

Blending basics

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Abstract

This article serves as a primer for the theory of online meaning construction known alternately as conceptual blending, conceptual integration, the many space model, and the network theory. Our tutorial proceeds by analyzing novel and conventional examples of linguistic and nonlinguistic blends that pertain to topics of reference, partitioning, mapping, structure projection, and dynamic mental simulation. Principal concepts and processes of blending theory are described, including composition, completion, elaboration, emergent structure, and optimality constraints. We review recent work on blending theory from the perspective of linguistics, psychology, computer science, and neurobiology, and conclude with a discussion of potential weaknesses of the theory.

Keywords: mental spaces; blends; conceptual integration networks; reference; dynamic mental simulation; rhetorical situations; methodology.

In 1998 an African American man named James Byrd Jr. was chained to a pickup truck and dragged to his death in Texas by three white men. In 2000, in the midst of a tight presidential campaign, a television advertisement featured the voice of James Byrd Jr.'s daughter. The ad presented grainy, black and white footage of a pickup truck with Texas plates, a chain tied to the bumper, dragging unseen cargo. Focused on the license plate and the chain, the camera follows the truck as it slowly pulls away. In the voiceover, Byrd describes her father's gruesome death, as well as Texas governor, George W. Bush's refusal to sign legislation strengthening laws against racially motivated attacks known in the U.S. as hate crimes. When Bush refused to back the legislation, Byrd recalls she felt "as if my father had been killed all over again".

Political pundits were quick to label the ad distasteful and unfair. But why? The ad merely presented facts about a Texas murder, facts about Bush's political statements, and a testimonial about one woman's subjective reaction to these events. We suggest that the ad is distasteful precisely because the viewer does *not* encode the facts as presented. Rather, we are prompted to integrate information from different domains to produce a very unfavorable framing of Governor Bush. In this integration, the implication is that there is a causal relationship between Bush's political actions in the year 2000, and Byrd's 1998 death, as well as future hate crimes. The process, or processes, that underlie this phenomenon are known as *conceptual integration*, or *conceptual blending*.

Discussed at length in Fauconnier and Turner (1998) and Coulson (2000), *conceptual blending* is a theoretical framework for exploring human information integration. It involves a set of operations for combining dynamic cognitive models in a network of "mental spaces" (Fauconnier 1994), or partitions of speakers' referential representations. Fauconnier and Turner (1998) suggest that a small set of partially compositional processes operate in the creative construction of meaning in analogy, metaphor, counterfactuals, concept combination, and even the comprehension of grammatical constructions. Blending processes depend centrally on projection mapping and dynamic simulation to develop emergent structure, and to promote novel conceptualizations, involving the generation of inferences, emotional reactions, and rhetorical force.

1. Mental space theory

Among other things, blending is a development of mental space theory (Fauconnier 1994). A theory of cognitive semantics, mental space theory locates meaning in speakers' mental representations, and construes linguistic structures as cues that prompt speakers to set up elements in referential structure. Elements in mental spaces refer to objects in the world only indirectly, as objects in speakers' mental representations, real or otherwise. Initially devised to answer questions about indirect reference and referential opacity, mental space theory has proven to be useful for describing various sorts of semantic and pragmatic phenomena (see Fauconnier 1997 or Fauconnier and Sweetser 1996 for review). In fact, mental space theory does not only pertain to meaning in language, but can be seen to apply to meaning in other domains, including math, gesture, and music (e.g. Goguen 1999; Liddell 1998; Zbikowski in press).

Mental spaces contain partial representations of entities and relations of any given scenario as perceived, imagined, remembered, or otherwise

understood by a speaker. Elements represent each of the discourse entities, and simple frames represent the relationships that exist between them. Because the same scenario can be construed in multiple ways, mental spaces are frequently used to partition incoming information about elements in the referential representation. For example, the sentence *When I was twelve, my parents took me to Italy* prompts the reader to construct two mental spaces, one for the present utterance space, and one for the time when the speaker was twelve years old, the event space. The correspondence between the focal participant in the utterance and the event space is represented via an identity connector between the two. Partitioning the information into two mental spaces allows the reader to understand that while the speaker was in Italy at age 12, she need not currently be there. The virtue of mental spaces is that they allow the addressee to divide information at the referential level into concepts relevant to different aspects of the scenario.

Although different spaces can contain disparate information about the same elements, each individual space contains a representation that is logically coherent. For example, Van Hoek (1997) argues that a sentence such as *On a visit to Madame Tussaud's Wax museum, former President Gerald Ford tripped and fell on himself* involves the construction of two mental spaces ("dominions" as she calls them), one for the live ex-president, and the other for the wax simulacra representation. Because elements in one mental space often have counterparts in other spaces, an important component of mental space theory involves establishing mappings between elements and relations in different spaces. These mappings can be based on a number of different sorts of relations, including identity, similarity, analogy, and pragmatic functions based on metonymy, synecdoche, and representation. In *When I was twelve, my parents took me to Italy*, there is an identity mapping between the speaker at age twelve and the speaker at the time of utterance. In the wax museum example, Gerald Ford, the man, is linked to Gerald Ford, the wax statue, by means of a pragmatic function connecting representations and the things they represent.

Although linguistic cues provide the listener with important information as to when to partition referential structure, and which elements are linked to which, meaning construction operations are not completely specified by grammatical information. One instance of the underspecification of meaning can be found in the observation that speakers can use the same grammatical constructions to set up a large variety of mental space configurations. For example, Dancygier and Sweetser (1997) show how the conditional construction (If X, Y) can signal conditionals based on content (*If he was home in San Jose, he couldn't have committed the murder*

in Los Angeles), epistemic contingencies (*If he typed her thesis, he loves her*), and speech acts (*If you're thirsty, there's beer in the fridge*). Noting the extent to which information at the referential level is underspecified by linguistic information, Fauconnier (1994) suggests that meaning construction relies on an elaborate system of "backstage cognition" to fill in details not specified by the grammar. On this view, meaning construction is successful because speakers utilize background knowledge, general cognitive abilities, and information from the immediate discourse context to help them decide when to partition incoming information and how to establish mappings among elements in different spaces.

2. Conceptual integration networks

Conceptual blending theory, too, posits a system of backstage cognition that includes partitioning, mapping, structure projection, and dynamic mental simulation. Central to conceptual blending theory is the notion of the *conceptual integration network*, an array of mental spaces in which the processes of conceptual blending unfold (Fauconnier and Turner 1998). These networks consist of two or more *input* spaces structured by information from discrete cognitive domains, a *generic* space that contains structure common to all spaces in the network, and a *blended* space that contains selected aspects of structure from each input space, and frequently, emergent structure of its own. Blending involves the establishment of partial mappings between cognitive models in different spaces in the network, and the projection of conceptual structure from space to space.

Consider the following slogan from a bumper sticker on a college student's car: *My karma ran over my dogma*. This pun is both a formal and a conceptual blend. The blend is formal in that the reader is supposed to recognize the partial (and coincidental) phonological similarity between *car* and *karma*, and *dog* and *dogma*, such that the polysyllabic term contains the monosyllabic term. The blend is conceptual in that the concrete, sudden, and tragic scenario of a car running over a dog frames an analogical situation of one religious and philosophical notion supplanting another. The conceptual integration network for this blend, then, contains one input space involving cars and dogs, another, philosophical, input space involving karma and dogma, a generic space in which one entity exerts a controlling force over another, and a blended space that integrates some structure from each of the input spaces.

In this example, the car input provides the organizing frame for the conceptual integration network. The *organizing frame* provides the relevant participants, actions, and events for the spaces in the network

(Fauconnier and Turner 1998). The focal participants and their on-scene relations can be used to structure information from other spaces because abstractions are easily extracted to form the generic space for the network. The visceral scene in the car input can be abstracted in terms of the CONTACT OVER image schema in which a trajector comes into contact with a landmark or set of landmarks. The CONTACT OVER schema also gives rise to a force dynamic relation in which a stronger agonist comes into contact with a weaker antagonist, effecting a change in the state or location of the antagonist. This schema applies to any specific situation where a trajector moves and is in contact with a stationary or momentarily fixed landmark, but does not specify the specific results. Although the scenario in the generic space in the karma blend is fairly abstract, this is not necessarily the case. Because generic spaces represent information shared by the entire network, it is often the case that information in the generic space is concrete, such as the identity of the driver.

As the interpreter builds the car input, she also structures the philosophical input space with a partial representation of the abstract concepts “karma” and “dogma”. This might involve a representation of karma as a distinctive aura or atmosphere that results from the cumulative effect of a person’s actions, and a representation of dogma as statements or practices taken to be true without proof. As noted above, the blended space contains information from each of the inputs as well as emergent structure that arises as a product of the imaginative processes of integration. The blended space in this network absorbs the frame from the car input with the elements karma and dogma from the philosophical input, such that elements from the philosophical input fulfill the roles of their phonologically similar counterparts. In the blended space, then, karma fulfills the role of the car in the car input, and dogma the role of the dog. Consequently, the punctual event of a car running over a dog frames the relationship between a person’s karmic status and dogmatic beliefs.

As in our discussion of the blend in this bumper sticker, blending analyses typically begin with the introduction of an example hypothesized to involve blending, and proceed with a description of conceptual structure in each of the spaces in the integration network. These descriptions usually begin with the structure in the input and generic spaces, and include a list of the mappings between elements and relations in each of the spaces. For example, in the bumper sticker blend we pointed to the mappings between the car, the karma, and the agonist in the CONTACT OVER schema, as well as the dog, the dogma, and the weaker antagonist in the CONTACT OVER schema. Next the analyst describes the structure in the blended space, focusing on which aspects of its structure come from each of the

inputs. For instance, in the bumper sticker blend, dogma and karma stand in opposition to one another, and karma kills dogma.

In such descriptions, it is important to characterize the differences between the structure evoked in the blended space and each of the inputs. For example, in the realistic car space, the car killing the dog is interpreted as tragic; in the philosophical space, karma supplanting dogma is a desirable outcome; and, in the blend, karma running over dogma and killing it is interpreted as a desirable outcome. In this case, then, the blending analysis suggests that the force dynamics of the scenario in which the car runs over the dog can be exploited analogically to frame the relationship between karma and dogma—in spite of the disanalogy between the emotional valence of the physical (negative) and philosophical (positive) consequences. The characterization of differences between the structure in the blended space and structure in the input spaces is how the analyst justifies the claim that conceptual blending gives rise to the emergent structure that frequently sustains reasoning.

3. Emergent structure and integration processes

Emergent structure arises out of the operation of three blending processes: composition, completion, and elaboration. *Composition* involves attributing a relation from one space to an element or elements from the other input spaces. This is the case in *My karma ran over my dogma*, in which a frame for a car accident has been applied to abstract philosophical concepts. However, composition is not always this spectacular. For example, composition is also involved in integrating an element such as “dinner” with a frame such as wedding anniversary. In both sorts of cases, emergent structure arises from contextual accommodation of a concept from one domain to apply to elements in a different domain.

Completion is pattern completion that occurs when structure in the blend matches information in long-term memory. For example, because we complete the car accident frame with the inference that the dog dies, the accident in the blended frame is completed with the “death” of dogma. In the integration of wedding anniversary and dinner, the blend might be completed with information about upscale restaurants, and the inference that the couple is likely to be dressed up and the service formal. Completion is closely related to *elaboration*, a process that often involves mental or physical simulation of the event in the blend. The karma blend, for example, might be elaborated with a mental image of the Dalai Lama running over the Pope with a Ford Escort. Alternatively, the eager husband might mentally simulate the anniversary dinner, planning in advance the moment when he offers his wife a gift.

Elaboration can be either coupled or decoupled. The Dalai Lama fantasy is an instance of a *decoupled elaboration*, an elaboration that involves little or no physical realization. However, elaboration can also be *coupled* with activity, if for instance an eager husband simulates his surprise gift by sitting at a table, reaching into his pocket, pulling out a small, black case, and extending his arm toward the empty chair across from him. Coupled elaborations can constitute action blends, where activity patterns from one domain are applied to elements from another. Coulson and Fauconnier (1999) discuss action blends in the elaboration of the analogical blend *trashcan basketball*, a variant of basketball played with wads of paper. Oakley (in preparation) explains how everyday physical activities like going to the library and getting a book are elaborations of conventional sequence-of-action blends.

Veale and O'Donoghue (2000) provide a computational rationale for many of the concepts in blending theory. For example, the integration process *completion* can be seen to be implemented via the process of spreading activation through a semantic network. A *semantic network* is a model of conceptual structure in which concepts are represented as hierarchies of interconnected concept nodes. On this sort of a model, the relationships between concepts are represented by the path or paths through which activation would have to spread to get from one concept to another. In their discussion of analogical mapping, Veale and O'Donoghue show how spreading activation can be used to solve three problems that arise in the comprehension of metaphors, as well as other sorts of blends. The first is relevance, or the question of what concepts are relevant to the analogy or metaphor at hand; the second is structural analysis, or the issue of the relationship between the relevant concepts invoked in the analogy; and the third is recruitment, or what sorts of mappings need to be activated to construct a coherent representation. Questions of relevance, structural analysis, and recruitment are all answered with the characterization of the structure of the semantic network and the way that activation spreads across its nodes as it computes a given analogy.

Grady (2000) also considers the role of spreading activation in conceptual blending, but from a neurobiological perspective. Reviewing the literature on object recognition, Grady describes how activity propagates from one neural ensemble to another, and how even an incomplete visual representation can activate neural structures responsible for the recognition of a partially occluded object. Grady suggests that conceptual operations might work analogously such that the activation of some concepts might produce a spread of activation that would ultimately result in the activation of a closely related concept. For example, given the task of

imagining a modern philosopher characterizing her opposition to Kant's position by first stating her own opinion, and then Kant's, the process of spreading activation might result in the activation of a debate frame. If the perception of abstract similarities recruits mechanisms that work analogously to object recognition, spreading activation might constitute a neurally plausible implementation of the integration process Fauconnier and Turner (1998) refer to as "completion".

Besides completion, Grady considers how other blending operations might be explained by basic cognitive and neurological processes such as binding and neural inhibition. In fact, his account of selective projection points to a potential weakness in the blending model, for blending theorists often talk about selective projection as if individuals construct input spaces with elaborate knowledge, and then actively select a subset of that knowledge, inhibiting the rest. Describing children's capacity to understand complex blends, Grady warns against wholesale acceptance of the idea of selection and inhibition implicit in many accounts of conceptual blending. He suggests that one reason children can easily comprehend the blends in nursery rhymes (such as *the cow jumped over the moon*), is that they lack the domain-specific knowledge adults might need to inhibit. One might speculate that the need to inhibit irrelevant structure will depend on the accuracy with which the relevance problem described by Veale and O'Donoghue (2000) is solved. If only relevant information is initially activated, there is no need for suppression.

4. The ubiquity of blending

That children seem to readily produce and interpret blends without much domain-specific knowledge suggests that conceptual integration is in fact a fundamental aspect of all human experience. Fauconnier and Turner (2000) argue that integration is involved in everything from perceptual processing, to the experience of pain, to knowledge of cause and effect. The perceptual phenomenon of apparent motion, for example, is the illusion of motion that occurs when two lights flash in quick succession. Fauconnier and Turner argue that the experience of motion is the result of the visual system's integration of two separate events into the unified percept of motion. In a conceptual integration network, one input space represents light 1 flashing in place p_1 at time t_1 , while the other input space represents light 2 flashing in place p_2 at time t_2 . In the blend, a single light, which we will call light 3 maps onto light 1 and light 2. By composing the events in the two inputs, light 3's transition from p_1 at t_1 to p_2 at t_2 is understood and experienced as the result of motion.

Gestalt psychologists in the 19th and 20th centuries studied this illusion to learn about how the visual system constructs the percept of motion. For example, if the time between the two flashes is very short, observers see two dots presented nearly simultaneously. If the time between the two flashes is very long, observers see two distinct flashes rather than a single light moving. Moreover, the farther apart the stimuli are, the longer the time between the flashes needs to be to produce the illusion. Not coincidentally, the larger the separation between the two lights, the farther a single source would have to “move”. In fact, apparent motion is the basis of movement in television and film, as the screen shows a rapid succession of images for the viewer to integrate. Although the motion in the phenomenon of apparent motion is illusory, the same process of integration underlies the perception of true motion as the visual system infers motion from the spatial displacement of a single object over time.

Further, Fauconnier and Turner (in preparation) suggest that integration processes at work in the perception of motion are a central component of higher cognition. Manipulation of visual perception through film editing produces such higher order blending effects. The shot/reverse shot editing technique in film and television is one such example. A typical case involves displaying two human figures in face-to-face interaction. The camera shows each figure alternately, with the other figure(s) either absent or partially occluded. The filmmaker cuts from one vantage point to another, selectively revealing the actions and reactions of each figure in profile. By composing these separate shots into an integrated sequence, the filmmaker represents the narrative flow of human interaction (be it a conversation or other such event), as the viewer utilizes completion to fill in missing information. This editing technique proved especially valuable for representing conversation and interaction in silent film (e.g., Fritz Lang’s (1927) *Metropolis*), even without benefit of sound. Because the shot-reverse editing sequence matches viewers’ entrenched knowledge of turn-taking procedures, they can witness the temporal flow of a face-to-face conversation on the basis of visual information alone (see Bordwell 1996 for extensive discussion of this technique).

As the above example indicates, blending theory can be used to address both the form and the content of the representation. But equally attractive is the ease with which the framework can be used to address the terms and conditions of enunciation. For example, even the most facile interpretations of *My karma ran over my dogma* seem to require the integration of formal linguistic features of the pun with its broader rhetorical dimensions. Assume for the moment that the reader sees this bumper sticker on the back of a car (a rusted Ford Escort) parked in the student parking

lot on a college campus. The conditions of reading do much to determine the nature of the interpretation. We can assume the reader has internalized the rhetorical culture of bumper stickers enough to know that the intent behind their display is to make bold public assertions about an issue or about one's ethnic, racial, political, religious, or sexual identity. By default, we interpret bumper stickers as assertions, and, not, for example, as confessions or acts of contrition. Given these implicit rhetorical conditions, it is difficult for the reader to transfer the negative emotional valences from the car accident space into the blend, because running over one's dog is not something one would normally like to advertise.

Although the owner of the car was in all likelihood not the author of these words, she is almost certainly thought to be the principal (cf. Goffman 1974) behind the bumper sticker's assertion. The imagined speaker represents herself as asserting the existence of karma and admitting to at one time embracing a doctrine she now regards as dogmatic. The enunciation space also provides tacit cultural knowledge, such as the knowledge that karma and dogma can have opposite valuations. While karma is often associated with all thing tolerant and free, dogma is associated with things intolerant and oppressive. If we take this analysis a step farther and assume the "speaker" is a college student, completion allows for recruitment of information about the effects of a college education. A student arrives at college with a prior set of beliefs and practices and systematically begins to scrutinize and challenge them. The bumper sticker, in effect, depicts the edifying effects of a college education. Oakley (in press) provides extended commentary on the implicit conditions of discourse that guide meaning construction in a setting far more structured and predictable than a parking lot.

5. Blending in performative speech and action

Besides its applicability to multiple levels of analysis, blending theory, as a general theory of meaning construction, has become a useful way of securing closer connections between the way we understand language with a broader understanding of human thought and activity. This is especially well-done in Sweetser's analysis of blending in performative speech and action (Sweetser 2000). In this analysis, Sweetser argues that the contrast between depictive and performative uses of language involves the causal relationship between two mental spaces, one for the representation and one for the represented. While depictive utterances are attempts to make one's words fit the world, performative utterances are attempts to make the world fit one's words. Consequently, depictive statements are those in which the represented space is ontologically prior to the representation

space; while performative statements are those in which the represented space is caused by the representation space.

Moreover, because mental space theory pertains to both linguistic and nonlinguistic meaning. Sweetser's analysis of performativity pertains to all sorts of representations—linguistic and otherwise. For example, a painting can be depictive, performative, or both. A buffalo, painted on the wall of a cave, might be intended to describe the buffalo that was recently killed, or, to ensure good luck in an upcoming hunt. Metaphorical representations, too, can be used both depictively to represent extant reality, and performatively to affect reality. Sweetser notes that white clothing is worn by brides to depictively represent their innocence, and performatively by penitents in the hopes it will help to purify them.

Sweetser's discussion of performativity in magic and ritual suggests meaning construction in these culturally constituted domains involves the same sorts of mappings between mental spaces as does the construction of linguistic meaning. Just as performative statements recruit mappings between elements in the representation and the represented space based on identity, similarity, metonymy, and analogy, so, too, do performative actions. This is why magic frequently relies on props that exhibit contiguity, similarity, and analogy to the things they act upon. A voodoo doll, for example, is linked via similarity to the person it represents and acts upon. Moreover, pinning a lock of the victim's hair to the voodoo doll sets up a metonymic link between the representation space and the represented space. By demonstrating the importance of mental space mappings to magic and ritual, Sweetser provides a bridge between conceptual metaphor theory, speech act theory, and the more general theory of performativity that she develops.

Moreover, Sweetser's analysis highlights the centrality of conceptual blending in cultural experience, especially in the comprehension of performative actions in cultural rituals such as a hunting dance intended to bring about a successful hunt. A representation of a future hunt, and intended to causally affect that future hunt, this ritual fulfills Sweetser's definition of performative action. Moreover, the ritual itself is experienced as a blend of the real space in which one person is dressed in hunting garb and another wears a buffalo hide, and the future hunting space, in which the same people will hunt for real buffalo. A full understanding of the ritual involves conceptual integration of information in the current real space with information in the future hunting space. The person dressed in a buffalo hide is experienced *as* a buffalo, and the actions of the hunter on the person dressed in a buffalo hide are understood as being representative of the future fate of the real buffalo they will encounter on the hunt. Finally, the actions of the actor who plays the

hunter in the ritual are understood and experienced as having causal efficacy in the future they depict.

6. Constraints on blending theory

Perhaps because of its descriptive power, blending theory runs the risk of being too powerful, accounting for everything, and, hence, explaining nothing (see Gibbs 2000 for a nice articulation of this point). In response to the charge that blending processes are unconstrained, Fauconnier and Turner (1998) suggest a number of “optimality principles,” or constraints under which blends work most effectively. Satisfaction of these principles is selective, and satisfying one constraint is often inconsistent with satisfying another. However, given a range of interpretations of a given blend, the interpretation that best observes the following constraints is the one most likely to be adopted. Constraints include

- i. the *integration principle* that representations in the blended space can be manipulated as a single unit;
- ii. the *topology principle* that relations in the blend should match the relations of their counterparts in other spaces;
- iii. the *web principle* that the representation in the blended space should maintain mappings to the input spaces;
- iv. the *unpacking principle* that, given a blended model, the interpreter should be able to infer the structure in other spaces in the network;
- v. the *good reason principle* that creates pressure to attribute significance to elements in the blend;
- vi. *metonymic tightening* that when metonymically related elements are projected into the blended space, there is pressure to compress the “distance” between them.

By reducing the space of possible blending analyses, these optimality constraints make blending theory more principled, thereby mitigating charges of capriciousness.

The charge that blending theory is arbitrary, and overly powerful is to some extent answered by Veale and O’Donoghue (2000), who present a computational model of blending that demonstrates the applicability of the theory to problems of metaphor and analogy comprehension. The model, known as Sapper, is based on the principles of blending theory and is shaped by its optimality constraints. Sapper explains the felt novelty of metaphors, accounts for how metaphors can be extended, as well as how old, dormant metaphors can be revived. Veale and O’Donoghue show that the optimality principles can be algorithmically implemented, and demonstrate the computational tractability of conceptual blending

theory. Moreover, they argue that the computational perspective offered by their model can contribute new insights to blending theory.

In their discussion of analogy and metaphor, Veale and O'Donoghue note that analogical reasoning is complicated by the fact that we often draw analogies between domains that have been defined at different levels of granularity. For instance, in an analogy between a car's motion and an animal's motion, we might assume a mapping between the car's wheels and the animal's legs. However, in this case, the counterpart for *LegMuscle* will depend on our representation of the car domain. If our model is that the *Pistons* control the *Wheels*, the counterpart is *Pistons*. If, however, our model is that the *Pistons* control the *Crankshaft* which in turn controls the *Wheels*, the counterpart is *Crankshaft*. Veale and O'Donoghue suggest that in cases like this it is often useful to either "stretch" or "contract" the structure in the target domain to optimize the analogy.

7. Compression and metonymic tightening

Processes of representational contracting and stretching are what Fauconnier and Turner (2000) refer to as *compression* and *decompression*, phenomena which they see as central to blending theory. One place where compression is quite frequent is in news headlines, such as *Tennessee Tramples Kentucky*, or *Overseas Absentee Ballots Boost Bush*. In each case, the representation in the blended space is interpretable because of metonymic relationships between elements in the blended space and elements in the inputs. For example, the blended space in the network for *Tennessee Tramples Kentucky* is interpretable because of conventional metonymic mappings between states, their universities, and their universities' football teams, as well as conventional metaphoric mappings between combat and sports. The blended space in the network for the second example is interpretable because of a conventionalized metaphoric mapping between upward movement and an increase in value (MORE IS UP), a metonymic connection between political candidates and their standing in an election, and the metonymic connection between the ballots and the votes they represent. In the ballot blend, then, the relationship between ballots and the votes they represent has been "compressed" such that they are understood as being one and the same.

Compression works subtly, too. For example, when a United States citizen living in the present says *We won the War of 1812*, the corporate use of *we* involves compression in which the speaker stands in for absent citizens in such a way that temporally dispersed populations linked by political institutions become one intentional group. The blend "tightens" or "compresses" relations of identity and time so that the speaker can be

mapped onto individuals living in the early nineteenth century. One input space in the conceptual integration network for this example includes an element representing the current citizens of the United States; another input space includes an element representing the citizens of the United States alive in 1812; and, the blended space includes an element that represents both citizens past and citizens present.

As an intermediate case, Fauconnier and Turner (2000) suggest that compression is also at work in the use of phrases such as *looks violent*, to mean looks like someone capable of violent behavior. Compression in the blend assumes a causal link between behavior and appearance that is based on the formation of an association between violent behavior and people who happen to have some particular appearance. There is of course no direct causal connection between violent behavior and, say, wearing tattered clothes and carrying one's belongings in a shopping cart. However, it might be the case that a psychotic condition is responsible both for the victim's unconventional appearance and his propensity for violence. Consequently, we speak of the complex causal relationship between psychosis, unconventional personal appearance, violent behavior, as well as the general association between appearance and behavior as being "compressed" in the blend.

A more extreme example of compression can be found in Sweetser's (2000) discussion of the blend in the hunting ritual intended to ensure the success of the future hunt. In the blended space of the ritual, the time between the events in the current real space and their counterparts in the future hunting space have been compressed, so that actions in the real space are understood as representing actions in the future. Moreover, because the ritual is performative, actions in the real space are understood as causing actions in the future. Consequently, this sort of performative ritual can be seen as a compression of cause and effect. Indeed, as a blend of the representation and the represented world it is intended to bring about, all performative speech and action involves compression of cause and effect.

8. Mechanisms for compression

Veale and O'Donoghue (2000) suggest a mechanism that can implement compression needed to establish mappings in the sorts of analogies they model, and which could be extended to cover the mappings in the sorts of examples discussed by Fauconnier and Turner (2000). Inspired by Hofstadter and the Fluid Analogy Research Group (1995), the mechanism in question involves a *slipnet*, a network that licenses "suboptimal" mappings between concepts, where optimal is understood as the case

where there is a perfect correspondence between the relational structure in the two domains. As noted above, analogical mapping between a sports car and a panther is complicated by the existence of the more detailed conceptual structure pertaining to sports cars. Thus, the paths *SportsCar* —contains→ *Engine* —part→ *Piston* —controls→ *Crankshaft* —controls→ *Wheel* and *Panther* —part→ *Muscle* —controls→ *Leg* differ considerably in their complexity. However, a slipnet that allows a path of two successive semantic relations to be *snipped* to produce a direct path, would enable us to simplify the representation of the sports car to something like the following: *SportsCar* (—contains→ *Engine*) —part→ *Piston* (—controls→ *Crankshaft*) —controls→ *Wheel*. The simplified (or compressed) representation *SportsCar* —part→ *Piston* —controls→ *Wheel* could then be mapped onto the representation of the panther, as in *Panther* —part→ *Muscle* —controls→ *Leg*.

In analogical reasoning, the slipnet must be constrained in a way that preserves the semantic validity of analogical inferences. Consequently, it encourages isomorphic mappings between domains that share causal and relational structure in a way that satisfies Fauconnier and Turner's topology constraint. However, there are many rhetorical instances of blending in which the existence of shared relational structure in the input domains is less important than the existence of an easily manipulated integrated structure with *some* mappings to other spaces. Such cases suggest an interesting tradeoff between satisfaction of the integration and the topology principles that occurs when the pressure to create an integrated representation in the blended space results in disanalogy between the blended model and its counterparts in the input spaces. In the bumper sticker blend, for example, the punctuated time scale of the car accident does not match the time scale for changing one's philosophical beliefs and religious practices. Consequently, the blended model is bound to violate the topology of one of the input spaces, and in this case it is that of the philosophical input.

The topology principle is also at odds with metonymic tightening, as the pressure to compress the "distance" between elements in the blended space can result in different event structures in the inputs and the blend. In the karma blend, for example, the metonymic relation between car and driver from the car accident space creates pressure to compress the conceptual distance between a person's karmic aura and the means of satisfying her immediate needs. Making karma a vehicle of intentional motion violates the topology of the philosophical space, because, unlike car, karma is not normally conceived as a means of bringing about a specific state-of-affairs, but, rather, as the cumulative effect of a person's actions (good or bad). Nonetheless, we suggest that more exotic cases of blending might

be captured by Sapper (Veale and O'Donoghue 2000), with some modifications of the constraints on the slipnet.

One such modification might include adding rules that promote slippage between metonymically related elements in different spaces. For example, incorporating metonymic mappings between states, universities, and their football teams would enable one to map between Tennessee and the University of Tennessee, and between the University of Tennessee and the University of Tennessee football team to help to interpret *Tennessee tramples Kentucky*. Similarly, metonymically motivated slippage between counterpart elements in two different time spaces could enable mapping between citizens past and citizens present in *We won the war of 1812*. Moreover, metonymically motivated slippage between participants in a hunting ritual and their future selves during the hunt provides crucial information for interpreting the hunting blend discussed by Sweetser (2000).

9. Integration in syntax and morphology

Examples above have mainly included cases where conceptual blending has been used to explain emergent features in lexical, phrasal, or clausal semantics. However, Mandelblit (2000) pushes the explanatory envelope of conceptual blending theory even further into linguistic theory with the suggestion that conceptual integration operations underlie the semantics of syntactic and morphological constructions in Hebrew. Following Kemmer and Verhagen's (1994) proposal that speakers use simple sentence structures such as the transitive clause to express the complex events they experience, Mandelblit argues that syntactic constructions express novel events by blending elements from a given event sequence with the abstract semantics of simple clause structure.

For example, in the sentence *Rachel sneezed the napkin off the table*, a complex event involving a woman sneezing and a napkin falling off of a table has been integrated with a syntactic construction known as the *caused motion construction*. Goldberg (1995) defines the caused motion construction as the pairing between the form [NP V NP' PP] (= SUB V OBJ OBL) and the meaning of an agent acting on and causing the motion of a patient ("X causes Y to move Z"). To produce this sentence, the speaker notices a mapping between the napkin's movement and the abstract scenario of caused motion, and expresses the scenario as an integrated causal event sequence. The listener's task, then, is to unpack the integrated representation. One input space in the conceptual integration network represents the caused motion semantics, while the other represents the perceived event. In the blended space, Rachel has been mapped to the causal agent,

the sneeze has been mapped to the causal action, the napkin has been mapped onto the object, and the napkin's motion has been mapped onto the effect.

Typically, sneezing is not considered to be a causal action. Rather, its potential role as a causal factor arises as an emergent feature of the composition of the event scenario (Rachel's sneezing fit) with the semantics of the caused motion construction. Further, the integrated construal prompted by the sentence is more specific than the schematic scenario evoked by the construction. For example, the path of the napkin is explicitly described as movement off the table, and the listener can invoke completion with his knowledge of gravitation to infer the napkin's downward trajectory. Mandelblit's analysis suggests grammatical constructions are formal devices that promote the compression of a complex sequence of events (such as that in which a sneeze produces a quick outflow of air whose path intersects with the napkin, the force of which causes the napkin to move off of the table and onto the ground), into a single schematic scenario.

Further, Mandelblit argues that blending theory offers a coherent theoretical framework for understanding how common underlying conceptualizations, such as caused motion, nevertheless vary substantially in form and usage across languages. Continuing in the work started with Goldberg (1995) on the caused motion construction and extended by Fauconnier and Turner (1996), Mandelblit (2000) compares the range of syntactic constructions of causation available to speakers of English and speakers of Hebrew. She notes that the two languages differ greatly in the frequency and freedom of the use of the caused motion construction, as English employs the construction far more frequently and liberally than does Hebrew. Moreover, the Hebrew language grammatically marks the relationship between the main verb in the sentence and its predicates in the perceived (actual) event, whereas English often leaves this relation unmarked. Although the two languages differ in the formal marking of the blending operations, Mandelblit's findings suggest the same type of conceptualizations generate syntactic constructions for caused motion in English and in Hebrew.

10. Problems with conceptual integration theory

So far, we have focused on the promise and attraction of mental space theory and the blending framework. However, as with any theory, it has its critics and criticisms. We wish to focus on a few, some of which are voiced by contributors in this volume. First, Gibbs (2000), objects that conceptual blending is not a single theory to be either confirmed or falsified, but

a general framework. Although falsifiability is not the ultimate desiderata for scientific theories, we suggest that the goal of a mature theory is to provide an account of the phenomena of interest that is specific enough to support falsifiable predictions. Along these lines, researchers in conceptual blending ought to strive for more explicit statements of the grounding principles, and more detailed specifications of the principles that underlie blending analyses.

Further, Gibbs complains that the representational grain size in blending analyses is often unclear. As outlined in previous sections, conceptual blending has been invoked to explain everything from perceptual experience, to parsing, to participation in rituals. While all examples seem to involve, at some level, cross-space mappings, integration, and the projection of emergent structure, there is huge variability in the nature and the amount of information that would need to be represented in the spaces in the different conceptual integration networks. In a related criticism, Grady (2000) questions whether blending processes work the same for all of the different sorts of blends. This seems to us a valid criticism, as it seems rather questionable that the exact same blending processes are at work in the perception of motion as in the comprehension of, say, metaphoric blends.

Another criticism, brought up by Gibbs (2000), is that blending theory proceeds by way of *post hoc* analysis of examples, a procedure prone to fallacious imputing of cause. While *post hoc* analysis does indeed have this pitfall, we note that most fruitful theories of meaning begin with this sort of analysis. Further, while *post hoc* analysis plays a prominent role in current work in conceptual blending, there is no reason to believe that the framework is incompatible with more robust methods of tracking production. In fact, to the extent that all theories depend on interpretation of the data, blending theory is an excellent candidate for extension beyond *post hoc* analysis, particularly in the realms of anthropology and ethnography. For instance, blending theory would be greatly enhanced and potentially improved if one had access to the production history of the blends it analyzes. So, while we agree that blending analyses must move beyond *post hoc* analysis, we think that *post hoc* analyses of texts will necessarily play a basic role in building and refining models of online meaning construction.

But perhaps most seriously, blending theory has been subjected to the charge that it is largely *ad hoc*, and often employs temporary, improvisational procedures for dealing with specific instances. However, we think this criticism confuses the nature of the theory with the nature of the kinds of data covered by the theory. Blending theory (like most theories of meaning) is really an interpretive model and its strength can be assessed

by how well it treats disparate cases in a principled way. What is variable is the contexts and situations in which blending is thought to occur. In this respect, *ad hocness* is good, because a principled interpretive model (see below) that focuses on variability renders important insights, especially when trying to scale the micro-structures of meaning to their macro-structures of the real time online situation. One simply does not know in advance how important an influence certain elements from the situation might prove to be. Examining many instances in their particularity may lead to new generalization regarding context. For instance, blending theory has proven quite adept at underscoring the role immediate physical context can play in constraining (perhaps through spreading activation) the range of possible blends.

At the risk of oversimplifying, we suggest these charges of *ad hoc* theorizing bring to the fore two competing traditions of inquiry that Galison (1997) outlines for contemporary particle physics: the image tradition and the logic tradition. The *image tradition* of inquiry has as its goal the representation of natural processes in all its complexity. As such, it dictates that researchers build and use machines such as nuclear emulsions, cloud chambers, and bubble chambers, for capturing an event as it occurs (so-called “golden events”). Evidence for the existence of a particle or effect depends on the presentation and interpretation of single events. In contrast, the *logic tradition* aims to make generalizations across a large number of events. As a result, researchers in the logic tradition tend to use electronic machines such as counters, spark chambers, and wire chambers, for assembling masses of data and formulating statistical generalizations across many similar events. In the logic tradition, evidence for the existence of a particle or effect depends on statistical frequency of particle behaviors. The upshot is that research in the image tradition is often immune from the charge that it has left something out, but vulnerable to the charge that it has located a fluke or oddity. On the other hand, research in the logic tradition is immune to the charge that it has located an oddity, but open to the charge that something has been left out of the account.

It is probably fair to say that blending theory has proceeded in the image tradition by mining for golden events. As such its findings are, at times, vulnerable to the oddity charge, but robust to the charge that something is missing from the accounts it gives. While we agree that the generalizability of conceptual blending theory has, at times, been obscured by the pyrotechnics of individual cases, we think enough work has been done on a wide enough range of examples (both novel and ordinary), and from enough disparate domains of inquiry, to mitigate accusations of flawed data. Further, generalizability may in fact depend upon examination of exotic

examples, as explaining the “semantic leaps” in complex cases of meaning construction often proves invaluable for elucidating the processes at work more generally (Coulson 2000; Turner 1996). Just as the Gestalt psychologists found it useful to characterize visual illusions to reveal the constructive processes of perception, so too do researchers in blending theory look to complex blends to reveal the processes at work in routine cases of meaning construction.

11. Conclusion

We opened this introductory essay by claiming that the political advertisement criticizing Governor George W. Bush was distasteful because viewers do more than simply decode the message as presented to them. They construct a scenario that, in effect, implicates Bush as a perpetrator of hate crimes. Consistent with the theses outlined above, and consistent with many of the arguments made by the contributors of this special issue, we suggest that meaning arises through the composition, completion, and elaboration of a blended mental space that compresses time and causality.

A blending analysis for this example would consist of an event space (input 1) representing the murder of Jame Byrd, Jr., a politics space (input 2) representing Bush’s refusal to back legislation against hate crimes (i.e., violent crimes motivated by hatred for members of a different race, ethnicity, or sexual orientation), an additional input space representing future instances of hate crimes (input 3), which would include open slots for the perpetrator(s), victim(s), and *modus operandi*. The blend recruits from input space 1 the role victim and its filler, James Byrd Jr., as well as specific elements of the *modus operandi*, viz., the pickup truck, chain, and road. Notice, however, that the identities of the perpetrators (who, in reality, have been convicted and sentenced to death) have not been recruited, leaving that slot open in the blend. The blend recruits from input 2 Bush’s refusal to sign legislation deterring future instances of hate crimes. The blend recruits from input 3 the immanent possibility of subsequent hate crimes.

In the composed blend, Bush’s refusal to back the legislation permits a recurrence of the exact same event. In the blend, but not in the future input, a chained James Byrd Jr. is once again dragged along Jasper County roads by a pickup truck. Because viewers are seeing a moving pickup truck with a chain tied to the bumper, it is easy for them to complete the blend by filling the perpetrator slot with the identity of George W. Bush. The compression of past and future makes it easy to remove many links of the causal chain connecting the Byrd incident, the ensuing

legislation, Bush's refusal, and future hate crimes so that Bush directly causes the death of another minority. Since past and future are compressed into the viewable present of a thirty-second advertisement, viewers easily sustain the reasoning process by imagining Bush as the driver of the pickup truck and, by implication, as someone unfit to govern. These implications project back to input space 3, which now represents future instances of hate crimes caused by a bush administration's *laissez faire* social policy.

Letting this implication arise as a matter of viewer inference allows the producers of this advertisement to disavow any intent to cast aspersions on George W. Bush's personal character. They let the blend do it for them.

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