative word meanings, lexical semantics alone is not sufficient to explain
the difference between the initial interpretation of the sentence and the meaning
evoked by the joke. Rather, interpretive differences in the initial and the joke
readings stem from extralinguistic information activated to construct the situation
model.

The psychological reality of frame shifting has been tested in a number
of studies reported in Coulson et al. (2006). Self-paced reading tasks, event-
related brain potentials experiments, and an eye-tracking study all reveal that
frame shifting involves an additional processing cost in comparison to non-joke
controls. These findings are in line with those of this study because both frame
shifting and double grounding involve the retrieval of alternative, contextually
evoked information, triggered by a single element (the final word in one-line
jokes or the metaphorical element in double grounding). The difference between
both phenomena resides in the relevance of the initially evoked frame, which is
suppressed in the case of jokes (Giora, 2003; Vaid, Hull, Heredia, Gerkens, &
Martinez, 2003), but is preserved in double grounding.

Indeed, it is the maintenance of both interpretations in double grounding that
makes this phenomenon problematic for traditional models that posit lexical
interpretation followed by the application of contextual considerations. Such
models would be subject to the misparsing problem described by Clark (1983)
in which the listener computes a literal reading of an innovative figurative
expression and, finding it contextually unproblematic, fails to go on to derive
its intended meaning. In the case of 5b, for example, a traditional model would determine that contracts are indeed comprised of paper and halt the interpretive process before noting its figurative interpretation (that the contract was signed without any intent of its fulfillment), let alone the metonymic link between Sappi and its principal product (paper).

More generally, the space structuring model differs from more traditional approaches to figurative language comprehension in its focus on discourse-level representations. Although most models describe figurative language comprehension in terms of the activation of lexical senses, and portray the role of contextual factors as constraining those activations (e.g., Graded Salience Hypothesis; Giora, 2003), the space structuring model describes comprehension as an imaginative process by which people combine linguistic and nonlinguistic knowledge to construct conceptual integration networks that represent the message-level representation (Coulson, 2006). The space structuring model, thus, is aimed at explaining the role of context not just in sense selection, or the choice of a contextually appropriate meaning, but in sense creation (see Clark & Gerrig, 1983)—that is, the emergence of novel meanings in response to contextual demands.

Although results of this study are consistent with the model, the details of the space structuring model go considerably beyond the data and require more specific testing. In some ways, optimal innovation and the space structuring model can be seen as complementary, as the former focuses on the order and strength of lexical sense activation, and the latter on the discourse-level representations themselves. However, the space structuring model also makes certain predictions that differentiate it from optimal innovation. For example, the web and topology principles in conceptual blending promote figurative constructions that highlight relational similarities between inputs (see Gentner, 1983); this suggests that the existence of shared relational structure will promote the perception of wittiness, independent of the salience of the relevant word meanings. CBT also suggests people prefer integrated concepts (“blends”) that combine input domains related by so-called vital relations such as analogy, disanalogy, similarity, category, representation, part–whole, identity, uniqueness, and change (for a review, see Fauconnier & Turner, 2002). However, whether these considerations factor in the perception of wittiness is a matter for further empirical research.

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