Conceptual Projection and Middle Spaces

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April 1994

Report 9401

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Mark Turner gratefully acknowledges the support of the John Simon Guggenheim Memorial Foundation and the assistance of the Department of Linguistics, the Department of Cognitive Science, and the Center for Research in Language at UCSD. We are grateful for comments from Adele Goldberg, Todd Oakley, Seana Coulson, and Nili Mandelblit. Copies of this report are available from the Department of Cognitive Science, UCSD, La Jolla, CA 92093-0515. A Microsoft Word version of this report is available by anonymous ftp from hamlet.umd.edu as pub/blend.word.

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Abstract

Conceptual projection from one mental space to another always involves projection to "middle" spaces—abstract "generic" middle spaces or richer "blended" middle spaces. Projection to a middle space is a general cognitive process, operating uniformly at different levels of abstraction and under superficially divergent contextual circumstances. Middle spaces are indispensable sites for central mental and linguistic work. The process of blending is in particular a fundamental and general cognitive process, running over many (conceivably all) cognitive phenomena, including categorization, the making of hypotheses, inference, the origin and combining of grammatical constructions, analogy, metaphor, and narrative. Blending is not secondary to these phenomena but prerequisite, and its operation is not restricted to any one of these phenomena. We give evidence for blending from a wide range of data that includes everyday language, idioms, literary metaphor, non-verbal conceptualization of action, creative thought in mathematics, evolution of socio-cultural models, jokes, and advertising. Blending is in general invisible to consciousness and detectable only on analysis. Blended spaces are routinely necessary for constructing central meanings, inferences, and structures, and for motivating emotions. We show that the blending of highly schematic spaces yields the fusion of grammatical constructions and functional assemblies studied in Cognitive Grammar and Construction Grammar. Finally, recognizing the cognitive import of middle spaces allows us to propose a generalized four-space model of conceptual projection that subsumes a variety of previous models. We explore the consequences of this model for the theory of concept formation.

Contents

Much of the excitement about recent work on language, thought, and action stems from the discovery that the same structural cognitive principles are operating in areas that were once viewed as sharply distinct and technically incommensurable. Under the old view, there were word meanings, syntactic structures, sentence meanings (typically truth-conditional), discourse and pragmatic principles, and then, at a higher level, figures of speech like metaphor and metonymy, scripts and scenarios, rhetoric, forms of inductive and deductive reasoning, argumentation, narrative structure, etc. A recurrent finding in recent work has been that key notions, principles, and instruments of analysis cut across all these divisions and in fact operate in non-linguistic situations as well. Here are some of them:

Frames structure our conceptual and social life. As shown in the work of Fillmore, Langacker, Goldberg, and others, they are also, in their most generic, and schematic forms, a basis for grammatical constructions. Words are themselves viewed as constructions, and lexical meaning is an intricate web of connected frames. Furthermore, although cognitive framing is reflected and guided by language, it is not inherently linguistic. We manipulate many more frames than we have words and constructions for.

Analogical mapping, traditionally studied in connection with reasoning, shows up at all levels of grammar and meaning construction, such as the interpretation of counterfactuals and hypotheticals (Fauconnier, to appear), category formation (Turner 1991), and of course metaphor, whether creative or conventional (Lakoff 1993).

Reference points, viewpoints, and dominions are key notions not only at higher levels of narrative structure, but also at the seemingly micro-level of ordinary grammar, as shown convincingly by Langacker 1991, Zribi-Hertz 1989, Van Hoek 1992, Cutrer 1994, among others.

Connected mental spaces account for reference and inference phenomena across wide stretches of discourse, but also for sentence-internal multiple readings and tense/mood distributions. Mappings at all levels operate between such spaces, and like frames they are not specifically linguistic. (Fauconnier 1985, 1994, Dinsmore 1990, Cutrer 1994, Fauconnier and Sweetser, to appear).

Connectors and conceptual connections also operate at all levels, linking mental spaces and other domains for coreference, for metonymy (Nunberg 1978), and for analogy and metaphor (Turner 1991, Sweetser 1990).

And there are many other notions that apply uniformly at seemingly different levels (for example, figure/ground organization, profiling, pragmatic scales, focus and viewpoint, and so on).

This report explores another cognitive process which operates uniformly at different levels of abstraction and under superficially divergent contextual circumstances. The general process is the conceptual projection of two mental spaces into a third, "middle" space giving rise either to a more abstract "generic" space or to a richer "blended" space.

We give evidence for this process from a wide range of data that includes everyday language, idioms, literary metaphor, non-verbal conceptualization of action, creative thought in mathematics, evolution of socio-cultural models, jokes, and advertising. The process of blending is in general invisible to consciousness and detectable only on analysis. Certain spectacular and highly noticeable phenomena of blending are only the tip of the iceberg.

We show how blended spaces are constructed and how they serve as sites of fundamental cognitive work. They are routinely necessary for constructing central meanings, inferences, and structures, and for motivating emotions.

We also show that the blending of highly schematic spaces yields the fusion of grammatical constructions and functional assemblies studied in Cognitive Grammar and Construction Grammar.

Finally, recognizing the cognitive import of middle spaces allows us to propose a generalized four-space model of conceptual projection that subsumes (among other things) a variety of models of analogical and metaphorical mapping. We propose that many disagreements between theorists of analogy and metaphor are resolved by taking into account this more elaborate model, and the parameters which define particular configurations.

The thrust of this report is that blending is a general instrument of cognition running over many (conceivably all) cognitive phenomena, including categorization, the making of

hypotheses, inference, the origin and combining of grammatical constructions, analogy, metaphor, and narrative. Blending is not secondary to these phenomena or inessential or elective. It is prerequisite. Its operation is not restricted to any one of these phenomena. Blending is motivated independently of metaphor and analogy, and is not restricted to phenomena of language.

The report is organized as follows: Sections I and II present the model and analyze a broad range of data which motivate the technical notion of blended space. Section III discusses the mapping strategies involved and distinguishes blending in its general form from some of its salient prototypes. Sections IV and V present further relevant evidence, including the important phenomenon of category extension. Section VI describes generic middle spaces, and section VII shows how the model yields various subschemes for conceptual projection when parameters are set in certain ways. Section VIII shows the key role of blending in generating grammatical constructions, and Section IX asks what all this means for concept formation.

I. The Four Space Model

The projection of conceptual structure is an essential instrument of thought. A metaphor between mind and computer, an analogy between electricity and water, a new social event imagined as a version of one we already know, an assimilation of something novel to an established category, a creation of a provisional category for local purposes—all of these and many other cognitive operations involve the projection of conceptual structure.

We reconsider the customary view—often reflected in our own work—that conceptual projection carries structure from one conceptual domain to another in a manner that is direct, one-way, and positive. We suggest that direct, one-way, and positive projection from source to target is only a special aspect of a more robust, dynamic, variable, and wide-ranging assortment of processes. In addition to the notions of source and target, all conceptual projections involve middle spaces that are indispensable sites for central mental and linguistic work. The existence of these middle spaces entails that conceptual projection is not

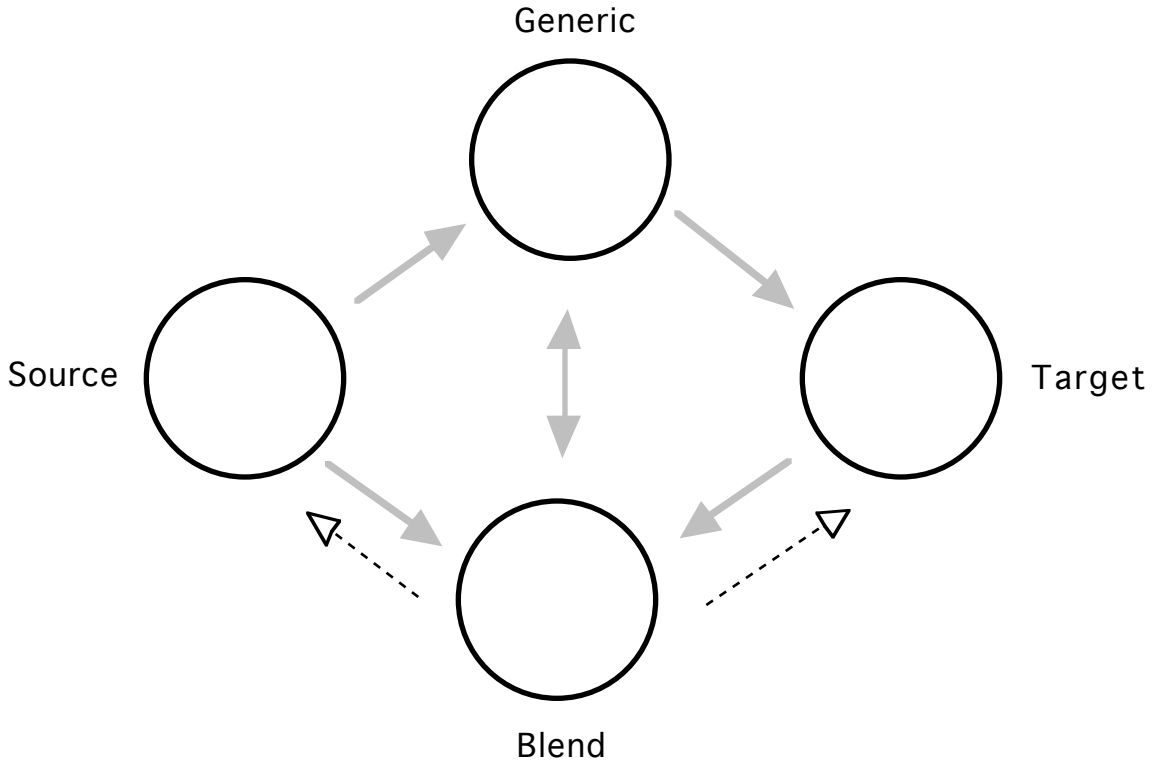

Figure 1

direct, except perhaps as a limiting case within the full range of cognitive possibilities. We will show that middle spaces provide key inferences not derivable in the source or target, and that such inferences can project to source or target, demonstrating that conceptual projection is not in general one-way. We will also show that blended spaces can pick out non-correspondence between source and target, demonstrating that conceptual projection .is not in general positive.

Here is an outline of the scheme to be proposed. First, we take it that when a conceptual projection occurs, two mental spaces are set up, one for the source, and one for the target—such spaces do not represent entire domains, but rather represent relevant partial structure, as highlighted from a certain point of view.[2] Like mental spaces in general, they may inherit additional structure by default from context, culture, and background.

As in standard accounts, there will be projection from source to target: the mental spaces will be linked by counterpart functions. But in addition, middle spaces will be constructed. The most abstract, which we call GENERIC, reflects the roles, frames, and schemas common to the source and target spaces. This part of the analysis actually has equivalents in most approaches and should be fairly uncontroversial. But a fourth kind of middle space, which we call BLENDED, is also available: it combines specifics from source and target, yielding an impression of richer, and often counterfactual or "impossible" structure. We shall argue that significant cognitive work is performed relative to such blended spaces.

Aspects of blending, and their cognitive importance, have been noticed and discussed in previous work. Koestler (1964) noted the role of blended spaces in problem-solving.[3] Talmy (1977) comments briefly, but with great insight, on the blended nature of certain syntactic constructions. Moser and Hofstadter (ms.) provide significant examples and deep, extensive, discussion of linguistic and other cognitive blends. Goffman (1974), in his penetrating analysis of social framing, alludes to frame mixing. Kunda, Miller, and Clare (1990) report experiments on the combining of social concepts that show that although the process of blending follows a logic, its output cannot be predicted, because subjects recruit from a wide range of knowledge in the process and because the blend routinely contains emergent structure not simply inherited from either input concept.[4] Turner (1991) analyzes some everyday linguistic constructions that have conceptual blending as part of their semantic and pragmatic interpretation. Fauconnier (1990, to appear) notes the blending involved in the construction of analogical counterfactuals.

This report generalizes such observations empirically and theoretically, and concludes that space-blending is a central, indispensable component of conceptual projection, and that crucial aspects of meaning (inferences, emotions, creativity) cannot be accounted for without it.

Finally, we suggest that middle spaces fall on a gradient, with the most abstract generics at one end, and the richest blends at the other. As meaning unfolds, there will be shifts in the middle space configurations.

In sum, we will argue that the *general* case of conceptual projection behind hypotheticals, counterfactuals, analogy, and metaphor has the structure diagrammed in Figure 1. We call this the Four-Space Model. This model will be sufficient to guide much of our discussion. But there are good reasons to believe that the Four-Space model itself is only a typical case of an even more general Many-Space generative scheme.[5]

II. The Phenomenon of Blended Spaces

1. Dante's *Inferno*

In the *Inferno,* Dante presents the character of Bertran de Born, who in life had instigated strife between the King of England and the king's son, tearing them apart. Spectacularly, Bertran's head is torn apart from his body: he carries his head in his hand, and must lift his head manually in order to talk to Dante as he passes. Bertran cites his punishment as appropriate to his sin:

> Perch'io parti' così giunte persone,
> partito porto il meo cerebro, lasso!
> dal suo principio ch'è in questo toncone.
> Così s'osserva in me lo contrapasso.6

Because I parted people so joined,
I carry my brain, alas, separated
from its root, which is in this trunk.
Thus is to be seen in me the retribution.

This is a blending impossibly in conflict with our understanding of actual human beings. In it, a talking human being has a body that is unnaturally divided. This blended space arises in this way: the sin of setting father and son against each other is understood metaphorically as dividing a cohesive and joined physical object. In this projection, physical division is projected from a space of physical objects and actions onto the space of social actions: the joined physical object corresponds to the father-son unit; the separation of the object corresponds to the separation of the father and the son; the act of separating the physical object corresponds to the act of separating the social unit, and so on. This projection is not at all novel; it relies upon a highly conventional metaphor in which social, psychological, and emotional "distance" is understood in terms of physical distance. In this highly conventional projection, there is a certain amount of abstract information that is projected from the source to a generic space and then from the generic space to the target.[7] Such a generic space is available to be projected to a great range of different target spaces, and in fact we find it in other cases in Dante that involve neither royalty nor family relation, but only some sort of psychological or social bond. This mental process—projecting skeletal information to a generic space, which is then available for infinitely many projections to specific target domains—is the standard procedure for interpreting proverbs in the absence of a pragmatic indication of the target. When we read in a book of proverbs, "He is strongest who stands alone," we interpret it by projecting certain kinds of skeletal information to a generic space, which is then available for projection to unspecified targets, many of which will not involve any sort of literal "standing." Lakoff and Turner have analyzed projection to a generic space in their discussion of GENERIC IS SPECIFIC in *More than Cool Reason*.

These generic spaces are one kind of middle space. But in Dante, we can see that there is another kind of middle space, a "blended" space. This blended space contains the generic space projected from the source; it additionally contains specific information borrowed from both source and target. In the blended space, the sinner and the sin come from the target, and the source *counterpart* of the sin is imposed as punishment upon the sinner. The specific information from the source—physical separation of a joined physical object—is applied impossibly to the human being from the target in a blended space which contains something impossible for either source or target: a talking and reasoning human being who carries his detached head in his hand like a lantern. In the blended space, it is entirely possible and consistent, even expected, that such events will occur; but they are impossible with respect to the target.[8]

It is especially to be remarked that the power and even the existence of the central inference of this projection come not from the source space and not from the target space, but only from the blended space. The central inference is that Bertran de Born has done something not merely wrong, but wrong in specific ways: unnatural, ghastly, violent, destructive of a worthy whole. In the source space, there may be nothing at all wrong with spatially separating a joined physical object. And of course, a human being, divided at the neck, who thereafter lives and talks in the normal fashion, is impossible for the source to begin with. In the target space, there may be nothing wrong in advising a son to oppose his father—perhaps the father is an evil infidel warrior, for example. But we all know there is something bad about having one's head chopped off. Before Bertran de Born even begins to tell his story to Dante in hell—which is to say, before we even learn the relevant historical details of the target—we see the amazing spectacle of Bertran carrying his talking detached head, and recognize that whatever this division symbolizes, it is meant to be taken as bad and unnatural. The inference is established in the blended space and is imported to the target space as Bertran recounts his actions.

Most readers who know this famous portrayal of Bertran de Born have not read Dante, and so can derive none of the inferences from context. Although a sophisticated reader

of Dante may establish from context that there must be something wrong with Bertran de Born, given that he is in hell, and that Bertran must have sinned in a certain way, given his particular location in hell, such a reader may nonetheless derive all the central inferences from the spectacular portrayal itself. It is possible to know an abstract definition of a sin while having only the thinnest corresponding conception. Dante is often praised as explaining sins to readers who otherwise would have no real understanding of them. Many readers, informed of the relevant history, would not even agree that Bertran de Born's actions were sinful. But we can all derive the inferences from the spectacular portrayal itself.

Blending is a generative conceptual mechanism of Dante's *Inferno*. The target space of sin and sinner is conceived in terms of a source space. A blended space is constructed in which the source counterpart of the sin is imposed impossibly upon the sinner.

Dante's blended spaces are explicitly marked as exotic and literary. They take place in a new conceptual domain: the imaginary world of hell. They are alien and fantastic—a reality inaccessible to us. But the essence of our report is that what we see here in technicolor—blended spaces providing central inferences—is the routine occurrence in everyday conceptual projection.

The example with which we began is striking. But it is literary and metaphorical. It might therefore be misunderstood as suggesting that blending is a bizarre event of strange literature, which, however clever, is inessential to everyday conceptualization and reasoning. Throughout this report, we will show that, on the contrary, blending is pervasive in all modes of thinking and talking, and in fact is not even inherently tied to language, but appears more generally in action and phenomena of cognition. It is useful in this regard to take a look at cases in which blending occurs straightforwardly, although no analogy or metaphor is involved.

2. Regatta

Consider the following excerpt from a report in the sailing magazine *Latitude 38*:

> As we went to press, Rich Wilson and Bill Biewenga were barely maintaining a 4.5 day lead over the ghost of the clipper *Northern Light*, whose record run from San Francisco to Boston they're trying to beat. In 1853, the clipper made the passage in 76 days, 8 hours. —"Great America II," *Latitude 38*, volume 190, April 1993, page 100.

Three situations, two real and one imaginary, are available to the reader: the actual passage of the clipper back in 1853, the current run by Great America II in 1993, and the imaginary race between Great America II and the ghost of Northern Light. The excerpt refers only to the third: the imaginary situation. And yet there is of course no confusion about what is said: readers do not assume that the writers believe in ghost ships, or that if Great America II should capsize, Northern Light's ghost will come along and rescue the crew. To understand the excerpt and to draw the proper inferences, we construct three spaces: one for the 1853 passage, one for the current 1993 run, and a blended space into which both ships are projected, yielding the additional conceptual structure of a race.

By giving the relative positions of the ships in the blended space, the writer provides information which can be exported to the target, the 1993 space: whether Great America II is doing well, is going fast enough, is accomplishing its goal, and so forth. Although positions in the 1853 and 1993 spaces could be compared to each other in an abstract way, the blended space does more, by fitting the comparison into a preexisting cultural frame, the RACE, which not only has the required structure, but brings with it emotions and intentions of the sailors, which can then be transferred globally to the target, with reduced cognitive effort and increased efficiency and content. Notice how the blend works: it does not merely superpose the two initial spaces; it projects structure from each one into a larger structure adapted to a preexisting cultural frame (racing), which appears in neither of the initial spaces. Notice also that the blend is perfectly consistent and straightforward—two boats in a race. Its "impossibility" is purely pragmatic,[9] and of no consequence to the efficient exported inferences and emotions. In the example from the *Inferno* , pragmatic clashes in the blend (carrying one's detached head while moving and talking) were exploited inferentially. In the boat race example, this is not the case.[10]

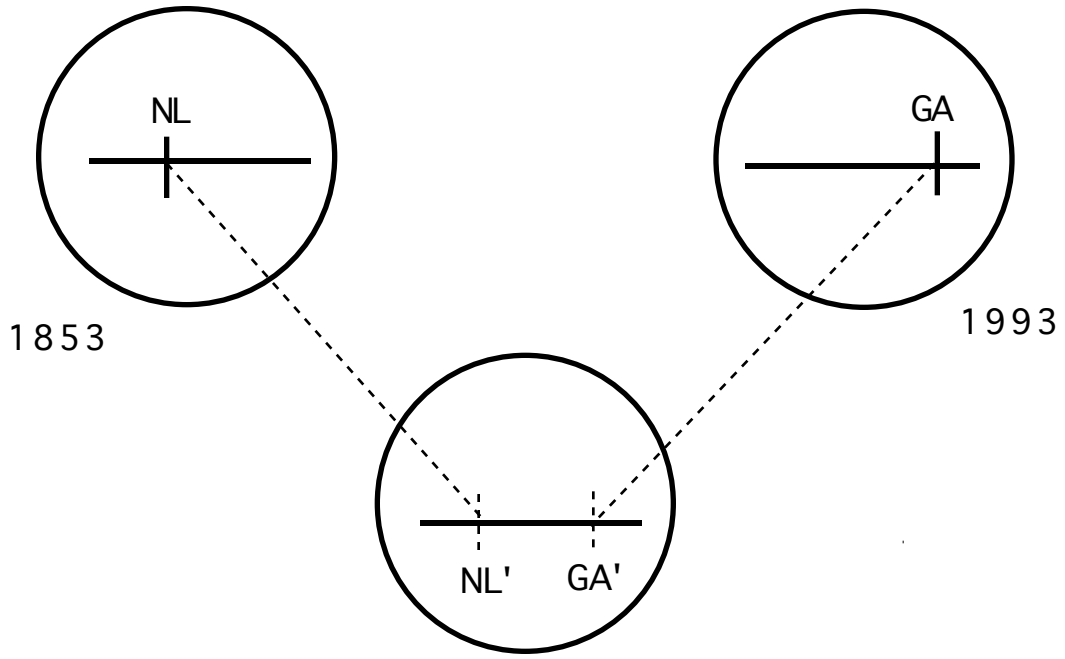

Figure 2

Nevertheless[11], the blend has produced its own new, fantastic, conceptual domain with ghost ships and imaginary races. But equally often, the blended space is set up without a corresponding conceptual domain. So, in the same context as before (Great America II's attempt to break the record), it would be perfectly natural to write:

> At this point, *Great America II* is 4.5 days ahead of *Northern Light*.

The blend is constructed just as before. It is in the blend, not in the *1853* space or in the *1993* space, that one boat is ahead of the other. But this time, no conceptual domain of phantom boats and races is invoked. As a result, the blend does not stand out consciously as it might have in the original text. In fact, our guess is that the sentence would be perceived by users and analysts alike as very straightforward. And yet, the same considerations as before motivate the construction and cognitive exploitation of the blended space.[12]

The boat race blend allows journeys that are distant in time to be construed locally as simultaneous, and part of a fictitious scenario. Great America II could of course be trying to beat its own previously set record, and then it would be compared to itself. In the blend, it would be ahead of itself.

3. <u>The riddle of the Buddhist monk</u>

Consider the following riddle mentioned by Arthur Koestler:

> Riddle of the Buddhist monk and the mountain: A Buddhist monk begins at dawn one day walking up a mountain, reaches the top at sunset, meditates at the top for several days until one dawn when he begins to walk back to the foot of the mountain, which he reaches at sunset. Making no assumptions about his starting or stopping or about his pace during the trips, prove that there is a place on the path which he occupies at the same hour of the day on the two separate journeys.[13]

We need to find <u>a place</u> on the path, occupied at exactly the same time going up and going down. An elegant solution to the riddle

is to imagine the Buddhist monk walking both up and down the path on the same day. Then, "the place" is where he meets himself. As in the boat race, the two journeys which really occurred on different days have been projected into a blended space where they occur simultaneously. In that space, the Buddhist monk descending must encounter the Buddhist monk ascending (himself). This provides the inference that there is a place on the path which the Buddhist monk must inhabit at the same time of the day during his two trips. This inference is projected to the target, where no such encounter occurs.

Blends can be constructed if there is abstract structure shared by the two input spaces. This abstract structure is found in the fourth space, the generic space. In the example of the Buddhist monk, the generic space is structured by a single journey from dawn to sunset, over a single distance (that separating the foot and the top of the mountain). It is not specified in the generic space whether that journey is up, down, or level. Nor is it specified on what day it takes place. Nor is the internal structure of the journey (e. g., starting and stopping, moving slower or faster) specified. This allows the generic structure to be projected equally well onto the space of the ascent the first day, the space of descent the next day, and the blended space where both occur on an unspecified day.

The example of the Buddhist monk has some interesting features. In the blend, the same individual can be at two different places at the same time. This is not inherently contradictory. It is merely pragmatically atypical, but still widespread in Marcel Aymé's stories, many religions, and modern technological situations involving state-of-the-art telecommunications.[14] In the example of the Buddhist monk, the pragmatic anomaly doesn't happen to yield any exportable consequence: we disregard it in order to focus on the problem at hand, the search for the meeting point, which will be exported back as a point attained at the same time on two different journeys. But of course, in principle the anomaly could yield consequences, as we shall now see with a structurally similar example.

4. Getting ahead of oneself

Consider, in contrast to Dante's literary acrobatics, the everyday, idiomatic, but still metaphorical expression, "I am getting ahead of myself."

One evident inference of "I am getting ahead of myself" is that the speaker feels himself to be engaged in an event in advance of its scheduled moment. Another strong inference is that this is not a good thing. This second inference is not available from the source of this projection. The source concerns self-locomotion along an intended spatial track. In the logic of this space, it is simply impossible for someone to be ahead of himself. It is quite possible for two different people to be at two different spots on a track, and even to be in a kind of race with each other. But there is no inference in the source that there is anything wrong with two different people's being at different spots on the track, and no possibility of a single person's being at two different spots on the track. So the inference that something is wrong is not constructed in the source space. Nor is it required or even common in the target space. The target concerns the scheduling of events, and it may be a very good thing to be engaged in an event in advance of its scheduled moment: "He made lieutenant a year ahead of schedule," "He's zipping through the schedule faster than expected," and "She finished ahead of schedule" can all be read as positive.

The inference that something is wrong arises when we recognize that it is undesirable for a single person to be at two different places at the same time. It is only in a blended space, where it is "possible" for someone to be at two different places at the same time, that this inference can arise.

There are two metaphoric mappings that connect the source of self-locomotion along an intended track to the target of the organization of events. In the first, the person at a location in the source is projected to the person engaged in the actual event in the target, as in the exchange, "I'd like to talk to John." "You can't, he's in the middle of an exam" said in a case when John is actually in the middle of an exam at the time of speaking. In the second, the person at a location in the source is projected to the person associated with the scheduled event in the target, as in the exchange, "Can I see you at three?" "Sorry, at three I am in the middle of an exam."

In both mappings, the locations in the source are mapped onto the same sequence of

events in the target. In any one mapping, two different events must correspond to two different locations in the source. Normally, we cannot use both of these mappings simultaneously. "I am ahead of John" does not mean that the event I am actually engaged in is earlier than the event John is expected to be engaged in, nor does it mean that the event I am expected to be engaged in is earlier than the event John is actually engaged in. It only means that the event I am actually engaged in is earlier in the sequence of events than the event John is actually engaged in, or that on the schedule of events, my event comes before John's, as when my tennis match is at 7pm and John's is at 8pm.

But consider what happens if source and target are blended. Recall that in the source, the essential information is that *two* different people are racing along *one* track, while in the target, *one* person is associated with *two* different "tracks"—the actual sequence of events versus the scheduled sequence of events. In the blended space, the *two* people from the source are blended into the *one* person from the target; and the *one* spatial sequence from the source is blended into the *two* event sequences in the target. So, when the actual event is not the scheduled event, the *one* person from the target corresponds to *two* locations in the source, and thus, since two locations require two different people in the source, the *one* person from the target is equal to *two* people from the source. One person in two different places is of course impossible for the source and irrelevant in the target. But this impossible clash is possible in the blended space and occurs there to yield the evident inference that something is wrong. We project from the blended space to the target this central inference. We cannot project from the blended space to the target the impossibility of one person's being in two different locations: the fact that one person is in two locations in the blended space corresponds in the target space to the situation of one person not being on schedule. The central inference that something is wrong is available only in the blended space; this inference, but not the impossible clash, is projected to the target.[15]

I'm getting ahead of myself. [Contrast: I am ahead of schedule.]

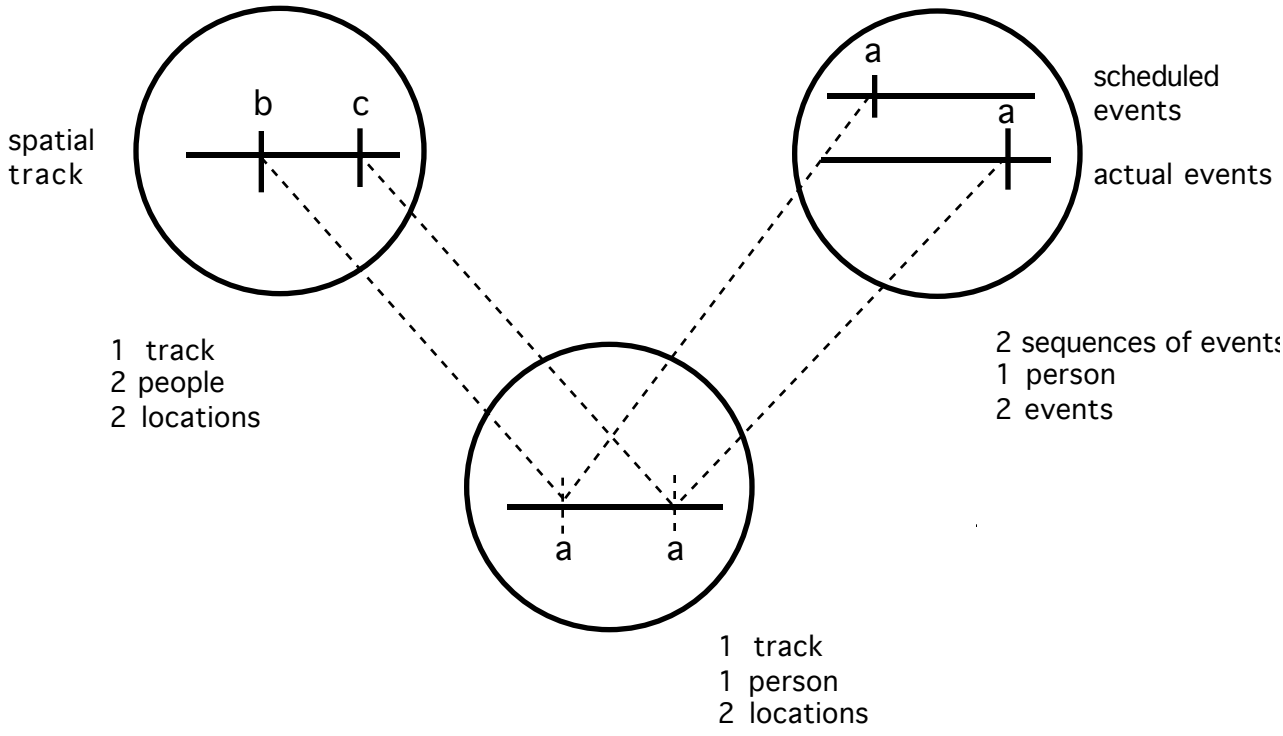

Figure 3

In the view we are developing, the exotic and highly structured example of Bertran de Born in Dante's *Inferno*, the boat race with or without the ghost, the ubiquitous Buddhist monk puzzle, and everyday locutions like "I am getting ahead of myself" and "I forgot myself" all require for their central inferences the construction of a blended space. On the basis of examples such as these, we are claiming that previous models of conceptual projection are inadequate and partial, since they neither recognize nor provide instruments for analyzing the cognitive and linguistic phenomena involved. It might be argued that such examples are mere marginal curiosities that do not warrant a radical theoretical shift to a many-space model such as we propose. "I'm getting ahead of myself," for example, although neither exotic nor literary, might seem to offer no fundamental problem, since it is an idiom. So, let us look at other examples with different characteristics, each of which provides a different kind of evidence for the necessity of a many-space model of conceptual projection.

5. Tuning in, and other actions

First, are we just dealing with language games, strange ways found in language to express otherwise unproblematic situations and conceptions? Consider the following, reported with some embarrassment by one of the authors of the present paper:

> I'm driving, and someone is sitting in the front passenger seat, talking to me, but I have trouble hearing what they say. I turn the volume knob on the car radio (which is off, of course). I've blended the frames for listening to the radio and for conversing with a passenger. I can't appeal to simple error: I am in no way under the misapprehension that the voice is coming from the radio, or that turning knobs will make people speak more loudly. What I have done, irrelevant, inefficient, and absurd as it may be, is EXTEND my category of controlled sound amplification within a blended space.

This blend is not produced by language use; it is a case of conceptual projection applied directly to action. Notice that it is inefficient in this particular case: the inferences that the driver of the car hopes will transfer to the real world in fact do not—the sound is not amplified, he does not hear his friend more clearly. Nature proves him wrong, the blend is suppressed, and the action is called a mistake. The other author of the present paper reports sitting down late at night to a dimmed computer screen at a desk illuminated by an architect's lamp and attempting to brighten the screen by turning the knob on the lamp instead of on the computer: another mistake, we say.

But in other circumstances, the blend may produce very rewarding inferences. For example, many people do not know how to coil a cord of neutral lay in a way that makes it easy to deal with afterward. But say to a sailor, "Pretend it is a braided dock line," and the sailor will coil it perfectly, not by going through some elaborate analogy, but simply by treating, for the moment, for local purposes, the cord as a dock line. In the frame of sailing, the person with the cord knows what to do; the sailing frame just has to be called up and blended with the frame of the cord.

We bring up such cases because they are non-verbal, and therefore clearly don't depend on special literary effects, metaphoric language, or idiomatic construals. Nor are these cases just abstract analogy—transfer of abstract schemas from one domain to another. In the blended space fleetingly revealed by a strange action, human and radio voices are not just similar; they are the same, under the control of the same knobs and switches. The cord is not just "like" a dock line; it is conceived of as a dock line in the blend. The successful action pattern is exported to the reality target, but the extended "dock line" category is not.

These examples and several others that we shall come across show that blended spaces do cognitive work in the strongest sense. They make available not just inferences, but also emotions and novel action patterns. And so they leave their mark on the real world. In the boat race example, the sailors were able, through the blend, to live their action as a race. They could wonder whether they were catching up with Northern Light, or how far ahead they were, and they could (through projection from the other spaces) actually find out: the blended space of the race comes with very precise, quantifiable truth conditions. By living as a race what is not a race, they could feel, react,

and reason differently, and perhaps more efficiently, and with more pleasure or pain, as the case may be.[16]

Our informal characterization of the construction of blended spaces has the following characteristics:

—Mental spaces in general have only very partial explicit structure, that typically includes roles, values, and relations.

—To blend two spaces is to project them onto a third space, also partially structured, in such a way that the first two partial structures map coherently onto the third. The word "coherently" here is a place-holder for a vast research program. We return to the issue in later sections.

—A blend in this sense is neither a union nor a blur. It is a space structured in its own right, onto which the two initial spaces are projected. The blended space typically has structure absent from the input and generic spaces, as we saw in the boat race example.[17]

—A blended space may give rise to a new conceptual domain (Dante's Hell, the race against ghost ships), but it doesn't have to, and in fact usually won't.

—A blended space may be used for local cognitive purposes only, or it may lead to more permanent reconceptualization and category extension, as we discuss below in section V.

6. Complex numbers

Conceptual projection enables us to extend categories to cover new provisional members. The blended space that develops during such such a projection merges the original category with its new extension. When categories are extended permanently, it is the structure of this blend that defines the new category structure, thus carving out a novel conceptual domain. The history of science, and of mathematics and physics in particular, is rich in such conceptual shifts.[18] It is customary to speak of models either replacing or extending previous models, but the pervasiveness and importance of merging may have been underestimated.

Consider as an example the stage of mathematical conceptual development at which complex numbers became endowed with angles (arguments) and magnitudes.[19] Square roots of negative numbers had shown up in formulas of sixteenth-century mathematicians and operations on these numbers had been correctly formulated. But the very mathematicians who formulated such operations, Cardan and especially Bombelli, were also of the opinion that they were "useless," "sophistic," and "impossible" or "imaginary". Such was also the opinion of Descartes a century later. Leibniz said no harm came of using them, and Euler thought them impossible but nevertheless useful. The square roots of negative numbers had the strange property of lending themselves to formal manipulations without fitting into a mathematical conceptual system. A genuine concept of complex number took time to develop, and the development proceeded in several steps along the lines explained above for analogical connections and blending.

The first step exploited the preexisting analogical mapping from numbers to one-dimensional space. Wallis is credited[20] with having observed—in his *Algebra* (1685)—that if negative numbers could be mapped onto a directed line, complex numbers could be mapped onto points in a two-dimensional plane, and he provided geometrical constructions for the counterparts of the real or complex roots of $ax^2 + bx + c = 0$. In effect, Wallis provided a model for the mysterious numbers, thereby showing their consistency, and giving some substance to their formal manipulation. This is of course a standard case of extending analogical connections; geometric space is a source domain partially mapped onto the target domain of numbers. The mapping from a single axis is extended to mapping from the whole plane; some geometric constructions are mapped onto operations on numbers. Notice that neither the original mapping nor its extension requires more than two domains. We do not need a generic space, since there is no assumption in work like Wallis's that numbers and points in a plane share properties at some higher level of abstraction. The necessary structure is already present in the conceptual source domain of two-dimensional space because it already contains the notion of distance which is expressed directly by means of numbers.[21] Nor does it involve a blend; numbers and points remain totally distinct categories at all levels. Although the mapping proposed by Wallis showed the formal consistency of a system including complex

numbers, it did not provide a new extended concept of number. As Morris Kline reports, Wallis's work was ignored: it did not make mathematicians receptive to the use of such numbers. In itself, this is an interesting point. It shows that mapping a coherent source onto a conceptually incoherent target is not enough to give the target new conceptual structure. It also follows that coherent abstract structure is not enough, even in mathematics, to produce satisfactory conceptual structure: In Wallis's representation, the source metric geometry provided abstract schemas for a unified interpretation of real and imaginary numbers, but this was insufficient cognitively for mathematicians to revise their target domain accordingly .

In the analysis developed here, the novel conceptual structure in the mathematical case of numbers is first established within a middle blended space. In the blend, but not in the original source and target, it is possible for an element to be simultaneously a number and a geometric point, with cartesian coordinates (a,b) and polar coordinates (r,q). In the blend, we find interesting general formal properties of such numbers, such as

$(a, b) + (a', b') = (a+a', b+b')$

$(\rho, \theta) \times (\rho', \theta') = (\rho\rho', \theta + \theta')$

Every number in this extended sense has a real part, an imaginary one, an argument, and a magnitude. By virtue of the link of the blend to the source (two dimensional plane), the numbers can be manipulated geometrically; by virtue of the link of the blend to the target (real numbers), the new numbers in the blend are immediately conceptualized as an extension of

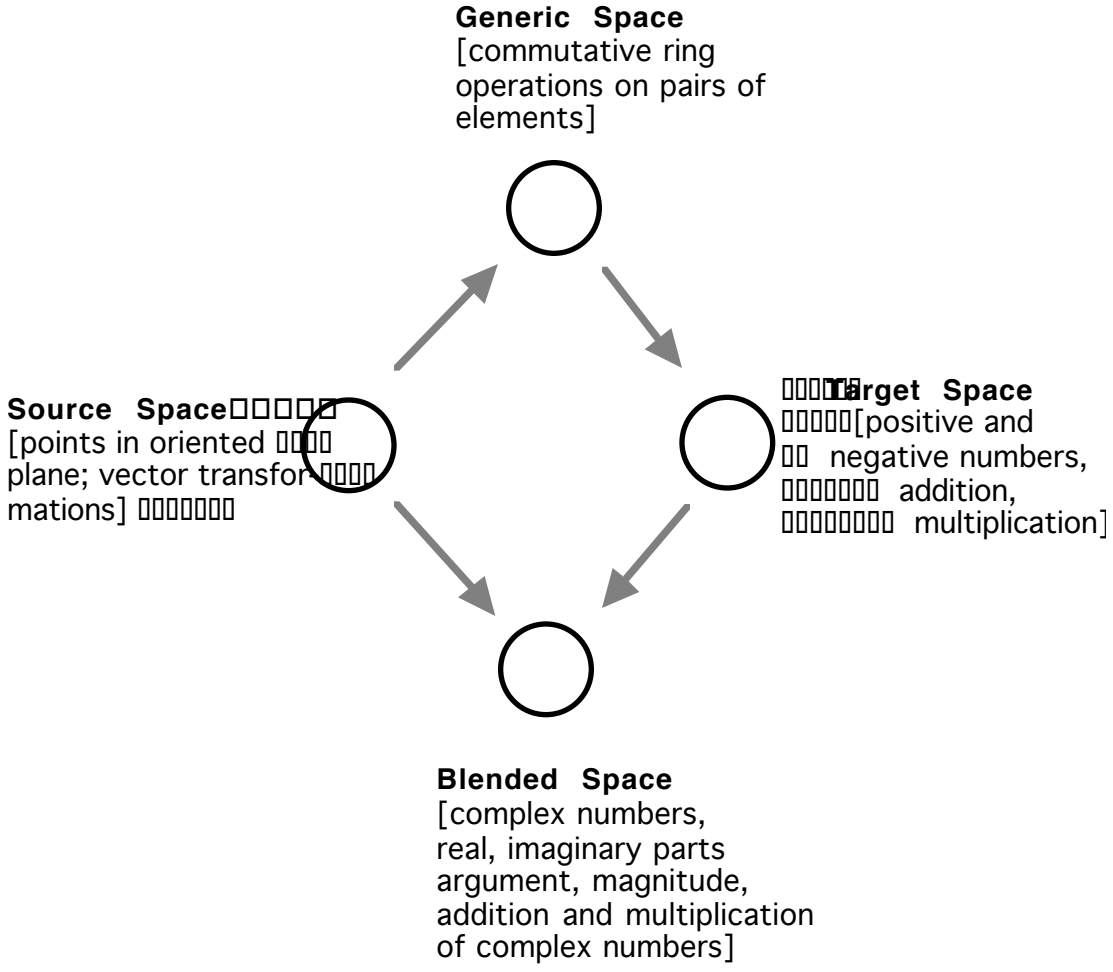

Figure 4

the old numbers (which they include by way of the mapping). As in Wallis's scheme, the mapping from points on a line to numbers has been extended to a mapping from points in a plane to numbers. This mapping is partial from source to target—only one line of the plane is mapped onto the numbers of the target domain—but it is total from source to blend: all the points of the plane have counterpart complex numbers. And this in turn allows the blend to incorporate the full geometric structure of the source.

Interestingly, when a rich blended space of this sort is built, an abstract generic space will come along with it. Having the three spaces containing respectively points (source), numbers (target), complex point/numbers (blend) entails a fourth space with abstract elements having the properties "common" to points and numbers. The relevant abstract notions in this case are those of "operations" on pairs of elements. For numbers, the specific operations (in the target domain) are addition and multiplication. For points in the plane, the operations can be viewed as vector transformations—vector addition, and vector composition by adding angles and multiplying magnitudes. In the blended space of complex numbers, vector addition and number addition are the same operation, because they invariably yield the same result; similarly, vector transformation and number multiplication are conceptually one single operation. But such an operation can be instantiated algorithmicly in different ways depending on which geometric and algebraic properties of the blend are exploited.[22]

In the generic space, specific geometric or number properties are absent. All that is left is the more abstract notion of two operations on pairs of elements, such that each operation is associative, commutative, and has an identity element; each element has under each operation an inverse element; and one of the two operations is distributive with respect to the other. Something with this structure is called by mathematicians a "commutative ring."

Under our account, then, the evolution and extension of the concept of number includes a four-space stage at which the concept of complex number is logically and coherently constructed in a blended middle space, on the basis of a (presumably non-conscious[23]) generic middle space structured as a commutative ring. The abstract and mathematical example of complex numbers is superficially different from other phenomena we consider in this report, such as jokes, idioms, literary metaphors, action slips, or social category extensions. And yet, like the others, it illustrates and supports the functioning of four-space conceptual projection, with its blended and generic middle spaces.[24] Like the car radio and dock line examples, it confirms that we are dealing with an aspect of thought that is not purely linguistic or verbal. It highlights the deep difference between naming and conceptualizing; adding expressions like $\sqrt{-1}$ to the target domain of numbers, and calling them numbers, is not enough to make them numbers conceptually, even when they fit a consistent source model. This is true of category extension in general. Calling a tail a leg doesn't make it one, as Abraham Lincoln insightfully and supposedly observed.[25] But blending our conceptions of life and computation may well decide not just what counts as a virus, but what a virus is.

III: Prototypes of blending and mistaken reductions

Although one central process that we treat in this report is the functioning of blended middle spaces in analogical and metaphorical mappings, the phenomenon of blending is more general, applying to non-analogical cases like the boat race, and, as we shall discuss in section VIII, to highly schematic grammatical frames and functional assemblies.

To see the kinds of formal problems that will have to be faced, consider once again the simple example of the boat race, analyzed now in terms of its precise frame and role structure.

Some of the relevant partial structure is distributed in the spaces as follows:

1853 space: $\mathbf{a_1}$, the clipper *Northern Light*; $\mathbf{t_1}$, the trajectory *San Francisco* to *Boston*; the clipper's positions on $\mathbf{t_1}$, the days of the passage from start to finish in 1853.

1993 space: $\mathbf{a_2}$, the catamaran *Great America II*; $\mathbf{t_2}$, the trajectory *San Francisco* to *Boston*, the catamaran's positions and the corresponding days of the 1993 voyage.

generic space **G**: **b**, the boat; **t**, the

trajectory *San Francisco* to *Boston*, $\mathbf{p_1}$, ... $\mathbf{p_i}$, ... $\mathbf{p_f}$, the positions of **b** on the trajectory **t**; the initial day $\mathbf{d_1}$ and the final day $\mathbf{d_f}$ of the voyage; a generic day of the voyage, **d**, and its position **p**.

This generic space frames the other two in a certain way: **b**, $\mathbf{d_1}$, $\mathbf{d_f}$, **d**, **p**, are roles filled by the more specific values for the boat, departure, and arrival dates and positions, in the *1853* and *1993* spaces. The trajectory **t**, on the other hand, is essentially the same as $\mathbf{t_1}$ and $\mathbf{t_2}$. The initial position is San Francisco in all spaces At the same time however, this generic space itself is framed by a more general schema of boat, trajectory, and positions, which itself is framed by an even more general oriented path schema, with a moving trajector, an origin, goal, and intermediate times and positions. Notice that **G** is built for local purposes to fit the spaces at hand and to fit the more general background knowledge frame-schemas.

G has the "same" trajectory as the other two spaces (San Francisco to Boston), and therefore conceptually it has the same available positions on that trajectory. However, the days for those positions are different in the input spaces, and so we have no specific day associated with a position in **G**. What we do have is the more abstract notion that each position **p** is reached on some day **d**, where **p**, **d** is a pair of roles without specified values in **G**.

Space **G** induces a mapping between the two input spaces, by correlating elements with the same **G**-projection:

$\mathbf{a_1}$	→	**b**	→	$\mathbf{a_2}$	(Northern Light → Great America)
$\mathbf{t_1}$	→	**t**	→	$\mathbf{t_2}$	(SF - Boston → SF - Boston)
$\mathbf{p_{i'}}$	→	$\mathbf{p_i}$	→	$\mathbf{p_{i''}}$	(same points on the path)
$\mathbf{d_{i'}}$	→	**d**	→	$\mathbf{d_{i''}}$	(days in 1853 and 1993 on which a particular position was —initial and final days will be correctly mapped)

Relational structure in **G**, projected onto the other spaces includes:

b sails from $\mathbf{p_1}$ to $\mathbf{p_f}$ on **t** .

b is at position **p** on day **d**, where the roles **p** and **d** define a function from positions to days, unspecified in **G**, but specified in the input spaces. This function meets the conditions $\mathbf{d}(\mathbf{p_1}) = \mathbf{d_1}$, $\mathbf{d}(\mathbf{p_f}) = \mathbf{d_f}$.

The blended space **B** is obtained through a different projection scheme from the input spaces, that preserves the mapping to the generic space:

The trajectories $\mathbf{t_1}$ and $\mathbf{t_2}$ are projected to the same trajectory **t'**. The moving boats $\mathbf{a_1}$ and $\mathbf{a_2}$ are projected to distinct moving boats $\mathbf{a'_1}$ and $\mathbf{a'_2}$ on **t'**. The blended space inherits the dates of 1993. The 1853 days are mapped onto corresponding 1993 days by using the $\mathbf{d_1}$ role for the first: i.e. in the blend, the two boats are assumed to start together on the first day of the 1993 passage. The boats in the blend retain their characteristics (clipper, catamaran). Positions and days for each boat are then mapped in the obvious way: identity for the catamaran, sequence from day 1 for the clipper.

We see that while the two boats were counterparts with respect to the generic framing, they no longer are with respect to the blend, where $\mathbf{a_1}$ and $\mathbf{a_2}$ project onto distinct elements. At the same time, the blend fits the generic in a many-to-one map. New relational structure is automatically created in the blend by this projection: there are now relative positions of the moving boats, distance between them at any time, difference in time to reach the same position, and so on. Notice crucially that this additional structure is not specified in the blended projection itself. It just follows topologically from that projection.

The next step, of great importance in our analysis, is to fit the blended structure thus obtained into a preexisting cognitive model. In

the case at hand, the blended structure in itself does not contain any notion of "race," but it fits the richer "race" model which we are independently familiar with: two moving vehicles driven by human beings, moving on the same path, with the same goal, and starting at the same time. The conceptual leap in building the blend is to automatically give it this more highly organized structure.

We take the mapping strategies outlined for the simple boat race example to be representative of space blending in general. While the Generic space is a structural intersection of the input spaces, the Blend creates new structure by allowing counterparts to be mapped to distinct elements, with distinct attributes, and by allowing importation of specific structures in the inputs. The key constraint is that we don't just have a union of the input spaces: only selected structure in the inputs is exported to the blend, but the overall projection will contain more structure than is available from the inputs. So for example, we saw that the days of 1853 were mapped onto the blend without their actual 1853 dates (selected structure), but that the resulting "race" structure in the blend went beyond what was projected from the input spaces.

The "whole" that we find in the blend is thus both greater and smaller than the sum of the "parts." Through projection of partial structures, and embedding into background frames, we get a truly novel structure, not compositionally derivable from the inputs. Therein lies the creative force of such blends. New actions (as in the dockline example), new concepts (as in the complex numbers case), new emotions and understandings (as in metaphor) emerge.

As we shall see in section VIII, the formal merging operations outlined above show up in the same form in grammar at the more schematic level of blended grammatical constructions and functional assemblies. A deep generalization is that the full interpretation of any sentence in a particular context is a sequence of successive blends meeting more and more specific local constraints. Meaning construction consists in solving successive constraint satisfactions on blends.

There is no way that all such mechanisms and constraints can be specified a priori. The detailed examples in this report point to a challenging research program. We believe that considerable empirical work must still be done to understand the precise functioning of the projections.

The general phenomenon of blending is not to be confused with any one of its easy, striking, or memorable special uses. In the hope of laying down for the reader a permanent barrier against the all too easy covert assumption that blending in general reduces to the features we see in one or another instance of its operation, we will survey some instances of blending and their central differences. No one of these instances provides a prototype to which other instances can be assimilated.

The most obvious special instance is the cartoon presentation of impossibly literalized metaphor made strikingly manifest through visual blending.[26] Consider the cartoon of the angry character: his skin grows red from his toes to his head in the manner of a boiled thermometer; he flips his lid and steam shoots from his ears. This is certainly a blend, based on the metaphoric projection from heated objects to angry human beings. It is also highly visible at a conscious level, because the cartoon world allows its explicit conceptual representation. It is therefore not representative of the general nature of blends. We stress the point, because it is tempting to reduce the phenomenon to its salient manifestations, and miss the deeper issue. Visual cartoon literalization of metaphor is a peripheral, not a prototypical case of blending.

A second tempting reduction is to the prototype of the fantastic, as in the *Inferno* example. A third tempting reduction is to the prototype of impossibility. "I'm getting ahead of myself" involves a structure that is impossible in Euclidean space for human beings. A fourth tempting reduction is to the prototype of "literary deviance," as we might suppose applies to Dante's Bertran de Born. This reduction compounds two errors: first, it assumes that blending belongs only to language explicitly marked as literary, and second, it assumes that the cognitive mechanisms of literature differ in kind from cognitive mechanisms of everyday thought.

All of these reductions, and others as well, obscure the aspect of blending that makes it fundamentally important to the cognitive sciences: blending is a general phenomenon, running across all varieties of cognition. Like

categorization, inference, the making of hypotheses, and metaphor, it is routinely employed and generally indispensable. It is not an advanced performance added optionally to more basic phenomena for special effect, like paint to a house. On the contrary, categorization, inference, the making of hypotheses, and metaphor depend in crucial ways upon the existence of the general cognitive capacity for blending.

Both the angry cartoon character and Bertran de Born are visual, but the category extension of sounds controlled by the radio volume button is not. The cartoon, the radio mistake, and the riddle of the Buddhist monk are striking blends that cannot fail to be noticed, but "I am getting ahead of myself" depends upon a covert blend detectable only on analysis. The radio mistake involves the making of a hypothesis, but "I am getting ahead of myself" does not. "I am getting ahead of myself" and the riddle of the Buddhist monk construct central inferences in their blended spaces. The cartoon is a case of making a conventional metaphor literal, but the example of Bertran de Born is not, since a literal presentation of social "division" as spatial division would produce a spatially divided father and son, not a spatially divided Bertran de Born.

The cartoon and Bertran de Born depend upon a metaphoric relation between source and target, but the boat race and the riddle of the Buddhist monk are not based on metaphoric relation between source and target.

The radio mistake is a mistake but the coiling of the cord is a success. Both involve the construction of a hypothesis and the execution of corresponding action, but neither is an analogy—a transfer of abstract schemas from one domain to another. Neither is a metaphor, since metaphor establishes a system of figural correspondences, not of identities: here, the radio volume knob and the pattern of coiling do not correspond figurally to something in the target; rather, they apply identically to blended categories built up on the basis of the source and target spaces.

In some cases of blending, there is linguistic evidence for the independent existence of the blended space: in the blended space of the boat race, there are two boats simultaneously racing, and we can refer to them accordingly, but there are vestiges of Northern Light's having come from a space that provides the reference frame, so that in the blend, Northern Light provides the landmark and Great America II is conceived as the trajector: We would say "Great America II is ahead of Northern Light" but not *"Northern Light is behind Great America II." Yet in other cases, as in the radio mistake, there may be no linguistic evidence at all.

In the rest of the paper, we will mention a host of other contrasts between specific uses of blending. We will see cases of blending in analogical counterfactuals where projection is not principally direct, positive, or one-way. We will see additional cases where blending provides category extension. We will see blends that are funny and blends that evoke mirthless ideological debate. We will see blends that concern scientific reality, others that concern social reality, and others that concern personal reality.

This illustrative summary of differences is offered as a talisman to ward away from the reader any reduction of blending to one of its merely noticeable uses. Instances of blending are amazingly diverse, naturally so, given that blending is a general cognitive instrument. What all these instances share is an intricate form of cognition which can be analyzed through the many-space model of conceptual projection.

IV. Further evidence for conceptual projection into a blended space

We have suggested that important cognitive work was performed in middle spaces, generic and blended; that a blended space had its own structure and organization, not reducible to an amalgamation of structure from the source and target; that blending could manifest itself in many ways, verbal or non-verbal, vividly imaged or masked from consciousness, in poetic invention, everyday language, or scientific inquiry.

This view raises multiple theoretical and empirical issues, most of which remain beyond the scope of the present report. In this section, we attempt to increase awareness of such issues through the examination of a rich array of examples that highlight theoretically relevant properties of conceptual merging.

1. President Bush on third base

We start with a case of metaphorical projection that is not exotic, literary, or idiomatic, but is meant to be a joke:

> George Bush was born on third base and thinks he hit a triple.[27]

The source is baseball and the target is society and one's image of one's relation to society. As is often observed, a projection such as this, which carries baseball onto life, does so by virtue of a shared schema that structures a generic space. In this generic space, there are agents in competition, goals to be reached, and so on. This generic space can be projected onto an indefinite range of specific targets, as in "He hit a home run at the meeting," "She scored the other night," making baseball an archetype of such competitive behavior. The example, "George Bush was born on third base and thinks he hit a triple," is an inventive use of the standard projection of this generic space.

However, not all of the meaning can be constructed in this fashion. Central inferences originate in a distinct blended middle space. One such central inference of this expression is that George Bush is not just stupid in the expected ways we are all stupid, but to a much higher, "inconceivable" degree. Where does this inference come from? It is not available from the source, because although there is more than one way to get on base (the batter can be walked, a pinch runner can be put on, and so on), in none of them is it possible to be confused about how you got on base. There is stupidity in baseball, of remarkable kinds such as those sampled in bloopers films,[28] and standard kinds, such as mental errors in the execution of an intended double play, or forgetting a complicated rule, and so on. But this kind of stupidity in baseball does not include not knowing how you got on base. None of the stupidity in the source domain is used to project the stupidity in the target in this case.

It is not impossible to project stupidity from baseball to the target. One could say of Bush's having lost the election, although he was president during the dissolution of the Soviet empire, that he "got on third base without ever having hit even a single ball, and had the chance to steal home, but he blew it." But in "George Bush was born on third base and thinks he hit a triple," none of the stupidity in the target accords with a stupidity in the source.

Neither is the inference that Bush is a paragon of stupidity available from the target. It is nearly the human condition that we are all deluded about our position in life. If President Bush is deluded, he is not exceptional in this regard.

But, in the blended space of life as baseball, we have from the source the information that someone is on base, and from the target the information that he is deluded about his position or how he attained it. The blended result is being deluded about how one got on base. The counterpart in the source is impossible. The counterpart in life is the standard condition. But the blend is stupid in the space of life as baseball. The stupidity is in the blended space.

It might be argued that, on the contrary, it is indeed possible to be ignorant in baseball of how one got on base, perhaps because the runner has had a stroke while running bases or is on drugs or because he has been brainwashed into insanity by a cult figure who has told him that the wheel of fortune assigns to every runner a base, or because of some other scenario alien to our concept of baseball but not absolutely impossible, and that such a delusion would be regarded as stupidity in baseball, and so the relevant inferences can indeed be projected to the target from the source. But now consider a second projection:

> Dan Quayle was born on third base and thinks he kicked a field goal.[29]

The inference that the Vice-President of the United States Dan Quayle is an "even more inconceivable idiot" than President Bush is not available from the source space of baseball, because the scenario of thinking you got on third base by kicking a field goal is not merely rare or unlikely, but fantastic. There is nothing in the game of baseball that allows for not knowing the difference between baseball and football. Dan Quayle has not had a mere lapse of memory; he is abidingly obtuse about even the distinction between the two different games. Again, the inference of exceptional

stupidity is not available from the target, where presumably everyone is in some measure deluded. It is available only from the blended space in which one can be simultaneously playing baseball and living life and be staggeringly confused about how one attained one's place on base.

There is another inference that can arise from the blended space but not from the source or the target. In the blended space, George Bush has been on third base all the time, i. e., 68 years, and has never advanced. In the source of baseball, it is not principally the runner's responsibility to make opportunities to advance bases; typically, it is the responsibility of the people who follow him in the batting order to bat him in. In the source, there is nothing wrong with Bush's staying on third, and no possibility of his staying there for 68 years. In any event, in the source, this situation does not count against Bush. In the target, certainly there is nothing wrong with having lived one's life at a high social station, been president once, and so on. But in the blended space, a runner is responsible for advancing, and it is is possible to stay in the same place forever. In the blended space, we have the inference that the longer the runner stays in one place, the less competent he is. Since Bush has never moved, the inference arises that Bush is exceptionally incompetent and lethargic. As in the case of the boat race, or the *Inferno*, the middle blend displays additional cognitively relevant structure (the agent's responsibility for not advancing), that was absent in the source and the target.[30]

George Bush and Dan Quayle were described in this fashion in order to indicate that, while it must be admitted that Bush and Quayle have a certain social, financial, and political status (third base), this does not mean they are to be given any credit, or regarded as competent for having attained this status, and that therefore, no one should vote for them because of their status. In fact, their delusion about the nature of status in general is positive reason to vote against them.

Although the blended space has many of the trappings of baseball—bases, runners, etc.—it also has many features of the target social world—birth is a means of arrival, the game can last for decades, players can be pathetically deluded. As in previous examples, the pragmatic anomaly of the blend does not prevent it from being logically coherent, fitting the schematic structure of the generic space, and thereby exporting the appropriate inferences and emotions to the target.

Notice, furthermore, that the conceptual domain corresponding to the blend is felt to be an extension (fantastic to be sure) of the game of baseball, not an extension of our social life as voters and candidates. In that sense, it functions like a source, in the traditional two-space sense, for projection to the target. This reflects, we think, an important asymmetry in the construction of blends, where the source provides landmarks and locations and the target provides trajectors and intentions. The boat race example, as we noted, displays similar asymmetry.

2. Nixon in France

We are convinced that jokes, poetry, or idioms often provide very useful data, because they make certain cognitive processes highly visible. Our next example, however, is not exotic, literary, idiomatic, or humorous, and does not seem to involve metaphor or category extension. It is an analogical counterfactual of the type studied by Fauconnier (1990, to appear):

"In France, Watergate would not have harmed Nixon."

Uncontroversially, understanding this counterfactual includes building a generic middle space that fits both *American politics* and *French politics*. It includes a leader who is elected, who is a member of a political party, and who is constrained by laws. This skeletal middle space fits the space of *American politics* and *French politics* so well and intricately that it is natural for someone to project a great deal more skeletal information from *American politics* into the generic middle space on the assumption that it will of course apply to *French politics*.

The rhetorical motive for saying, "In France, Watergate wouldn't have done Nixon any harm" is exactly to stop someone from projecting certain kinds of information to the generic middle space on the assumption that it applies to *French politics*. It is the power of the non-counterfactual generic middle space that causes the speaker to lay down a barrier.

The speaker does this by constructing a specific, counterfactual, and pragmatically anomalous blended space.

Into this middle space, the speaker has projected information associated with President Nixon and the Watergate break-in. Nixon and Watergate and so on are brought into the middle space with only skeletal properties, such as being a president who breaks laws in order to place members of a political party at a disadvantage. It may be that such information in fact in no way belongs to *French politics*, that something like Watergate has in fact never happened in *French politics*. No matter, it can be imported to the middle space from the source. Additionally, into this space is projected, from the target, French cultural perspectives on such an event. Such a space is a blend; its counterfactuality is a consequence of this blending.

This counterfactual space operates according to its own logic. In this counterfactual space, an illegal act directed with the knowledge of the elected leader against the opposing political party leader will not cause the public outrage associated with Watergate. For this central inference to take place, we must have both the nature of the event from the source and the general cultural attitudes from the target. The blended space is again not a side-show or curiosity or merely an entertaining excrescence of the projection. It is the engine of the central inferences.

Clearly, in the case of such an analogical counterfactual, the construction of meaning cannot be mistaken as an attempt to impose structure from the source onto the target. In fact, this particular analogical counterfactual is trying to do exactly the opposite. It is trying to make clear in just what areas information projected from the source cannot be imposed on the target. Moreover, its purpose is to illuminate not only the nature of the target, but also the nature of the source. The inferences are thus not one-way. They can go from the counterfactual space to both the source and the target.

Nor are the analogical connections exclusively positive. It is disanalogy rather than analogy that is the central assertion of the statement. We recognize that a scenario can be shared by *American politics* and *French politics* but that in certain key respects these spaces have negative counterparts rather than positive counterparts. The utterance sets up a blended middle space exactly for the purpose of illuminating these counterparts and their negative relation to each other. The projection in the case of "In France, Watergate would not have harmed Nixon," is thus not direct, not one-way, and not exclusively positive.

This, then, is a case demonstrating a wholesale theoretical inadequacy of the two-space model, since under the two-space model there are no processes by which the intricate meaning of "In France, Watergate would not have harmed Nixon" can be constructed.

Of course, one may object to the assertion about France. One can respond, "You are wrong, look at all the harm the Greenpeace incident did to Mitterand." This can be interpreted as asking us to change the blended middle space so that the illegal act is now general enough to include not only acts directed at an opposing political party but even acts directed against any opposing group (Greenpeace). It asserts that the space does indeed include cultural perspectives that, contrary to the previous assertion, do apply to both *American politics* and *French politics*. This, in turn, has the effect of expanding the generic middle space. This is a fundamental and general point that will arise repeatedly in our analyses: the four spaces are built up dynamically and inventively in order to achieve a conceptual projection. The four-space model dictates no fixed sequence in this construction of meaning. It additionally accords notable place to energetic and imaginative effort and revision.

We might ask, in what space does it hold that Watergate does not harm Nixon? Not in the source, or the target, or in the generic space. But if we shift to the blended space, then the claim holds. It appears that a central part of conceptual projection is knowing how to construct a blended space and how to shift to that blended space in order to do real conceptual work, with the consequence that the vestiges of that real conceptual work are often projected to the target and often even the source. But the structures of the blended space that would be impossible in the other spaces are left behind in such projection. That they are left behind does not mean that they are not indispensable to the central conceptual work.

3. Personification

Now let us consider personification. As Lakoff and Turner have analyzed, the generic-level metaphor EVENTS ARE ACTIONS is an instrument for understanding events without agents metaphorically in terms of actions by agents by projecting generic-level information from the source action to the target event. The generic-level information in a given action can be projected to a generic space and projected thence to a range of specific events. In this projection, something in the target space of the event causally related to the occurrence of the event can correspond, under projection, to the agent of the source action. The result is that something in the target that is not a person is understood by projection from something in the source that is a person. This is the general mechanism of personification, and underlies such specific personifications as the metaphoric understanding of Death as someone who takes you away, or the metaphoric understanding of Time as a thief who steals your youth.

By now, it may be apparent that the projection of the agent from the source action onto the target event cannot be direct. To be sure, information is ultimately carried from the source to the target, and indeed we do have a conception of Death as a person, of Time as a thief, of situations we are trying to master as intentional opponents, and so on. But such personifications belong to an impossible blended space that can be extraordinarily robust and dramatic—with Death the Grim Reaper whose body is a skeleton, who wears a dark cowl, and who carries a sickle, for example. No one ever confuses this blended space with the actual target space of the biological event of death. Information and inferences are projected to the target from the blended space, but the clashes that are possible only inside the blended space are not projected to the target space. We do not identify the target space and the blended space. The construction of meaning involves many spaces, simultaneously active, and connections between them. There isn't an end state in which the meaning has been deposited in the target and the other spaces have disappeared. Personification involves—in a dynamic and interconnected fashion—a source space, a generic space, a blended space, and a target space. The blended space and the target space are both active and both necessary to the construction of the meaning of the target. It would be a mistake to assume that because inferences are ultimately carried to the target that they are carried directly from the source, and equally a mistake to assume that because people do not identify the target and the blended space, and in fact regard the blended space as false, that the blended space is merely whimsical or parasitic and not essential for the construction of meaning in the target.

It would also be a mistake to assume that blended spaces are arbitrary and free play spaces. We have seen various cases in which the blended space operates according to an intricate logic of its own, as in counterfactuals, such as "If I were you, I would have done it," said by a man to a woman who declined earlier to become pregnant: the woman did not do it, the man cannot do it, but in the blended space, the blend of selves is such as to combine the man's judgment with the woman's conditions, enabling the man-woman to become pregnant in the counterfactual past of the blend.

Such intricate logics, and their intricate origins, are beyond the scope of this paper, but we can increase awareness of their existence by considering some of the phenomena of trajector and landmark in examples. In the conception of death as departure, the source has a clear trajector — the traveller — and a clear landmark — the place departed. There may be many different ways to conceive of the event of death, with various trajectors and landmarks, as when we buy the farm or God cancels our rumba tickets, but the established trajector and landmark of the source in this projection induces a trajector and landmark in the blend: blending the person leading the life with the traveller, and "here" with being alive, makes the person a trajector with respect to the landmark of being alive.

In other cases, the target induces the trajector and landmark, as in "I'm getting ahead of myself." In the source, with two runners, each runner is a trajector with respect to the landmark path, and each runner is a trajector with respect to the other as landmark: each runner inhabits various roles as trajector and landmark. But in the target, the actual event is the trajector with respect to the landmark schedule. Therefore, in the blend, the runner corresponding to the actual event must be the trajector with respect to the runner corresponding to the scheduled event. "I am

getting ahead of myself" does not mean that the scheduled event is ahead of the actual event. Here, the induction of specific trajector and landmark comes from the target.

In "George Bush was born on third base and thinks he hit a triple," there are trajectors and landmarks in both source and target (runner and bases in baseball, person and social hierarchy in life), and they are aligned, but the source trajector and landmark are more limited than the target trajector and landmark. It is possible for someone to go down the social hierarchy in life, but not possible for someone to be demoted to a prior base in baseball. So in the blend, it would be "illogical" to say that someone was born on third base but soon found himself sent down to second base and then, before long, coming up to bat for the first time.

In the boat race, the spaces of 1853 and of 1993 each have a boat as trajector and its course as a landmark. In neither space can one boat be the trajector relative to the other as landmark, since there is only one boat. In the blended space, there are two boats in a race. In an actual race, either boat can be the trajector with respect to the other: we can say either "Great America II is ahead of Northern Light" or "Northern Light is ahead of Great America II." But the status of the space of 1853 as providing the actual reference course and time is inherited in the blend, so that Northern Light must be the landmark, and we can say only "Great America II is ahead of Northern Light," not *"Northern Light is behind Great America II." By contrast, in the riddle of the Buddhist monk, neither the space of his ascent nor the space of his descent supplies the necessary reference, and so either can supply the trajector with respect to the other: either "The place is where he (ascending) meets himself (descending)" or "The place is where he (descending) meets himself (ascending)" is perfectly fine.

V. Category extension

We now discuss blends that produce temporary or permanent category extensions, of the sort we saw in the discussion of complex numbers.

Consider first examples like the following, which readers may or may not consider intuitively metaphoric:

He's a real fish.

The source space has fish and water. The more abstract generic space projected from this source space includes the information that there is an agent who moves through the water excellently. This generic space can be projected over a great range of specific target spaces, so that, for example, one could say "My native Newfoundland water dog is really a fish" or "This roving pool cleaner is a regular fish." In the case we are considering—"He's a real fish"—the agent of the generic space is projected onto a human being in the target space. The blended space has the frame structure of the generic space as well as more information from the source and the target. In the blended space, all things that move efficiently through water are fish, including real fish. In fact, in the blended space, all things that move efficiently through water are real fish. This may seem confusing, but it must be remembered that to be a real fish in the blend is not the same thing as to be a real fish in the source or the target. This again raises a general point: what is true, what is possible, what is real, what is what all depend upon the space with respect these questions are asked; the answers in general vary as we shift from space to space.

In the blended space, a new provisional category has been constructed, for local purposes. It gets its name in the usual fashion from the source, and so is called "fish." It has been considered a mystery why the word "real" would be used as a hedge to designate things that don't really belong to the category. The answer is that "real" signals a mental space shift to provisional reality. In our example, the provisional reality is constructed in the blended space. In "If he were a real spy, his name wouldn't be James Bond," the provisional reality is the counterfactual space. In "He thinks this is a real gun," the provisional reality is the space of his beliefs, which might be wrong. Finally, if someone asserts that a gun is a toy, we can reject that proposal of a provisional reality by retorting "No, it's a real gun," in which case "real" indicates shift back to real reality (which of course is only the speaker's reality).

In the blended space constructed under "He's a real fish," or "My dog is really a fish," something can be both a human being and a fish, or a dog and a fish. Consider the use of the words "real" and "actually" in these expressions. It is completely false of both source and target that the human being is a fish or that the dog is a fish. "He's a real fish" and "My native Newfoundland water dog is actually a fish" are both false with respect to the source and the target. But they are both true of the blended space, which instantiates the extended category. With respect to the blended space, the human being is indeed a real fish and the dog is actually a fish. The effect of "real" and "actual" in these cases is scopal: it indicates that the locus of truth is the blended space. If no blended space were involved in the construction of this conceptual extended category, there would be no reason for "real" and "actually" to occur in these expressions. Of course, it is important to remember that no one is confused about the status of these various spaces: that the swimmer in the blended space counts as a "real fish" never leads anyone to imagine that he counts as a "real fish" outside the blend. The category extension is strictly limited to the blend. It does not spread to other spaces. In that sense, then, it is local and temporary. It serves a certain purpose at a certain point of the conversation, but does not set up a novel conceptual scheme. In the long term, fish are still fish and dogs are dogs.

But the four space projection mechanism can also lead to more permanent category shifts. Consider now the relationship between analogical connections and category connections. Analogies place pressure upon conventional category structures. A successful analogy can, through entrenchment, earn a place in our category structures. The assault of an analogy on conventional categories is often expressed in its early stages in a noun phrase that draws its adjective from the target and its head from the source. "Same-sex marriage," for example, asks us to project the scenario of marriage onto an alternative domestic scenario. People of violently opposed ideological belief will freely agree that the generic middle space of this projection carries information that applies to both the conventional marriage scenario and the alternative domestic scenario; this information includes people living in a household, division of labor, mutual protection, financial planning done as a unit, or whatever. What is at issue is the status of this information. For someone whose conceptualization of conventional marriage has as a criterial component "heterosexual union for the sake of children," the result of constructing an understanding to account for "same-sex marriage" will be an analogical projection whose middle space does not carry this criterial component from the source. From the view of such a person, "same-sex marriage" will remain an analogical projection whose blended middle space is as conflicted as any we have seen in Dante or Shakespeare —this blended space includes married couples that are not man and wife, a strong clash with the criterial component of the Source. But in spite of this clash, and in fact in part because of this clash, the blended space captures legitimate connections between one kind of scenario and an entirely different kind of scenario.

However, someone of differing ideological viewpoint may regard the skeletal information in the generic space as the central information in the scenario of marriage. He may regard "heterosexual union for the sake of children" as non-central, even marginal, information in this source scenario. For someone holding such a view, a "same-sex marriage" is not an aggressive analogical construction; it simply refers to a subcategory of marriage in the way that "light wave" refers to a kind of wave.

The distinction is not one of professed belief. Agreeing to treat two scenarios as belonging to the same category for purposes of protection under the law or taxation or health coverage or whatever is not the same as actually having a conceptual structure in which these two scenarios belong to the same conceptual category. Liberal goodwill toward diverse scenarios, on a philosophy of live and let live, is very far from the phenomenon of recognizing light to be a wave or recognizing a working mother to be a mother or recognizing a heron to be a bird.

Were the generic information in the generic space of "same-sex marriage" to come to achieve a different status as the default information in the source, the concept and category of *marriage* would change, not by including new information but rather by shifting the information that structures the source. In that case, the generic space that links "same-sex marriage" and traditional

marriage in the analogy would come to define the category structure of "marriage" in general. To do so, of course, it would have to displace the conventional category structure of "marriage" in general. In that event, the blended space would be, instead of a locus for impossible or fantastic clash, the defining space for the new and wider category. The blend would, for many people, begin as an impossible clash, like a messenger's being nature or one person being in two places at the same time. But as the generic space is returned to structure the source and the target as the subsuming category, the blended space becomes simply a possible union, and the result is a newer category. The final result would be that the blended space would come to have the names associated with the original source, and therefore so would the original target, because it is contained in the blend.

The cultural tussle over the pressure placed by the analogy of "same-sex marriage" upon conventional category structures provides daily journalistic copy and stirs some passions. It has an equally profound but more temperate parallel in the contemporary discussions of "artificial life."[31] If our mental space of life includes as central information "development through biological evolution, carbon-based," and so on, "artificial life," which comes from the lab and is not based on carbon, will always be an analogical concept, and "artificial life" will not belong to the category "life." But computer viruses, for example, share many things with biological organisms. As the generic space that can be projected from life and imposed on artificial life grows more useful, it may become attractive to change our conception of the status of this information as carried in the source category of life. This generic space may come to constitute the central category information in the source category "life." In that case, "artificial life" will become a subcategory of life, rather than a projection from life to technological phenomena that have manifest connections to "life" that are nonetheless resisted by the category connections between "life" and its conventional subcategories.

As we have seen in all our examples, generic spaces provide abstract scenarios for source and target, while blends provide in a sense richer, more developed scenarios into which source, target, and generic, can all project.

The evidence we have considered so far shows that conceptual projection does not carry information directly from a source to a target in a manner that is one-way and positive. Although the two-space model accounts passably for certain special events of conceptual projection under reduced circumstances, it is radically inadequate in principle. A better analysis reveals the role of middle spaces, both blended and generic, and leads to the **many space** model.

VI. Generic Spaces

We imagine that the claim of the existence of generic spaces is one of our least controversial. Most researchers will acknowledge that source and target in a projection share skeletal information. Nearly all forms of traditional representation depend upon some shared skeletal information between what is represented and the representation. Charts and maps, for example, are understood as sharing geometric structure with what they represent, according to some customary mode of representation. A Mercator projection, for example, does not preserve area but does preserve angular relations, order relations, and so on.

The question is: must the generic space have an existence independent of its embedding in the source and the target. One sort of argument that it must comes from Lakoff and Turner's analysis of GENERIC IS SPECIFIC. Many proverbs are understood as having a generic reading, in the absence of any indication of a specific target. For example, we can all understand "Don't get between a dog and his bone" without having to apply it to any particular specific target, and this reading just is a generic space. So the generic space exists independent of its embedding in the source and the target. This generic space can be applied at will to an infinite range of specific targets. If all that were available were direct projection from the source to a specific target, it would take an infinite number of such individual projections to account for the range of spaces to which the proverb can be read as applying.

Generic spaces do not have a rich vocabulary associated with them in the way

source and target and therefore blended spaces do. The vocabulary of the generic space is largely shifted to it from the source, and then this vocabulary applies whenever we impose the generic space on a new target. To give just one example of this common activity: we do not have a generic word that means "whatever instrument somebody uses all the time in his chosen work, an instrument that comes to be identified with him, an instrument to which he applies effort, and with which he has an unusually close association." One such instrument for one such worker is an *axe*. The relation of the worker working with the axe, manipulating it, trying to get it to do what he wants done, has a skeletal structure, and this structure can be projected to a generic space. In music, especially jazz music, someone's instrument is called his *axe*. Of course a saxophone can be an axe, but so can a flute, a guitar, a drum set. A new projection of the generic space onto a new kind of instrument (perhaps some electronic synthesizer) does not look unusual. The application of the vocabulary to the new target is expected, because it is used whenever the generic space is applied. The existence of the generic space and its projection to a range of targets gives rise to a provisional category, which is the blended space of all axes, including axes. This is the same mechanism as we found behind "He's a real fish."

One of the clearest kinds of evidence for the existence of generic spaces as independent of their embedding in the source and the target comes from analogies where the source and the target are identical. In these cases, structure is projected from the source to the generic space, and then back to the target, which is the same as the source. But the projections from the generic space to the target are not exact inverses of the projections of the source to the generic space.

For example, consider the cartoon "Momma," in which Momma's son, Francis, prompts his friend Jack to report to "Momma" that Jack's mother, Victoria, pays all of Jack's credit card charges, so he never has to bother her for money.[32] Francis asks her, "Can't I do that, too?" Momma replies, "It's fine with me. Check with Jack's mother." Francis is attempting to project from the conceptual space of family finances onto the same domain, not onto a different type of conceptual domain. He uses one generic space, in which the parent pays for the child's credit card bills. Obviously, he means for that generic space to be projected back onto his own situation in such a way that *parent* projects to *Momma* and *child* projects to *Francis*. Momma builds a different generic space, in which Victoria pays for a generic profligate's bills. This, in turn, is also projected back to the target, with the profligate projecting onto Francis and Victoria onto Victoria. Francis is attempting to categorize Momma and himself as belonging to the ad hoc category of families where the parent pays for the child's credit card charges. Momma is resisting that ad hoc categorization, preferring to place her son into the ad hoc category of people whose credit card charges are paid for by Jack's mother.

Momma and Francis both recognize that Jack's situation can be mapped onto Francis's. Moreover, they do not disagree about the abstract structure underlying the situations—family ties, modes of payment, etc. But as it turns out, they are fighting over the construction of generic spaces—one in which mothers pay for their sons versus one in which Victoria pays for everybody. Such spaces are more than schemas extracted from the source. They have their own (partial) mental space structure with roles, values, and frames, and once established, they have a life of their own, like the commutative rings of our mathematical example, or the self-help injunction extracted from "Look before you leap."

Genericness is a relative notion. Generic spaces built up at one level may be mapped on, and blended into, each other on the basis of yet higher level generic spaces. In that sense, image schemas in the sense of Lakoff, Johnson, and Turner define generic spaces at a very high level, with extremely partial and skeletal structure with multiple projection possibilities. The same can be said of frames associated with grammatical constructions. We return to this issue in Section VI.

VII. Parameters and subschemes

The conceptual projection scheme we have outlined involves a dynamic construction of multiple spaces: source, target, and middle—both generic and blended. The spaces and the

links between them are dynamically activated and transformed or elaborated, yielding inferences and meaning that are not concentrated in one single locus. In the full-blown scheme of the four-space model, everything is maximally differentiated and activated. From this general scheme, we can derive typical subschemes by considering special or limiting cases. The parameters we consider are:

—number and type of spaces involved
—degree to which the space is active as a **working space**
—degree of blending and of abstraction
—vocabulary transfer (on line or permanent)
—category relationship between source and target, and consequently likelihood that blending will give useful category extension
—number of conceptual domains involved
—whether or not the conceptual domain involved is consciously focused upon
—the extent to which the blended space gives birth to a new conceptual domain.

Note that conceptual domains and the spaces locally built upon them are different in nature. In particular, a space can be activated without the corresponding conceptual domain being consciously focused upon.

And, as an independent important point, the existence of a blended space does not entail that it serves as the basis for an imaginary conceptual domain. When it does, we have cases like Dante's hell or Alice's wonderland with the talking Cheshire cat: an imaginary world that gives substance to the blend so that it can become a common conceptual domain in everyday life. Other blends, while serving important local cognitive functions, will have no corresponding conceptual domains. This is the case for examples discussed above such as "Pour down thy weather," "Get ahead of myself," and so on, as we will see below.

Let us consider a range of cases that differ along these particular parameters. In the notation that follows, smaller type means diminished role as a working space (S vs. S), or absence of conscious focus for a domain (D vs. D).

Case 1: [D_1, S, G] There is only one overt space S, and one overt domain under consideration: the source is also the target, and the projection is identity. For example, imagine we are talking about hiking and climbing, and saying things like: *Long climbs are tiring. It's great to reach the top after getting over all the boulders.* This is what one usually, and no doubt correctly, thinks of as literal talk. But in spite of the apparent absence of projection, notice that the conventional projections of the space are primed: even though the first climber may have spoken literally, it is straightforward for the second to reply: *Yes, it reminds me of {my career, learning flamenco, reading Heidegger, ...}.* A standard generic space G is readily available, potentially active, independently of the speaker's intent.

Case 2: [D_1, S, G] The only overt vocabulary is in one domain, but the speaker's intent is explicitly to build the generic space along with the source, by exploiting conventional projections of the source. *Look before you leap*, on a fortune cookie, is the sort of thing we have in mind here. The source is a good archetype for the generic, and the generic is provided for the purpose of further projection onto unspecified targets. We understand the statement on the fortune cookie as a general purpose instruction, not a literal remark about jumping. The resulting configuration has two working spaces, a source and a generic, but no target and therefore no blend. This is the SPECIFIC to GENERIC projection studied in Lakoff & Turner, and its conceptual dynamics consists in making the new space available for further projection.

Case 3: [D_1, D_2, S, G, T] There are two conceptual domains, and an active target space, plus weakly active source and generic spaces. This is the case where, through entrenched conventional metaphor, the source vocabulary has become directly associated with the target. For example, we may talk about Christmas being near, without strongly activating the source of physical space for which *near* is a primitive vocabulary item. This is not because *near* has changed meaning, or because the link between time and space has been lost. Rather, it is because the relevant abstract ordering structure, also found in the mediating generic space, is conventionally available for time, by virtue of the already established time-space mapping. The important point here is that physical space is the archetype of the relevant generic (mental) space (probably by virtue of

being its experiential basis), and thereby retains its leading role, i.e. potential activation, whenever this generic space is projected onto a target. As soon as less conventional vocabulary is used, this reactivation becomes apparent (*we're a stone's throw from Christmas*). There is a paradox in this form of conceptualization: it is precisely because the source structure is widely shared in thinking and talking] about the target, that the source need not be a principal working space, and that we do not consciously perceive our way of talking about time to be metaphorical; but if we were, so to speak, to cut off the target from its source, treating words like *near* as merely polysemous, there would be no account for the readily available extensions of the source to target mapping. Having the source and generic mental spaces "in the wings" (potentially active) is the key to this apparent paradox.

Case 4: [D_2, G, T] In a sense, this the twin of Case 1: only one space is set up, and only one domain is talked about, but the attention of the participants is directed implicitly to relevant generic structure. To say *My son betrayed me* is also to draw attention to the more abstract generic space in which betrayal by loved ones has culturally defined consequences, and those inferences in the generic space are likely to be projected back into the target space. This configuration opens the way for introduction of an overt source into the discourse, as in *This is like a dog biting the hand that feeds him*. The activation of an overt source will then explicitly activate the generic space G, transforming the initial configuration:

[D_2, G, T] → [D_1, D_2, S, G, T]

Case 5: [G] Specific domains are not mentioned explicitly, and only a generic space is set up. This can happen only if abstract vocabulary is available to access the generic space directly, as for instance in making the recommendation *Before acting, measure the consequences of your acts*. The activated generic space is the same as with *Look before you leap*, but it is accessed directly, and there is no source, and no target. This configuration, of course, opens the way for a transformation to a more elaborate one, with explicit source or target or both. If we are discussing the advisability of giving away all your money to your lover, that context (technically, the corresponding mental space) becomes a likely target for projection from G. Or, in the vein of Confucius and Mao Zedong, we can call up a source for G, as when we add to the generic admonition, the specific one: *...in other words, look before you leap*.

A key point is that vocabulary to access G directly is seldom straightforwardly available. It would seem that we manipulate many more generic frames than we have names for. In fact, we make up new ones up as we go along. The extraordinary power of metaphorical and analogical projection and blending lies in the access this complex process gives us to such frames, both for building generic spaces, and for projecting them back onto more specific ones.

Case 6: [D, S, G, T] There is only one conceptual domain, but distinct source, target, and generic spaces. The credit card example above is a good instance of this configuration. We set up the specific source situation of Jack charging his expenses to his own mother's particular credit card, project to a generic space in which sons charge expenses to their mother's card, and project back down to the target space in which Francis uses Momma's card. Notice that we can't get a blend in this type of case, because the counterpart categories in the two spaces are exactly the same. If the distance between spaces is extended, as suggested in our discussion, blends become available, e.g. Francis hiking away on a shopping spree through expensive malls. It is only, therefore, when we distinguish the conceptual domains, that blends are perceived and operated on. But as noted for the "same-sex marriage" and "artificial life" examples, those very same blends may put pressure on category structure that leads to merging of the initially distinct conceptual domains. When that process succeeds, we are back to the Case 6 configuration: a married couple is the counterpart of another married couple, regardless of sex and gender, not metaphorically, or by analogy, but as a simple consequence of the new category structure, like the mother-and-son counterpart pairs in the credit card example. The blend will then have disappeared into the source and target.

Notice some of the differences between the cases considered so far. In 1, there is no target, and no implied target, but a weakly active conventional generic space opens up the way for one. In 2, there is no target, but the

need for a subsequent target is strongly implied. This target could be relative to a different conceptual domain, or the same one (as when Francis pointedly describes to Momma Jack's arrangement with his mother, without adding anything else). In case 3, source and generic are weakly activated, and there is no blend, but the conceptual domains are kept sharply distinct—no supercategory of space and time is formed. In 6, on the other hand, the conceptual domains are not distinguished, but the source and target spaces are both active and distinct.

Let us move on to further combinations.

Case 7: [D_1, D_2, S, G, T] The source is weakly activated, but the generic middle space is activated along with the target. For example, in the expression, "He is seeking a higher cup of coffee," there is a generic space of *increase of a quality along a gradient* and even of categorized regions of that gradient. The vocabulary comes from the archetype source of *increase or decrease of height*], which is to say, *up and down*. But that vocabulary has been exported from the archetype source to the more abstract realm of the generic. This "bleaching" of vocabulary will happen slowly over time and will vary from individual to individual, so case seven, like case three, is a matter of degree. As Eve Sweetser has shown, diachronically the source may get lost altogether in such configurations, because the corresponding domain acquires new specialized vocabulary. Its former vocabulary shifts to the bleached senses or to specialized uses in specific targets. This historical evolution, however, takes considerable time when it happens. At any synchronic stage, many abstract vocabulary sets will remain linked to an active source. As for case three, the importance of the potential activation of the source should not be underestimated. The source continues to provide the strongest archetype for the more abstract structure, and as a result it also provides the primary basis for novel projection: the search for new conceptual structure, in generic or target spaces, will attempt to exploit the source space. We will say, for example, "This coffee is stratospheric" or "This coffee is above terrestrial orbit."

It should be clear by now that there is not a set list of cases. How many different patterns of activity over the four spaces can we distinguish? As many as we have energy to look for. Cases can be extended as spaces and domains are added or activated.

Consider the celebrated case of the analogy between taking a fortress and treating a tumor inside the body.[33] Only a laser beam of low intensity can be sent through healthy tissue without harming it, but such a beam will not kill the tumor cells. This is likened to a mined path leading to the fortress that can be traversed safely by a small number of soldiers but not a large number; the small number would be unable to take the fortress. But, just as several small groups of soldiers sent along several mined paths to arrive simultaneously at the fortress can combine to overwhelm it, so several beams of low intensity sent along several paths to arrive simultaneously at the tumor will add to kill the tumor cells. In this analogy, there is an active source, generic, and target, but an avoidance of the blend. There are two conceptual domains in conscious focus: the medical and the military. [D_1, D_2, S, G, T]

In the case of "Pour down thy weather," there are two domains in conscious focus (*nature* and *communication*), a source, a target, and a blend, but the generic space, although of course live, has very little role as a space of new conceptual work. Furthermore, even though the blend is highly active as a working space, it does not generate a corresponding conceptual domain. [D_1, D_2, S, G, B, T].

In the case of Dante's Bertran de Born, the source, target, and blend are all fully active as working spaces, the generic is weakly active as a working space, and three conceptual domains are in conscious focus: the conceptual domain of physical objects and physical separation, which underlies the source, the conceptual domain of social discord, which underlies the target, and, most interestingly, the conceptual domain of hell: there is a conceptual domain corresponding to the blend in a way that there is not in the immediately previous case. Dante's hell becomes a conceptual domain that can be relied on not only for the rest of the *Inferno* but may also spill into everyday talk, the way Sherlock Holmes has. [D_1, D_2, D_B, S, G, B, T]

In the case of "In France, Watergate would not have harmed Nixon," the generic, too, is active ("Western political system"), so that all four spaces are fully active, and two conceptual domains—the United States and France—are in

conscious focus. [D_1, D_2, S, G, B, T]

In the case of "I am getting ahead of myself," by contrast, the generic is only weakly active, while the source, target, and blend are fully active. The conceptual domain of the organization of events is in conscious focus, and the conceptual domain of movement along an intended track is not in conscious focus. [D_1, D_2, S, G, B, T] Activation as a working space is not two-valued, strong versus weak. There is a gradient of activation between strong and weak. In the case of the more idiomatic "I'm getting ahead of myself," the source space may be, compared to "I can't catch up with myself," less active, but it still must be active to supply conflicting positions to the blend.

In cases of provisional extended categorization, like "He's a real fish" and "same-sex marriage," all four spaces are active; two conceptual domains are in conscious focus. [D_1, D_2, S, G, B, T]

Now imagine the case in which the category of *marriage* has undergone a shift under the pressure of the analogical projection of "same-sex marriage." Then the original distinct conceptual domains (*traditional marriage* and *same-sex domestic arrangement*) have united into one domain. The blend is fully active as the new category, and the generic can therefore subside into weaker activation. [$D = D_1 \cup D_2$, G, B]

In the case of a projection of intentionality, such as "The nail doesn't want to go in," the source, blend, and target are active, the generic is weakly active, the domain of carpentry is in conscious focus, and the domain of contest with an intentional adversary is not in conscious focus. [D_1,D_2,S,G,B,T].

In a case of full personification, the conceptual domain with respect to which the source is constructed will be in conscious focus: in Euripides's *Alcestis*, Thanatos (the greek word for death) is a wrestler who comes to take the body of Alcestis away to Hades. Here, the conceptual domain of contest with an intentional adversary is so fully focused upon as to be dramatically prominent. In addition, the blend itself has served as the basis for a corresponding conceptual domain. [D_1, D_2, D_B, S, G, B, T]

Many different spaces can become active as the operations of projection and blending are performed over them. We began from the view that two spaces—a source and target—are not enough, and introduced two more—blend and generic—for a total of four. But blend and generic are poles of a gradient, so in fact instead of four spaces, we may have indefinitely many. Now we see that even this array of spaces—source, target, and a gradient of middle spaces—is not maximal.

It is therefore not possible to give a taxonomy of cases of projection in terms of arrays of spaces and activations. What is important instead is the nature of the operations of projection and blending, which can operate over however many spaces are active, and do so recursively and multiply.

To give just one example, consider "The stork dropped George Bush on third base with a silver spoon in his mouth." One projection has in its source space *arrival* and in its target space *birth*. The stork bringing the baby belongs to the blended space of this projection. Another projection has in its source *baseball* and in its target *life*. Being born on third base belongs to the blended space of this projection. Notice that the two blended spaces must be blended to get the inference that the stork's dropping George Bush on third base means that George Bush was born on third base. Yet a third projection has in its source *dining* and in its target *life* and especially *status in life*. The hierarchy of stations in life is understood in terms of the hierarchy of dining scenarios. Having a silver spoon in one's mouth belongs to the blended space of this projection. All three of these blended spaces are then blended into a hyper-blended space, in which being born, the stork, third base, and the silver spoon all reside. Inferences, motivations, and emotions constructed in this hyper-blended space can then all then be applied to our understanding and feelings about George Bush, his social status, and his candidacy.

Here is a recapitulation of our examples, which differ along the parameters considered:

[Note on notation. Capital D: the domain is in conscious focus. Capital S, G, B, T: the space is a working space.]

Case 1: [D_1, S, G] *Long climbs are tiring.*

Case 2: [D_1, S, G] *Look before you leap*

Case 3: [D_1, D_2, S, G, T] *Christmas is*

near

Case 4: [D_2, G, T] *My son betrayed me.*

Case 5: [G] *Before acting, think of the consequences.*

Case 6: [D, S, G, T] Momma and the credit card [same-domain analogy]

Case 7: [D_1, D_2, S, G, T] *I am seeking a higher cup of coffee.*

Case 8: [D_1, D_2, S, G, B, T] *I'm getting ahead of myself.*

Case 9: [D_1, D_2, S, G, T] Explicit analogy: fortress/tumor

Case 10: [D_1, D_2, S, G, B, T] *Pour down thy weather*

Case 11: [D_1, D_2, D_B, S, G, B, T] Dante (a conceptual domain corresponding to the blend is created)

Case 12: [D_1, D_2, S, G, B, T] Nixon in France

Case 13: [D_1, D_2, S, G, B, T] *Real fish. Same-sex marriage.*

Case 14: [$D = D_1 \cup D_2$, G, B] Marriage after category shift (G fades).

Case 15:[34] [D_1, D'_1, S, S', B_S, G, B, T] Dracula [Two source spaces are blended into B_S (vampire-repertory actors, etc.). This blend in turn serves as a source that may blend again with the target space to yield B (a middle space with actor/vampire/health professionals).

Case 16: [D_1, D_2, S, G, B, T] *The nail doesn't want to go in* [compare to Dante, personification]

Case 17: [D_1, D_2, D_3, D_4, S_1, S_2, S_3, G_1, G_2, G_3, B_1, B_2, B_3, HB (B_1, B_2, B_3), T] *The stork dropped George Bush on third base with a silver spoon in his mouth.*

Any number of spaces can be made active, and any number of projections and blendings (including higher-order projections and blendings) may operate over them. The four spaces are important as kinds of spaces a prototypical conceptual projection requires. The operations that occur across these four spaces can, however, occur across fewer or more, and they can occur multiply. We will return to this complex issue at the close of the paper, "The Concept of a Concept."

VIII. Blending and Grammar

In cognitive linguistics, as represented by Langacker's Cognitive Grammar, Talmy's conceptually-based grammar, and Fillmore's Construction Grammar, syntactic constructions are representations of generic spaces of very high order. For example, the caused motion construction studied by Goldberg (1994)

NP V NP P NP

as in *They hit the ball out of the park*, or *They laughed the poor guy out of the room*, is a representation of a minimal generic space with roles a, t, and g, and the schematic structure (icm):

a CAUSE t MOVE g

where the capital letter notation is used for convenience to refer to the appropriate schema, perhaps better described ultimately in a diagram notation like Langacker's which allows important figure/ground and profiling information to be represented.

As in any mental space, what we find here is partial structure with elements (roles) and relations between them. When syntactic constructions are filled in lexically, more specific spaces are built. Since lexical items are themselves grammatical constructions, we have what Goldberg (1994) calls a fusion of grammatical constructions. This fusion is in fact a blend of the higher-order generic spaces set up by the grammar.

One of Goldberg's many examples, *I sneezed the napkin off the table*, will show how this works. As Goldberg explains, it results from the fusion of the caused motion construction just mentioned and the construction characterized by an English lexical item, the verb *sneeze*. The first construction (caused motion) has three roles, roughly AGENT, THEME, GOAL, the second has only one role (the sneezer). The corresponding four space configuration that blends them is the following:

The blended space, as in the general case, inherits structure from both input spaces: **a** is sneezing, and **a** is causing the napkin **t** to move to **g** (off the table).

But crucially, there is more structure to the blended space than to the inputs. First, the two processes are incorporated into a single coherent process, where it is the sneezing that causes the napkin's motion. Second, not just any such process will do: a prototype is imposed on this understanding—it is the air displaced by the sneezing that moves the napkin.

So, for example, the sentence cannot be

used to describe a situation where by sneezing, I cause someone to pass me the napkin, thus moving it off the table, or a case where sneezing makes me fall on the table and on the napkin, which in turn falls off the table.

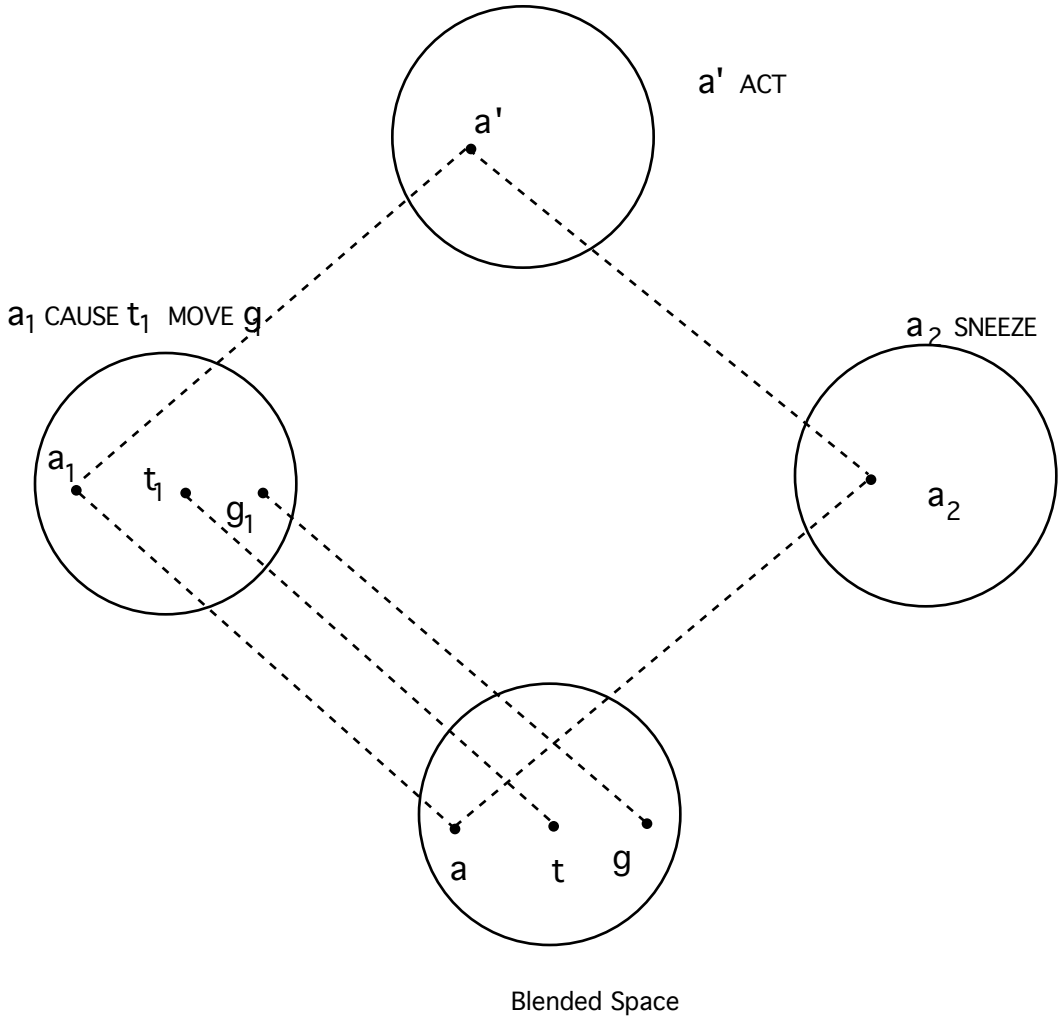

Figure 5

The same is true of a grammatically similar example like *They laughed the guy out of the room*. The highly preferred interpretation of the elaborated blend, is that "the guy" left because they were laughing at him, not because the laughing was too loud, or because he was overwhelmed with joy by the great response to his best jokes.

Goldberg (1994) notes the existence of general constraints on conflation patterns and cites relevant work by Croft (1991) and Matsumoto (1991).

What is striking in the context of the present report is the technical uniformity of blending in all cases, whether they are highly grammaticized as in the examples just reviewed, or locally constructed, as in most of our other examples. The formal treatment of the boat race example proposed in section III is directly applicable to Goldberg's fusion of grammatical constructions. This is no accident: grammar as we view it has among its functions

to enable us to combine very general frames and image schemas to produce more and more specific ones until we zero in on the mental space partial structure that fits the context at hand. And blending is a creative component of this general process. It is remarkable that in all cases, blending allows the whole to be more than the parts. The fusion of grammatical constructions is yet another example of the general properties of blending outlined in section III (Prototypes of blending and mistaken reductions): projection of partial structures and embedding into background frames generates novel structure not compositionally derivable from the inputs; the full interpretation of any sentence in a particular context is a sequence of successive blends meeting more and more specific local constraints. Grammar makes generic frames, lexical frames, and their blends available in order to guide and constrain this process. The partial structures ultimately obtained, however, are at a greater level of specificity.

Without proposing to assimilate to our analysis theoretical work by Langacker and by Fillmore and Kay, we see in their work explicit conceptions that fit in with our view of grammatical blending, as well as some support in the form of compatible specific analyses of specific grammatical constructions.

There is no question that Langacker's Cognitive Grammar and Fillmore and Kay's Construction Grammar view the combining, unification, or blending of grammatical constructions as an essential, perhaps the essential, mechanism of grammar. Langacker writes, "Grammar, I claim, is nothing more than patterns for successively combining symbolic expressions to form expressions of progressively greater complexity. These patterns take the form of constructional schemas, some of which incorporate others as components."[35] Fillmore and Kay provide an elaborate technical model of the nature of such unification of constructions.

Cognitive Grammar treats, under the name "accommodation," ways in which negotiation happens over the structures of the input spaces to arrive at appropriate structure for the blend: "It must be emphasized that syntagmatic combination involves more than the simple addition of components. A composite structure is an integrated system formed by coordinating its components in a specific, often elaborate manner. In fact it often has properties that go beyond what one might expect from its components alone. . . . For example, the meaning of *run* as applied to humans must be adjusted in certain respects when extended to four-legged animals."[36] [37]

The metaphor of "projection" in describing the general cognitive phenomenon of blending has been used by Fillmore and Kay to characterize the unification of constructions. They speak of the semantics of the sentence as arising by a chain of projections from the lexical verb to the Verb Phrase to the sentence. More technically, in our terms, the particular lexical verb construction and the higher-order Verb Phrase Construction, as input spaces, project to a blended space which is not identical to either; this space and the Subject-Predicate Construction, as inputs, project to yet another, hyper-blended space, the full construction, which is identical to none of its inputs; and there is projection of semantics from the space of the lexical verb to the first blend, and from there to the hyper-blend.

We know, of course, that grammar also gives precise indications as to the dynamic space building and space linking that occurs as discourse unfolds: tenses, moods, copulas and some verbs , adverbials and conjunctions, are some of the devices that serve this purpose.[38] This suggests a global view of language as guiding the space construction process through space building, space blending, and projection of generic spaces. The XYZ metaphors analyzed in Turner (1991) give a powerful illustration of this type of process. The syntactic construction is deceptively simple:

NP	be	NP	of	NP
X		Y		Z

as in *Vanity is the quicksand of reason* . This simple construction has a complex semantic/pragmatic interpretation: construct a metaphorical mapping such that X in the target is the counterpart of Y in the source, and Z in the target is the counterpart of a fourth element W in the source, and use this construction to project appropriate inferences into the target. In the example, W is the traveller, who should reach a goal; as quicksand destroys the traveller, vanity destroys reason. The

grammatical information is minimal and highly abstract: find a mapping and a missing element; the rest is left to the cognitive competence of the user. Notice that an implicit generic space must also be constructed. And interestingly, syntactic concatenation can activate a blended space, as in Turner's example *Language is fossil poetry*. With *language* as X, and *poetry* as Z, the modifier *fossil* identifies Y, a source counterpart for *language* , and a missing W ('living organism') completes the mapping. But this time a blended notion of something which is simultaneously language, poetry and fossil has been constructed: in the blended space, poetry IS a living organism that can evolve into a fossil (language). As in our other examples, this is achieved through a local category extension in the blended space, where more things count as organisms and fossils than in the source. Rather strikingly, then, the apparently innocuous syntactic construction 'NP be N NP' exhibits all the features of meaning construction we have been talking about: it triggers a multi-space configuration, with source, target, generic, and blend, and it leads to the introduction of elements and structures (the living organism and its evolution) for which no explicit vocabulary appears.

IX. The concept of a concept

Conceptual projection involves the dynamic construction of source, target, generic, and blended spaces, multiply linked. In this scheme, inferences and meaning are not bounded in a single conceptual locus. Meaning constructed by conceptual projection is not a mental object but rather a complex operation of binding, linking, blending, and integration over multiple spaces. This meaning never "settles down" into one residence.

This view runs counter to everyday notions. We customarily think of concepts as little packets of meaning whose boundaries circumscribe our knowledge of them. They seem to ask for labels: *marriage, birth, death, force, electricity, time, tomorrow*. When we view concepts in this way, meaning we recognize as distributed looks secondary, marginal, or parasitic. A blended space must look like an exotic mental event, put together in exceptional ways.

The variety and the diversity of our examples suggest, on the contrary, that the dynamism, distribution, projection, and integration we see in blending are central and pervasive. But how central are they? We will suggest that they are standard for even the most basic thinking.

As we have seen in the analogy between the tumor and the fortress, the provisional categorization in "real fish," the attempt to extend a category with "same-sex marriage" and "artificial life," and so on, conceptualizations are not static and not permanent. Different projections, category assignments, and space configurations are activated locally in given situations. The ability to project is a central component of the ability to conceive.

Consider something that we think of as a basic everyday concept, like *house*. It seems to us static and permanent, stable and unitary, cohesive and self-contained. It is our suggestion that there are no such concepts, that this folk notion of *concept*, which enjoys considerable influence, should be dispensed with. We have no concept *house*, but we do have a word, "house," and being able to use that word—like the words "fish," "marriage," "life"—requires the ability to construct, link, and activate the appropriate space configurations, frames, and cognitive models. We may not perceive this activation for a word like "house," exactly because the array and links activated for "house" are so often the same, again and again. But a great range of spaces is activated over and over again for house: shelter from the elements, bounded interiors, security from intruders, financial investment, artifacts, aesthetic design, instrumentality for inhabitants, social residence, partitioning of activities into different physical spaces, rental property, and on and on indefinitely. Any single use of the word "house" for any particular purpose will involve construction of meaning as an operation of selective integration over these various distributed spaces.

But what does it mean to say that a great range of spaces can be activated? Let us consider an example: "Italian is the daughter of Latin." The source space contains very little overtly; it has a parent and a daughter. The target space also contains very little overtly; it has Italian and Latin. Ultimately, the projection

will connect parent in the source to Latin in the target, and daughter in the source to Italian in the target. The result is a double personification. But this hardly accounts for the meaning we construct on hearing this phrase. One normal interpretation might be paraphrased: "Latin existed first, and Italian came into existence second by deriving causally from Latin." It may seem as if the material needed for constructing this meaning is intrinsically in the source space of parent-child and the target space of Latin-Italian. But it isn't. It must be imported to the source and the target. It can be imported by activating other spaces and projecting those spaces to the skeletal source and target. Onto the skeletal target, we may project a space concerning languages, according to which some languages derive from others, and in particular, Italian derives diachronically from Latin; and onto the skeletal source of parent and child, we may project a particular space concerning progeneration, according to which a parent bears a causal and sequential relation to the child: the parent produces the child; the parent precedes the child in the sequence.

If the source and the target are elaborated in this way, they come to share a causal and sequential structure. This causal and sequential structure will then be available to constitute the generic middle space that underlies the interpretation "Latin precedes and results in Italian."

But now consider the following fact: suppose the subject of our conversation is the program of studying foreign languages in a particular high school, and we are making the point that nearly all the students of Latin take the subject up because they first got interested in it when they were taking the Italian courses. We might say, "Italian is the mother of Latin." Does this contradict the earlier statement that "Italian is the daughter of Latin"? Clearly not. In this case, the target has been elaborated in a different way: what has been projected onto the target is the sequential order in which languages are learned. In the space of learning languages, the sequential order of Latin and Italian is the reverse of their sequential order in the space of the history of languages. Under projection from the space of learning languages, Italian is the mother of Latin, while under the projection from the space of the history of languages, Italian is the daughter of Latin. In general, there is no fixed structure of the target space that the source has to match, because the target space has different structure under different projections.

What about the source? Suppose we are discussing the relative aesthetic qualities of Italian and Latin. Suppose we are remarking the precision of Latin in Vergil or Propertius or Horace and comparing it to what seem florid and ostentatious qualities of Italian in Boccaccio or Tasso. Our companion remarks, "Well, Italian is the daughter of Latin, and her ostentatious beauty is really a rebellion against her mother's austerity." Here, the projection to the source of mother and daughter concerns not progeneration but rather social relations between mothers and daughters, for example, adolescent rebellion over appearance and behavior. Under this projection to the source, Italian is still the daughter of Latin, but in an entirely different sense.

In all these examples, the conceptual domains—kinship and languages—are the same, but the spaces selected for projection to source and target are different. The resulting configurations—source space, middle spaces, target space—are different in each case.

Notes

[1]Mark Turner gratefully acknowledges the support of the John Simon Guggenheim Memorial Foundation and the assistance of the department of linguistics, the department of cognitive science, and the Center for Research in Language at UCSD. We are grateful for comments from Adele Goldberg, Todd Oakley, Seana Coulson, and Nili Mandelblit.

[2] We return throughout the paper, and especially in sections IV and V, to the important difference between general conceptual domains and particular mental spaces set up on the basis of such domains, and used for analogical, metaphorical, and other conceptual projection purposes.

[3] Arthur Koestler, *The Act of Creation* (NY: Macmillan, 1964); see "Concretization and Symbolization," pages 182-184.

[4] Ziva Kunda, Dale T. Miller, and Theresa Clare, "Combining social concepts: The role of causal reasoning," *Cognitive Science* 14: 551-577 (1990).

[5] See the analyses in sections II.9, V, and VIII below.

[6] *Inferno*, canto 28, lines 139-142.

[7] In studies of analogy, this process is often called schema induction. (See Gick and Holyoak (1983)). See also Langacker (1991) on the induction of abstract schemas in such mappings. In Sec. III, we show that such schemas build up higher level "generic" middle spaces.

[8] A complete analysis of the Bertran de Born example is more complex than indicated in the text, because it additionally involves a metonymy between sinner and sin. In the blend, the source counterparts of sin and sinner (the broken object and the object breaker) are projected onto the same counterpart: the man with the detached head). So, in fact we have a blend not just of the metaphorical source and target, but also of the metonymic trigger and target.

[9] I.e. it can't have a true projection in a world without ghost-ships.

[10] It is therefore not the case that blends are constructed in general for the sake of producing something exotic, contradictory, or bizarre. This is easy to see for counterfactuals (which, as we shall see, are also blends): one may construct a counterfactual, for the purpose of showing an impossibility, as in *reductio ad absurdum* proofs in mathematics, or one may construct a counterfactual to export other kinds of inferences. For instance, in the boat race context, one could say: *If the two ships had been racing, Great America would now be 4.5 days ahead of Northern Light*. As before, the pragmatic impossibility of the boats' traveling together is now irrelevant. The exported inference is directed at the speed of the boats, and the likelihood of breaking the record.

It should also be added that the fact that a feature of the blend is not used for inference transfer does not mean it couldn't be used. One can imagine using ironically the expression *You're 4.5 days ahead of the ghost of Northern Light* to criticize sailors who try to break records established by completely different vessels—a high-tech racing catamaran versus a huge wooden clipper ship fully laden. For that understanding, the pragmatic clash in the blend would be relevant.

[11] A fantastic blended conceptual domain does not necessarily produce pragmatic clashes that would be transferred inferentially to the target or the source. Cf. also the Buddhist monk example below.

[12] Because of some underspecification of the blending, the example has another interesting feature. The preferred reading seems to be that *4.5 days* is the difference between the time N it took *Great America II* to reach its current position (point A), and the time N+4.5 it took *Northern Light* back in 1853 to reach point A. Under that interpretation, the boats' positions in the initial spaces (*1853, 1993*), and in the blend, are their positions (point A for GA, and point B for NL) after N days, which is the time on the clock in the *1993* space at the time of writing. But then, the 4.5 days are a time in the *1853* space—the time it took NL to get from B to A. Another conceivable reading has this reversed, taking the time on the clock in the *1853* space and the 4.5 days in the current *1993* space. Under that interpretation, *Northern Light* got to point B' after N days, *Great America II* got to point A after N days, and it took *Great America II* 4.5 days to get from B' to A.

Other readings may be available. Suppose Great America II is following a different course from its illustrious predecessor's, so that positions on the two journeys cannot be directly compared. But suppose also, that experts can estimate, given current positions, how long it "should" take *Great America II* to reach Boston. Then, the example sentence could be interpreted as saying that given its current position, *Great America II* should end up making the run to Boston in 76 days, 8 hours minus 4.5 days, i.e. in 71 days, 20 hours. This time, in the blended space of *1853* and the experts' hypothetical *1993* space, *Great America II* reaches Boston 4.5 days ahead of Northern Light.

All these readings involve blended spaces. The blended space is different in each case, and its structure accounts for the corresponding difference of truth values in the interpretations. This is a nice point: far from being fuzzy and fantastic, the blends allow a totally precise quantified evaluation of the truth conditions they impose on the actual world.

[13] A version of this riddle appears in Arthur Koestler, *The Act of Creation* (NY: Macmillan, 1964) pages 183-189; Koestler attributes the invention of the riddle to Carl Dunker.

[14] E.g. Answering machines that say "I'm not here."

[15] There are other idioms in which unnatural division of a person signifies error. In English, we would indicate that we have neglected to pay attention to the sequence of events by saying that we "lost track of time," but in French, we would say that we have "forgotten ourselves," as in "Elles s'oublièrent à causer" ("They forgot themselves while chatting.") This phrase does not mean that they stopped paying attention to themselves, but rather that in paying attention to the actual sequence of events, they forgot about the scheduled sequence of events. In the blended space, there is a split. One half of the split is their imaginary "double," who dutifully performs the scheduled events in the scheduled order. It is this imaginary "double" that they have forgotten while paying attention to their actual selves.

It is not only imagined scheduling that is normative. Imagined etiquette is also normative. Just as, in a blended space, a non-actual imaginary double can perform properly according to schedule, so a non-actual imaginary double can perform properly according to etiquette. We can say in English, "I forgot myself utterly and said something positively beastly to John." The idiom is identical in French: "Il s'oublia jusqu'à la frapper."

[16] Moser and Hofstadter (ms.) bring up interesting examples of contamination in action, and capture errors (Norman 1988), which blend frames in an apparently incongruous way. Although incongruity is one feature that highlights a blend and makes us consciously aware of it, as in the *Inferno* example, our evidence suggests it's only an incidental feature, not a necessary or defining one.

[17] Blends are thus to be distinguished from 'blurs', where frames are simultaneously evoked and superimposed. Moser and Hofstadter provide nice examples of both, but do not make a sharp distinction. They cite the case, for example, of a recently engaged middle-aged man talking about his new house:

> "I used to think there was a perfect *house*, but after looking around for a long time, I've come to realize that no house is perfect, and I'm willing to settle for this one."

His friends understand that he is 'talking' (thinking?) about selection of *mates* as much as he is about choosing houses. This analogically connected double frame does not build up a blended space, however.

[18] See Fauconnier and Turner (in preparation).

[19] Also called absolute values.

[20] See Kline (1980).

[21] Of course, this source domain has a conceptual history of its own. We argue elsewhere that in fact it is itself the product of a non-trivial conceptual blend.

[22] For example, if $(\rho,\theta) = a + bi$ and

$(\rho',\theta') = a' + b'i$, then

$(\rho,\theta) \times (\rho', \theta') = (\rho\rho', \theta+\theta') =$

$(a+bi) \times (a'+b'i) = aa'-bb' + (a'b+ab')i$

[23] The generic space is not consciously conceptualized as an abstract domain when the full-blown concept of complex number gets formed. It becomes a conceptual domain in its

own right when mathematicians later study it and name it.

[24] Douglas Hofstadter (personal communication) reports his discovery of how to "make" new geometries by blending. Taking projective geometry as a generic, and Euclidean as a source, he obtained a dual target for the latter, and a new "contrajective" geometry as a blend of the Euclidean and the Euclidual.

[25] In giving the response "four" to the question "If the tail was called a leg, how many legs would this cat have?"

[26] Wonderful examples of cartoon blends (in particular in Gary Larson and W.B. Park) have been studied insightfully by D. Hofstadter and his collaborators. See Hofstadter et al., 1989.

[27] This was a description of George Bush, incumbent president and presidential candidate in 1992, provided in a speech by rival candidate Tom Harkin.

[28] Smead Jolley making three errors on a single play, or Jimmy St. Vrain running the bases in the wrong direction.

[29] Thanks to Brian Ladner for pointing out this new joke built on the first.

[30] Remarkably, in this example, the additional structure is also detectable in the prototype schema of the generic space: it is prototypically good to advance, and not to advance reflects unfavorably on the agent. It's almost an accident that this prototypical feature does not project directly to the source and target: an accident due to the rules of baseball for the source (runners are not masters of their destiny); an accident due to Bush's eminent position in the target: he has already reached the top, and so can hardly be blamed directly for not advancing.

[31] See John Markoff, "Beyond Artificial Intelligence, a Search for Artificial Life," *New York Times*, 25 February 1990, "Week in Review" section, page 5.

[32] See Fauconnier (to appear).

[33] M. L. Gick and K. J. Holyoak (1983) "Schema induction and analogical transfer," *Cognitive Psychology*, 15, 1-38; Dedre Gentner, "Structure mapping: A theoretical framework" *Cognitive Science*, volume 7 (1983), pages 155-170 ; Dedre Gentner, "The mechanisms of analogical learning" in S. Vosniadou and A. Ortony, editors, *Similarity and analogical reasoning* (New York: Cambridge University Press, 1989); Felice Orlich and Jean Mandler, "Analogical Transfer: The Roles of Schema Abstraction and Awareness," UCSD manuscript.

[34] See Fauconnier and Turner (in preparation).

[35] Ronald W. Langacker, "An Overview of Cognitive Grammar," *Topics in Cognitive Linguistics*, ed Brygida Rudzka-Ostyn (Amsterdam and Philadelphia: John Benjamins Publishing Company, 1988), pages 1-48. Published as volume 50 of the series *Current Issues in Linguistic Theory.*

[36] Ronald W. Langacker, *Foundations of Cognitive Grammar* volume 1: *Theoretical Prerequisites* (Stanford: Stanford University Press, 1987), pages 75-76.

[37] For syntactic example of such accommodation, we point to any of the analyses in Construction Grammar, even of something as simple as "the mud." The basic idea of the syntactic attribute **maximality** is that a maximal constituent can play a "major role" in a sentence, such as subject or direct object. The lexical construction for *mud* has syntax in which the value of **max** is unspecified; the right daughter of the Determination Construction has syntax in which the value of **max** is negative; the Determination Construction itself has (external) syntax in which the value of **max** is positive. Just as in the example of blending the lexical verb construction *sneeze* with the more abstract caused-motion construction, the blend of *mud* with the Determination Construction draws its structure from different input constructions. In blending *mud* with the right daughter of the Determination Construction, the semantics (boundedness, configuration, number) comes from *mud*, some of the syntax comes equally from *mud* and the right daughter (improper noun), but the value of the syntactic attribute **max** comes from the right daughter. And this blend of *mud* with the right daughter in turn blends with the larger Determination Construction to produce an external syntax for the final construction whose value for **max** is positive—that is, not taken from *mud*, from the right daughter, or from the blend of *mud* and the right daughter.

In general, "unification" of grammatical constructions in Construction Grammar requires negotiation between the input constructions as to the structure of the blend.

[38] Fujii 1992, Sweetser (to appear), Mejias-Bikandi 1993, Cutrer (1994).

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