Frame Blending

Institute Professor and Professor of Cognitive Science

Case Western Reserve University

To be published in *Frames, Corpora, and Knowledge Representation*, edited by Rema Rossini Favretti. Bologna: Bononia University Press, 2008. 13-32.

Conceptual Integration

Conceptual integration, also called "blending," is a *basic mental operation* that works on *conceptual arrays* to produce *conceptual integration networks*. Certain conceptual arrays provide *inputs* to the network. Selective projection from the input conceptual arrays and from the relations between them carries elements and relations to a *blended conceptual array* that often has *emergent structure* of its own. This blended conceptual array is often referred to as "the blend." The blend typically does not obliterate the inputs. It provides a human-scale, integrated scenario that serves as a conceptual anchor for the conceptual integration network.

This thumbnail sketch omits complexities. Conceptual integration always has as its goal the creation of conceptual integration networks, but any of the arrays in the network can have provided the original basis for the network's creation; work can be done on any of the participant arrays during the construction of the network; there can be multiple inputs and successive and iterated blends; there can be, and usually are, hyper-blends that have blends as inputs; a conceptual array can be decompressed in interesting ways so as to

create a network in which the original conceptual array ultimately counts as a blend; emergent structure should be thought of as arising not only or even chiefly in the blend, but rather in the entire network; and so on.

Conceptual Integration, Frames, and Frame Blending

(Fauconnier and Turner, 2002) analyze the way in which conceptual integration can blend frames. *Frame blending is a basic mental operation for cognitively modern human beings and a basic topic for linguistics, philosophy, and economics.*

When frames are blended, the operation is called *double-scope conceptual integration* and the result is called a *double-scope integration network*. Double-scope integration is the most advanced form of conceptual integration. To give a more exact definition, double-scope integration is the blending of input frames into a blended frame whose organizing frame-level structure includes at least some organizing structure from each of the two input frames that is not shared by the other. Often but not always, the input frames to the double-scope integration network are incompatible.

Double-scope integration networks, which achieve frame blending, are the topic of this paper. But first I mention other kinds of conceptual integration network that involve frames.

Simplex networks. A *simplex* network is a conceptual integration network in which one input space has a familiar abstract frame (such as the kinship frame *parent-ego*) that is designed to embrace certain kinds of values, and the other input space is a relatively specific situation presenting just such values. For example, if we wish to say that two people—John and James—stand in a certain kin relation, we say something like "John is the father of James." The *parent-ego*

frame of kin relation is in one input space; the other input space has John and James. In the blended space, John is the father of James, and there is a new role *father of James*.

Mirror networks. In a *mirror network*, two input spaces share topology given by an organizing frame, and the blend inherits that organizing frame. A standard example of a *mirror network* is "Regatta." In "Regatta," a freight-laden clipper ship, *Northern Light*, set the record for an ocean voyage from San Francisco to Boston in 1853 and a modern catamaran named *Great American II* is in the process of making that run in 1993. A sailing magazine named *Latitude 38* reports, "As we went to press, Rich Wilson and Bill Biewenga [the crew of the catamaran] were barely maintaining a 4.5 day lead over the ghost of the clipper *Northern Light*." Here, the two inputs—we label them "1853" and "1993"—have the organizing frame *boat making an ocean voyage*. The blend has an extension of that frame: *two boats making ocean voyages and moreover racing as they make them.*

Single-scope networks. A conceptual integration network is *single-scope* if the inputs have different organizing frames and only one of those frames is projected to organize the blend. For example, a cartoon of presidential candidates having a shoot-out evokes a single-scope network. The frame *gunslingers at a shoot-out* is projected from one of the inputs to organize the blend. As long as the shoot-out frame is the only one used to organize the blend, then the network is single-scope. But if frame-level organizing structure from the other input is later on projected to the blend so as to play a role in the organizing frame of the blend, the network ceases to be single-scope.

Double-scope networks. A conceptual integration network is *double-scope* if different input frames are blended into a blended frame whose organizing frame-level structure includes at least some organizing structure from each of the two input frames that is not shared by the other. (Single-scope networks sit atop

a very slippery slope and slide easily into double-scope structure.) Double-scope networks involve frame blending.

The Foreign Aid Rice Bowl

Consider the example, discussed in (Fauconnier & Turner 2002), in which someone says of a politician's vetoing a foreign aid bill that "he's snatching the rice bowl out of the child's hands." In the diffuse network having to do with the foreign aid bill, there are very many agents, a complex network of causality, and many actions serially and in parallel along paths that in principle lead from the political resolution of the foreign aid bill to differences (some no doubt hard to predict) in the provision of various kinds of aid, some of it consequential for the production, storage, transportation, procurement, growth, irrigation, financing, fertilizing, distribution, and whatnot of food. Some of these differences presumably connect to actual consumption of food by various people. Alongside this diffuse network, we are asked to place a crisp, human-scale frame in which one agent is actually physically snatching a bowl of rice away from one child.

The "snatching" frame carries direct emotional reaction. It is a human-scale scene, in a human-scale expanse of time and space, with a single actor, a single action, a single victim, all in a single visual field. Many parts of this "snatching" frame are projected to the blend, especially the tightly-packed, human-scale, direct causation of unjustifiable harm to the victim. But many things are not projected from the "snatching" frame. Let us consider some of them. In the "snatching" frame, the child could attack, call for help, question, or publicly accuse; the adult would be obliged to do something with the rice and the bowl, such as eat the rice, throw out the bowl, give the rice to someone else,

and so on; and the adult would hear and see the child, who would have a recognizable and distinct individual identity. None of this structure projects to the blend.

Many elements and relations are projected to the blend from the diffuse network framed by political action. In the political input, the politician has personal impunity and power and is subject to only his own local conditions. These conditions of the politician are projected to the blend, where, interestingly, his being subject to only the local conditions that obtain in the input results in the emergent structure of his being *invulnerable* to local conditions where the child is located. For example, in the blend, no do-gooder who is merely a bystander in the "snatching" frame can punch the politician in the head and hand the rice bowl back to the screaming child. But if, in the political frame, Congress overrides the veto, then Congress could be blended with the do-gooding bystander and, in the blend, the bystander/Congress could punch the politician and reverse the politician's action.

It is easy to pick out clashes between input frames in this example. In the political frame, no possession is actively taken away, but in the "snatching" frame, the child's rightful possession is taken away. The action of *taking away* is projected to the blend from the "snatching" frame. In the political frame, the president does not personally receive the foreign aid that would have been distributed had he not vetoed the bill, but in the "snatching" frame, the rice bowl initially held by the child is now held by the adult. The politician's not receiving any of the aid is projected to the blend from the political action frame. In the blend, he does not himself enjoy the rice (or have any motivation to enjoy the rice) that he has taken away.

Emergent structure in the blend is clear: in the blend it is possible to *take* something without *having* it as a result. Human beings have no difficulty

constructing the emergent structure that comes from double-scope integration. In this case, they understand that the blend, however rich, is meant as a human-scale anchor for the entire conceptual network, not necessarily as something that is to be reified. The example of the Foreign Aid Rice Bowl is pyrotechnic, but similar emergent structure can be found in everyday blends. For example, someone who does not have a headache can, in the blend, *give* you a headache. In such a blend, someone can *give* what he does not *have*, just as, conversely, the snatching politician can *take* but not then *have*.

It is also easy to see that the "snatching politician" integration is for the most part not metaphoric. Throughout, the politician remains a politician and does not become a snake, a pig, or some even more unsavory animal. The rice is the rice; the food is the food; the child is the child.

Vanity Is The Quicksand Of Reason

Double-scope blends can be highly metaphoric. Consider "Vanity is the quicksand of reason," which prompts for a double-scope frame blend. The projections from the organizing frame of the *quicksand* input are obvious: the blend inherits a traveler, a path traveled, distance traveled, motion, a potential trap that arrests motion, and so on. But frame-level projections come from the *reason* input, as well. Consider first intentional structure: a reasoner can be unaware of his failure even when his failure is, objectively, thorough. This potential lack of awareness is projected to the blend, in which the traveler/reason can be unaware of being in quicksand. In the blend, the traveler/reason can be deluded, viewing himself as perfectly rational, oblivious to the fact that he has in fact long been trapped. This intentional structure conflicts with the frame of the *quicksand* input, in which it is unconventional to be

ignorant that one is in quicksand, unconventional to think that one is traveling normally when one's torso is sinking.

Next, consider causal structure from the *reason* input: reasoning can lead to vanity about one's reasoning, which can lead in turn to diminished reason. This structure projects to help organize the blend: in the blend, quicksand/vanity exists for the reasoner but not for the person whose mind is merely wandering, even though they are both travelers. This causal structure conflicts with the organizing frame of the *quicksand* example, in which traveling is not causally related to the existence of quicksand, and in which all travelers in the desert face the same dangers. Additionally, in the *reason* input, the more you have achieved through reason, the more justification you have for being vain; in the blend, the more you have achieved through reason, the more vulnerable you are to being caught in quicksand. But this structure conflicts with the *quicksand* input, where it is novice travelers who should be most vulnerable to quicksand.

Now consider the structure of roles in the *reason* input: there is only one reasoning capacity. The blend follows this structure: the traveler is solitary, or, if not solitary, then accompanied by *unequal* companions (character, memory, etc.). This structure of roles conflicts with the *quicksand* input, where there may be several equal travelers.

Now consider modal structure from the *reason* input: the reasoner does not have the choice of foregoing reasoning while remaining intellectually sophisticated. This projects to the blend: the traveler cannot choose to forego traveling in deserts; traveling/reasoning always presents a certain danger; that danger is in the desert exclusively; so the traveler/reasoner must deal with the desert. This structure conflicts with the *quicksand* input, in which the traveler can avoid the danger by declining to travel through deserts (which can be viewed as uninteresting in any event)—there are many wonderful places one can visit as a

sophisticated traveler; one can experience a lifetime of interesting travel without entering a desert; and so on.

In summary, although the frame-level projections to the blend from the *quicksand* input are obvious, there are frame-level projections of intentional, causal, modal, and role structure from the *reason* input to help organize the blend, and these projections conflict with the frame of the *quicksand* input. The frame blend is in these ways double-scope.

Conceptual Integration Networks for RISK

Charles Fillmore and Beryl Atkins (1992) provide an analysis of the frame for RISK. Although their article precedes the origin of the theory of conceptual integration and they accordingly do not use terms such as "frame blend," I propose that their analysis gives evidence of frame blending in an area of human experience that is simultaneously of interest in philosophy, economics, and linguistics.

As a first step, Fillmore and Atkins show that RISK integrates CHANCE and HARM. CHANCE comes into play whenever some conceptual structure is less than certain and there are alternatives. We can say, "It will probably rain tomorrow, but there is a chance it will be sunny," or "Bill was probably born in 1952, but there is a chance he was born in 1953," and so on.

HARM comes into play whenever there is an unwelcome development. I note that HARM automatically involves an evaluator. It may seem as if the burning of a tree or crushing of a stone automatically involves HARM, independent of intentional evaluators, but that is only because we slip such evaluators invisibly into the understanding. There is nothing in the tree or the stone that evaluates this transformation negatively. As an example, consider the

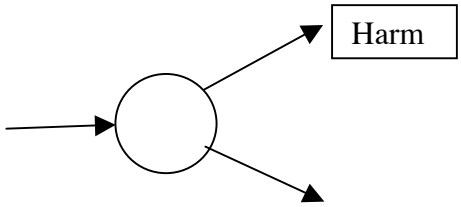
perfect cutting of a jewel, so as to display its beauty, that is in fact owned by someone who, for sentimental reasons, absolutely did not want it cut. Then the cutting of the jewel does involve HARM. The victim is not the jewel, but the owner.

HARM and CHANCE are independent. If the possibilities for tomorrow's temperature are 12 and 13 degrees Centigrade, and we do not care, then our understanding of tomorrow's temperature includes CHANCE but not HARM. And if it is absolutely certain that because of the Alternative Minimum Tax, I must pay a huge tax on April 15, and I view this development as unwelcome, then there is HARM but not CHANCE in my understanding of my tax burden on that date. As Fillmore and Atkins discuss, when HARM and CHANCE are integrated, the result is a frame for RISK. In the RISK frame, when one of the possibilities carries HARM, or, I would add, when one or more of the possibilities carries greater harm than another, then there is RISK that the more harmful possibility will occur. Clearly, in the blend, the frame-level structure for RISK gets some of its frame structure from CHANCE but not HARM and some from HARM but not CHANCE. This is a frame blend.

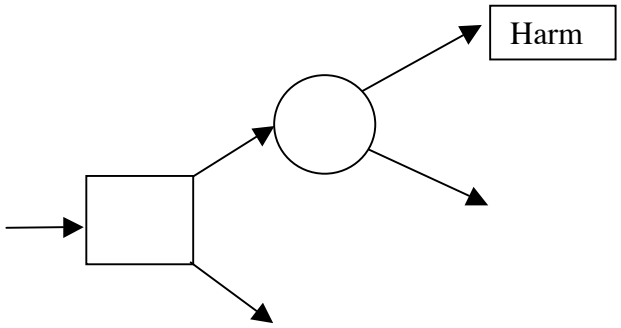
I would add to this analysis that there is emergent structure in the blend, namely, *hope*. HARM brings the evaluator into the blend. But since HARM does not itself carry CHANCE, it does not carry hope. And since CHANCE does not carry HARM, or indeed any preference, it does not carry hope. But when CHANCE and HARM blend, and the evaluator faces the chance of relative harm, it is almost automatic for us to "run the blend," i.e. conduct the simulation in which developments occur, and to construct an evaluator who hopes for the least harmful (and fears the most harmful) outcome. This is crucial emergent structure.

As Fillmore and Atkins show, if one also blends this basic RISK frame with the frame for CHOICE, the result is another variant of the RISK frame, or, if one likes, a further optional complexification of the RISK frame, so as to include the possibility of someone's *choosing* to take an action that creates the situation in which there is a possibility (but not a certainty) of the relatively unwelcome outcome. Fillmore and Atkins illustrate the difference as *running a risk* versus *taking a risk.* Suppose a doctor informs us that we carry a certain gene, and consequently run the risk of developing a genetic disease. There is no suggestion that we have chosen to take an action or actions that led to the situation of the possibility of harm. That is *running a risk*. But *taking a risk* is a matter of choosing to take an action that creates the possibility of harm.

All situations of taking a risk, Fillmore and Atkins observe, involve running a risk. Running a risk can be seen as a proper subset of taking a risk. Using decision-theory coding, where the circles represent *chance* and the squares represent *choice*, Fillmore and Atkins offer the following representations of risk-running versus risk-taking:



Risk-running



Risk-taking

This additional blending of CHOICE into the network results in additional emergent structure in the blend, as follows. Human beings can become excited, even thrilled, at being in a situation of risk. Of course, they often choose to perform an act that results in a situation that carries the possibility of *harm* exactly because they hope for an alternative outcome, of *benefit*. But they can also act to create the situation not because they have hope of benefit but because they *like the excitement*. Thrill-seeking is not abnormal. Consider, for example, someone who routinely bets with a friend and who believes that over time the gains and losses will balance out. He is not seeking benefit in the form of winnings. Instead, he is seeking the thrill of uncertainty. This is an emergent possibility in the blend of CHOICE with RISK.

Fillmore and Atkins additionally note the possibility of further inputs. They discuss their happening upon certain sentences whose meaning involved the work "risk" but "seemed to involve more elements than what we could find in the otherwise fairly well-motivated RISK frame." (96). The evidence lies in what they call "derivative syntax" but which I would call blended syntax. Blended syntax results from selective projection from various inputs: when two related frames are blended to conceive of a situation, the grammar associated with those frames can project to the blend and be blended there, to provide means of expressing the blend. As Fillmore and Atkins observe,

> [W]hen "smearing" something on some surface results in covering that surface, the verb SMEAR acquires the syntax of COVER, as in "I smeared the wall with mud," and when loading hay onto the truck results in filling the truck, LOAD can take on the syntax of FILL, as in "I loaded the truck with hay." (97)

Fillmore and Atkins make similar observations for RISK, as follows. It can "acquire" the syntax for POSSIBIILITY, "as in 'there is a slight risk/danger/possibility that such-and-such will happen'." (97). It can "acquire" the syntax for EXPOSE, "and we find in the clause a secondary complement appropriate to EXPOSE, namely the TO-phrase representing the threat against which something is unprotected" as in "We would have to reinforce it before risking it *to* the waves" (97). It can "acquire" the syntax for INVESTING "in" something, as in "Roosevelt risked more than $50,000 of his patrimony *in* ranch lands in Dakota Territory" (98). It can "acquire" the syntax for BET, WAGER, and GAMBLE as in "He's likely to risk a week's salary *on* a horse" (98).

Part of double-scope blending is the blending of grammar associated with the frames being blended. Double-scope blending is the mechanism that provides what Fillmore and Atkins refer to as "acquiring" "associated syntax."

Frame Blending in Linguistics

"Derivative syntax" is only one aspect of frame blending in linguistics. As analyzed in Chapter 8, "Language," of (Turner 1996), Chapter 9, "The Origin of Language," of (Fauconnier & Turner 2002), and (Fauconnier & Turner 2007), double-scope blending is indispensable for the origin of language. A conceptual frame for one kind of meaning can be blended with other frames. By selective projection, the resulting blend for extended meaning can inherit expressions that happen to exist for one of the inputs. So these expressions can now prompt for the meaning in the blend rather than the meaning in the original input frame. Very conveniently, the expression of new meaning in the blend does not require the creation of new linguistic forms, because it gets them from the input. This operation of selective projection of expressions to the blend solves the central problem in the origin of language. Complicated as grammar can become, conceptual structure is incomparably more complicated. Conceptual blending allows us to use relatively few expressive forms to prompt for the construction of indefinitely many meanings with exceptionally complicated structure. Fauconnier & Turner 2002 provide analyses of blending for lexical items, phrases, and clausal constructions. Fauconnier & Turner (1996 and 2002) additionally give analyses of the way in which blending allows the development of more complicated grammatical forms from less complicated inputs.

Frame Blending in Philosophy

Philosophical research is replete with issues that arise because of double-scope frame blending. For example, as discussed in (Turner and Fauconnier

1998) and (Fauconnier and Turner 2002), counterfactual thinking, a special concern of philosophers, and ubiquitous in human thought, is a product of conceptual integration. Consider the counterfactual blend we call "philosopher in a coma": A woman who had already been in a coma for ten years was raped by a hospital employee and gave birth to a child. A debate ensued concerning whether the pregnancy should have been terminated. Counterfactual blends arose such as, "It is right to figure out what she would want. It is wrong to try to figure out what we want." The *Los Angeles Times* article reporting the case ended with a comment by a professor of law, who said

> Even if everyone agrees she [the comatose woman] was pro-life at 19, she is now 29 and has lived in PVS [persistent vegetative state] for 10 years. Do we ask: 'Was she pro-life?' Or do we ask more appropriately: 'Would she be pro-life as a rape victim in a persistent vegetative state at 29 years of life?'

In the dramatically double-scope blend, the woman is in a persistent vegetative state, but has the reasoning capacities and general information that she would have had at age 29 under ordinary circumstances. The purpose of the integration network is not to construct a plausible situation in which a woman is reasoning about her inability to reason. Its purpose is instead to cast light on the element of "choice" in the input space in which the woman is indeed in a coma. The professor of law is committed to framing this woman as having the right to choose, but what does it mean for a woman in a coma to choose? Her abstract opinion, voiced ten years before her specific dilemma, does not meet our frame for "choice"; the law professor is offering instead an alternative—in the blend, the pregnant woman can make an informed choice about the specific dilemma, and this choice should be projected back to the input to guide our judgment and action.

This is a pyrotechnic example. It stands out and demands attention and recognition. But counterfactual blending of frames is a routine and usually unnoticed part of everyday reasoning, as is shown by unspectacular examples like *If I were you, I would have done it,* where the speaker is a man and the addressee is a woman who at an earlier age had declined to become pregnant. The relevant framing of the man and the woman conflict absolutely on disposition and ability, but the blend has an individual incompatible with both the man and the woman, and the remarkable emergent structure of a birth.

Frame Blending in Economics

Cognitive science has shown that human thought is remarkably more complicated and diffuse than our folk theories of mind suggest. For example, there is no controversy in vision science and language science that the mechanisms of vision and language are extraordinarily complex, quite unlike commonsense conceptions of how they work, and mostly invisible to human beings, who see and talk and offer folk theories such as "I just open my eyes and the scene comes in" or "Words have meanings so I say what I mean."

Great ranges of backstage cognition make vision and language happen. The principal reason that human beings think that sight and language happen in fairly simple ways, with fairly simple principles and with intelligible, human-scale frames, is that vision and language do produce some small, integrated, useful packages and deliver them to consciousness, and these little packages do seem fairly simple, with simple principles and with intelligible, human-scale frames. The cognitive scientist is in a curious situation: human beings are not

built to understand actual mental functioning scientifically—doing research in the field is slow, hard work—but human beings are built to grasp the little packages of consciousness, and to blend the frame for the scientific question with the frames of conscious experience, and so to produce, in the blend, human-scale folk theories of who we are and what we do. One result is that citizens who believe that physics and chemistry are very difficult can have a hard time grasping what a cognitive scientist does or why a university needs them. Vision and language must be child's play; a three-year-old does fine, right? Oh, sure, when something goes wrong—a brain hemorrhage, for example, or the development of a speech defect—we need a doctor or therapist, but what is there to study when vision and language are working just fine?

Actual mental functioning is distributed, complex, and not at human scale. We are not designed to look into what we are and how we operate. Obliviousness to the complexity of mental mechanisms, and our species-wide inability to inquire easily into them, are no surprise. What evolutionary benefit would there have been in our environments of evolutionary adaptation for a cognitive power to analyze vision and language? Seeing and speaking are one thing; analyzing their mechanisms is another.

For centuries, scientific notions of perception depended on the "Cartesian theater," that is, the implicit idea that there is a little perceiver in the head, a kind of attentive homunculus, who pretty much watches a representation of what we are watching in the world, and who figures it out. In this simple conscious frame, each of us is an attentive self looking at the world and figuring it out. To answer the question *what is the mind doing?,* we blend that simple conscious frame with our frame for the scientific question and so create a folk-theory of mind as pretty much an attentive agent looking not at the world but at a mental representation of the world. This folk theory of the watchful little perceiving guy

in the head is a frame blend. It had influential scientific standing for centuries. But it turns out that vision works nothing like that. Vision is far more complicated, there is no attentive homunculus in the mind, and there is no anatomical spot where sensory data are assembled into a unified representation of the sort we imagine. Indeed, it is a deep scientific problem to explain how something like a coffee cup—with its hue, saturation, reflectance, shape, smell, handle for grasping, temperature, and so on—can seem in consciousness like one unified object. In neuroscience, this problem is called "the binding problem" or "the integration problem." We are built to think that the reason we can see a coffee cup as one unified object is simply that it *is* one unified object whose inherent unity shoots straight through our senses onto the big screen in the mind where the unity is manifest, unmistakable, no problem. It is natural to hold such a belief, but the belief turns out just to be a folk theory, another case in which we make a frame blend of the scientific question with a frame of consciousness. It does not seem to us in consciousness that we are doing any work at all when we parse the world into objects and events and attribute permanence to some of those objects, but these performances constitute major open scientific problems.

In consciousness, typically, we frame experience as consisting of little stories: our basic story frame includes a perceiving self who is an agent interacting with the world and with other agents. Despite the swarm of detail in which we are embedded, and the manifest discontinuities in our lives, we manufacture small conscious narratives of ourselves as agents with stable personal identities, and these small narratives are at human scale and easily intelligible.

In these narratives, we possess straightforward powers of decision, judgment, and choice. Consciousness is equipped for just such little stories of choice: we encounter two paths, or a few fruits, or a few people, and we evaluate,

decide, choose. We act so as to move in the direction of one of the possibilities. We say, "I'll have an espresso." We are not set up to see the great range of invisible backstage cognition that subtends what we take to be evaluation, decision, and choice, any more than we are set up to see the work of vision or language. But we are set up to make a blend of (1) the human-scale conscious experience of a chooser choosing and (2) the scientific question of how the mind works.

The result is *homo economicus*—a folk theory of a rational actor in the head, with preferences, choices, and actions. *Homo economicus* is a homunculus much like the little mental guy in *the Cartesian theater*. The Cartesian homunculus looks at the screen and perceives; *homo economicus* looks at choices and chooses. In the *homo economicus* blend, each of us is a stable chooser with interests, living a narrative moment as an agent with a personal identity, encountering other such agents. This human-scale narrative blend of the self as a stable identity with preferences that drive choice toward outcomes is marvelously useful, instrumental in action, motivation, and persuasion. It is a worthy fiction that helps us grasp ranges of reality that are diffuse and complicated.

Chapter 3, "Choice," of (Turner 2001) analyzes some of the ways in which the science of backstage cognition, and in particular the science of frame blending, could suggest revisions of the *homo economicus* folk theory and so contribute to the science of decision and choice in economics, politics, and kindred fields. *Behavioral economics* is the name of the existing field in which economists and behavioral scientists explore effects of backstage cognition, including effects of framing and heuristics. As I have analyzed in (Turner 2001), blending is indispensable for many parts of decision and choice. Blending plays a crucial role in running the simulations that result in our sense of possible futures and outcomes that are consequent on different actions. Blending plays

an equally crucial role in the assigning of values and in the conception of an equilibrium path.

Consider the cognitive scientific study of activation. Our mind is not constant. Its variability has been understood in some technical detail within cognitive neuroscience at least since the work of Sir Charles Sherrington, who famously referred to the central nervous system as an "enchanted loom" where "millions of flashing shuttles weave a dissolving pattern, always a meaningful pattern, though never an abiding one" (Sherrington 1906.)

The mind is dynamic in two senses. First, it does dynamic work. Think of a drill; the drill does dynamic work. It goes fast, goes slowly, drills here, drills there. Surely the mind is dynamic that way, but it is dynamic in another way that the drill is not: the mind itself changes from second to second, minute to minute. Its powers, dispositions, and cast change. The drill is the same tool whether it turns slowly or quickly. But the brain is not a fixed tool. It is a shifting pattern of activity. The cast of mind we have is dependent upon what is active in the mind. What is active varies.

There is another aspect of the mind's dynamism, less obvious but equally important. Our cast of mind is dependent not only on what is active but also on what is inactive. It is well known that negative events such as inhibition and cell death influence the working of the brain. Activating a cast of mind is a matter not merely of activating certain patterns but also of not activating and sometimes even inhibiting or deactivating certain others. Cognitively modern human beings have a basic mental disposition to understand the world through human-scale stories of interdependent agency and causal action, and so, it is natural for us to suppose that causal efficacy in thought results from a kind of linear sum of activity in the brain. This assumption affects our interpretation of cognitive scientific data and our analyses of decision and choice.

I make these points about activation to contrast cognitive science with economics. The sciences of decision and choice in economics stereotypically ignore the issue of activation, in this way: in the folk theory, the chooser seeks choices at each level, moving forward through the tree of possible choices; the chooser's knowledge, such as it is, becomes activated at any point where it could be useful in the development of this forward-looking consideration of choices, or nodes. Within economics, political science, and kindred disciplines, the examples used to study such mental activity are typically small games or very restricted situations, such as "Tit for Tat," "Prisoner's Dilemma," "The Battle of the Bismarck Sea," "Centipede," a common value auction, or a game of checkers. In these small examples, the future landscape is so tightly restricted as to remove activation as an issue. Such simplicity can seem scientifically useful, since it provides a small laboratory for experiments, but it is not in general ecologically valid. It does not fit the human condition. Cultures have done considerable work to create situations that channel activation very narrowly, and to train and support certain people to succeed as agents in those situations (e.g., final decisions in a Board of Trustees meeting or Committee of Selection meeting where accessory stages have greatly reduced and narrowed the possibilities and the members of the committee must inhabit the situation only temporarily, with a clear agenda, staff support, refreshment, external representations of intended focus, dress codes, rituals of engagement, and personal security unaffected by the decisions to be made).

In (Turner 2001), I propose a process, "Backward Invention of the Story," to help take account of backstage cognition, such as activation, during activities involving choice. In "backward invention," we activate both a frame for a current situation and a frame for a desired situation. Call them "the present" and "the vision." Rather than proliferating a tree of nodes of interdependent choice from

the present to outcomes and selecting an equilibrium path that leads to an outcome preferred according to some version of expected utility theory, the mind attempts to create a conceptual integration network that blends the frames of the present and of the vision, such that there is a story that leads from the present to the blend. For example, the present might be *personal solitude and loneliness* while the vision is *happy mating*. Or the present might be *a current university campus* and the vision *a different and better university campus*. And so on.

As discussed in (Turner 2003) and (Turner 2006), it is already remarkable that cognitively modern human beings should have the ability to entertain such simultaneously conflicting frames, especially when one of them conflicts energetically with the present situation inhabited by the thinker. How it happened that we evolved to be able to do that is another difficult open scientific problem, as Terrence Deacon has emphasized in various lectures. But we can activate conflicting frames, and beyond that, we can blend them. Blending them involves trying to create conceptual connections between them.

The impulse to connect has strong effects for activation. For example, if there is an element in the vision, then under blending, its activation might help activate partial counterparts in the present. For example, suppose there is a splendid performing arts center in the vision and no counterpart in the present. The impulse to connect through a vital relation, such as analogy, might lead to attention to an abandoned temple near campus that had not even been activated for any type of consideration. The abandoned temple and the superb performing arts center might have roughly analogical footprints. After a lot of blending, the blend might include a renovation, redesign, and rebuilding of the temple, despite the fact that no one had noticed such a possibility when contemplating the present. "The solution was standing right there in front of us all along."

Similarly, consider the blend for happy mating. The abstract role for the mate in the vision might activate a mental hunt for a counterpart in the present, where a friend might be located. The two frames conflict profoundly, friend versus mate, but the activation of the vision can increase activation for the friend, in a new light. Perhaps the blend will develop amazing emergent structure: the mate was once a friend, giving the happy mating situation a quite unexpected psychological texture, one with new roles and possibilities. In this case, the vision was incompatible with the present, but the blend, with its emergent history of friendship, is not incompatible with the present.

Conversely, an element in the present can activate the search for some variety of counterpart in the vision and the blend. Perhaps we had been focusing on the abandoned temple in the present, as a financial problem and an eyesore. Maybe we wanted to raze it. The vision had no role for the disused temple. Focusing on the disused temple prompts for a counterpart in the vision and the blend. This can prompt for the addition of a superb performing arts center to the vision and an element in the blend that is a renovated temple now being used as a performing arts center. In forming conceptual integration networks, one can work at any site in the network to achieve suitable integration. Now we work on a story leading from the present to the blend, to take the friendship present to the happy mating blend, or the present campus to the better campus with a performing arts center.

The model of backward invention of the story is different from the usual rational choice model in economics of interdependent decision, but the two models can be blended. In (Turner 2001) and (Turner 2001a), I propose that economics and cognitive science are destined to blend and that one of the first steps in blending them is to blend theories of choice with theories of blending.

References

Fauconnier, Gilles and Mark Turner. 2007. "The Origin of Language as a Product of the Evolution of Modern Cognition." In Origin and Evolution of Languages: Approaches, Models, Paradigms. Edited by Bernard Laks. London: Equinox Publishing Ltd.

Fauconnier, Gilles and Mark Turner. 2002. *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities.* New York: Basic.

Fauconnier, Gilles and Mark Turner. 2000. "Compression and global insight." *Cognitive Linguistics*, Vol. 11, 3-4. Pages 283-304.

Fauconnier, Gilles and Mark Turner. 1998. "Conceptual Integration Networks." *Cognitive Science* 22:2 (April-June 1998), 133-187.

Fauconnier, Gilles and Mark Turner. 1996 . "Blending as a Central Process of Grammar" in *Conceptual Structure, Discourse, and Language*. Edited by Adele Goldberg. Stanford: Center for the Study of Language and Information (CSLI). Expanded web version 1998, available at http://blending.stanford.edu.

Fillmore, Charles J. and Beryl T. Atkins. 1992. "Towards a frame-based organization of the lexicon: the semantics of RISK and its neighbors." Lehrer, Adrienne and Eva Kittay, editors. *Frames, fields and contrast: new essays in semantics and lexical organization*. Hillsdale, NJ: Erlbaum. 75-102.

Sherrington, Charles Scott, Sir. 1906. *The Integrative Action of the Nervous System*. New York: Scribner's Sons.

Turner, Mark. 2007. The Blending Website: http://blending.stanford.edu.

Turner, Mark. 2006. "The Art of Compression" in Turner, Mark, editor, *The Artful Mind*. New York: Oxford University Press. See http://theartfulmind.stanford.edu.

Turner, Mark. 2004. "The Ghost of Anyone's Father." *Shakespearean International Yearbook*. Edited by Graham Bradshaw, Thomas Bishop, and Mark Turner. Volume 4. Hants, U.K.: Ashgate Publishing Limited, pages 72-97.

Turner, Mark. 2003. "Double-scope stories." In *Narrative Theory and the Cognitive Sciences*, edited by David Herman. Stanford: CSLI. Pages 117-142.

Turner, Mark. 2001. *Cognitive Dimensions of Social Science: The Way We Think About Politics, Economics, Law, and Society*. New York: Oxford University Press.

Turner, Mark. 2001a. "Toward the Founding of Cognitive Social Science." *The Chronicle of Higher Education*. 5 October 2001.

Turner, Mark. 1996. *The Literary Mind: The Origins of Language and Thought*. New York: Oxford University Press.

Turner, Mark and Gilles Fauconnier 1998. "Conceptual Integration in Counterfactuals" in *Discourse and Cognition.* Edited by Jean-Pierre Koenig. Stanford: Center for the Study of Language and Information. Pages 285-296.