The Foundations of Decision Making

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Abstract

 Acknowledged or not, the study of decision making rests upon one of two underlying theories of human cognition. In this essay, I will briefly examine each of these theories and then describe an alternative theory in which cognition reflects the structuring of conscious experience to create expectations about the future. Decision making consists of evaluating the significance of expected future threats, selection of actions for mitigating those threats, and evaluation of progress toward successful mitigation of those threats. Threats are defined as violations of standards about how the world, other people, and we ourselves should behave. Actions are defined as contingent sequences of manipulations of the physical and social environments that influence the unfolding future so that when it becomes the present, predicted threats will be significantly diminished or eliminated. A model for the decision process is presented.

 How one characterizes decision maker cognition dictates how one characterizes decision making (or vice versa). In decision research, there currently are two primary ways of doing this. The first characterizes cognition as rationality in the face of uncertainty and decision making as optimized gambling. For over 60 years, this the view underlaid a prolific research program designed to demonstrate its own inadequacy. As the evidence mounted, the gambler metaphor was retained for decision making but the characterization of cognition changed, culminating in Kahneman’s (2011) two-systems theory of cognition. For lack of a better name, I’ll call this the establishment view.

 The second characterization views cognition as problem solving and decision making as the process of identifying the problem and using past experience and innovation to solve it. The research has focused on people who are skilled in a particular area and examined how they use their knowledge to determine about how things are, how they should be, and how to reconcile the two. Because of its ‘real-world’ focus, this characterization is called the ‘naturalistic’ view.

 In what follows, I will describe a third way to characterize cognition and decision making. It is largely irreconcilable with the establishment view but is highly compatible with the naturalistic view. I’ll give it a name after I’ve described it.

**Critique of Establishment and Normative Characterizations**

 The gamble metaphor cast decisions as bets and is based on the assumption that virtually all decisions are risky to one degree or other. This assumption suggests that the mathematics developed to evaluate risky commercial decisions or decisions about how to prevail in games of chance provides a normative model for how decisions should be made and, therefore, the criteria for studying the adequacy of characterizing decision making as gambling. As a result, research began by examining how closely research participants’ decisions resembled the decisions a logician, statistician, or decision theorist would prescribe using the formal tools of their disciplines (Peterson & Beach, 1967). The results quickly revealed that participants’ decisions bore little resemblance to the experts’ prescriptions (e. g., Hershey & Shoemaker, 1980).

 The beauty of this research strategy was not just that it revealed the discrepancy between what ordinary decision makers do and what the experts do, it also suggested how decision makers could be helped to make ‘better’ decisions, i.e., to more closely resemble experts’ prescriptions. Most decision aiding schemes broke the decision down into its component parts, had a decision maker evaluate each part, and then combined the evaluations using a computer and the appropriate math, (probability theory, multi-attribute utility theory, etc.) to identify the best option. It was then left to the client, the decision maker, to choose that option.[[1]](#footnote-1) There came to be, and still are, many very useful variations on this strategy, often designed for a specific client’s unique decisions.

 The expert-as-criterion strategy also was attractive to those seeking to understand decision making as a cognitive activity. The most influential work in this vein was done by Danial Kahneman, Amos Tversky and their colleagues. It began by modifying key aspects of the normative model to make its prescriptions resemble participant’s decisions; the model was then assumed to be a model of the participants’ cognitive processes (Kahneman & Tversky, 1979). This led to a long sequence of studies aimed at understanding why the normative model had to be modified in the first place; that is, why participant’s made the ‘wrong’ decisions. This culminated in Kahneman’s (2011) proposal of two modes of thought, called System 1 and System 2. The former supposedly is for everyday, quick and dirty, decisions—the sort that leads to differences between research participants’ prescriptions and experts’ decisions. The latter, System 2, supposedly is for carefully considered, analytic, decisions—the sort that leads to decisions that correspond to experts’ prescriptions.

 Absent a working knowledge of probability theory, sampling theory, economic decision theory, and formal logic, System 2 is unavailable to most people. But, as described in the Kahneman’s theory, the remaining system, System 1, more or less boils down to the three short-cuts, called heuristics, and the errors they produce, called biases, which were identified by Tversky and Kahneman in 1974. Well over 100 biases have been identified, although it is not clear how they all result from application of the three heuristics or how they relate to each other.

 Running counter to the establishment view, a dissident group of researchers examined everyday decision making, largely in non-laboratory settings, and concluded that it is far more complex than just resorting to short-cuts (e.g., Donaldson & Lorsch, 1983). They established that these ‘real world’ decision makers were trying to accomplish something quite unlike that which the experts’ tools were designed to accomplish, making those tools a questionable performance criterion (e.g., Isenberg, 1984; Mintzberg, 1975; Peters, 1979). Indeed, these real world decisions were less about making the right decision, in a normative sense, than about figuring out what needed to be done and embarking upon a course of action that was flexible enough to drive through to success. Indeed, real world decisions were about what a desirable future would look like and what to do to ensure that things turn out that way.

 This launched a countermovement that focused on how decisions furthered the interests of the decision maker rather than on whether they were made the way that experts would. The foundational work included recognition-based theory (Klein, 1993, 1996) in which the decision is about which solution is appropriate to a recognized situation; reason-based theories (Jungermann & Thuring, 1987; Pennington & Hastie, 1988, 1992; Lipshitz, 1993) in which decision makers gather information, construct a plausible account about what is going on and make decisions that are congruent with the account; incrementalist theories (Beach & Mitchell, 1990; Braybrooke & Lindblom, 1963; Lindbloom, 1963; Connolly, 1988; Connolly and Wagner, 1988) in which decisions are about steps toward a better state of affairs (or, at least, away from a bad one) rather than about a single big decision about the best state; moral/ethical theory (Etzioni, 1988, 1993) in which decisions are dictated by enduring morals and culturally shared values; and emergence theory (Beach & Wise, 1980; Wise, 1981, 1985) in which decisions are not made, in the usual sense, but come into form as a result of prevailing forces. Although most of these theories date to the 1980’s and 90’s, they, and more recent versions of them, continue to have influence (e.g., Falzer, 2018; Rutten, et. al, 2013).

 Kahneman’s two-system scheme and the various naturalistic alternatives to it are well reasoned and well researched. They do a good job of accounting for the kinds of decisions they are designed to address. But, even though they may appear to do so, they fail to tell us much about the big picture, about decision making as a part of cognition and the mostly leave action as an afterthought. For example, Kahneman’s discussion of System 2 is less about thinking than about the problems arising from doing it less well than an expert does. And, because they usually are narrow in focus, naturalistic theories contribute interesting ideas but have yet to coalesce into a unitary viewpoint.

 Over the past 40 years, I have devoted a lot of thought to decision making and how it fits within a broader conception of cognition. This has led me to an appreciation of consciousness and conscious experience as the foundation of decision making and how they dictate attempts to further individual and group well-being, and, in the extreme case, even survival. What follows is a brief description of the theory that has evolved from my thinking and to describe my conclusions about the place of decision making within it (see Beach, 2010, 2019 for greater detail).

**The Structure of Conscious Experience**

We all are preoccupied with the flow of our own and others’ conscious experience (Pigliucci, 2019), which we think about and talk about in the form of stories (e.g., Beach, 2010, 2019; Bruner, 1990; Fisher, 1989; Graesser, 1993; Jungermann & Thuring, 1987; Lipshitz, 1993; Pennington & Hastie, 1988, 1992; Steen, 2005). The general term used to refer to stories is *narrative*, a sequence of events ordered by time and causality (Atkinson, 1978; Carroll, 2001; Polkinghorne, 1988). That is, narratives are not just about what happened and in what order, they also are about causality—how earlier events led to later events (Atkinson, 1978).[[2]](#footnote-2)

A narrative can be recounted in numerous ways as long as each version includes the key events and respects their temporal/causal order. This is evident when two people describe the same series of events. Not only do they seldom tell exactly the same story, seldom do either of them tell it exactly the same way twice. That different versions of events can be regarded as equally accurate suggests that they reflect something more basic, an underlying temporal/causal structure from which the various versions derive. I call this underlying structure the *prime narrative.*

It is easy to conceive of the prime narrative as a reflection of past and present experience, because they actually have happened. It is more difficult to conceive of it as regards the future, because the future hasn’t happened. And yet, most narratives either describe or imply a future. If you read a mystery novel, you can predict what is likely to happen next (although an accomplished author will ensure that you predict incorrectly—which is what makes it a mystery). If someone tells you something, you usually can see the implications. And when you think about your present circumstance, and how you reached it, you can imagine where it will lead. In the latter case, you probably are right more frequently than you’re wrong, especially in the short term. If you couldn’t correctly anticipate what is going to happen in the next few moments, even the next few hours or days, you wouldn’t know what to do next; you would live in a state of suspension, anxiety, and constant surprise.

Of course, because the future has not yet happened, no one can predict with certainty what it will be.[[3]](#footnote-3) Humans have invented a variety of tools for dealing with this fact—fortune telling, divination, statistics—most of which require the user to have special skills or the help of people who have the skills. But, lacking expertise or an expert, tools such as these are unavailable to most people. Left to their own devices, they must rely upon their ‘intuition’ to provide glimpses of the future. Because these glimpses are all they have, they must treat them as accurate and act accordingly, hoping for the best.

There are many reasons for trying to glimpse the future but, in the long run, the most basic reason is likely to be survival. That is, a glimpse could reveal potential threats and suggest actions to avert them or soften the blow. Of course, not all threats are so grave they jeopardize survival, expectations of pain or even discomfort are sufficient to warrant action. They do not even have to be physical; anticipated aggravation and hassle, potential loss of esteem, or the possible failure of opportunities or benefits to materialize are all threats that require mitigation. But, however serious, the most efficient way to handle threats is to anticipate them and deal with them before they cause damage.

**Structure**

 Structured conscious experience is the platform for thought, not the result of thought. It begins with sensed changes in the internal and external environment that cause changes in the flow of sensory stimulation. The change in flow prompts the body to mobilize to deal with whatever is causing it. Mobilization stimulates internal senses and the resulting sensation is called *arousal*, which varies in intensity as a function of the magnitude of sensed environmental change.

 Although the flow of sensory activity is continuous, it is convenient to talk as though it consists of a series of discrete packages, called *events*, each consisting of the sensations deriving from environmental change and the arousal accompanying mobilization. A *fresh* *event* represents the present, what is happening at this moment, but, as yet, it has no meaning and its arousal has intensity but no valance (positive/negative).[[4]](#footnote-4) Meaning and valance require context and, to jump ahead a little, context is precisely what narrative is. So, when the fresh event takes its place as ‘the present’ in a narrative, it acquires meaning and valance through its connection to everything in the narrative that describes what led up to this moment, i.e., the narrative past and its vast array of referents in memory. This contextual interconnectedness endows the fresh event with ‘thingness’—a person, object, or occurrence—and its arousal becomes emotion, with valance as well as intensity (Russell, 2002; Brooks, 2019). And, as we shall see, insofar as the narrative is encoded in language, the part of it that is about the past provides socially learned, situationally contingent labels both for the fresh event’s ‘thingness’ and for the accompanying emotion.

**Causal Links and the Prime Narrative**

 Physicists may not be sure that the world is deterministic (Musser, 2017), but humans and other creatures behave as though it is (Cheng, 1997; Holyoak & Cheng, 2011; Lagnado & Solman, 2016; Sobel & Kirkham, 2006; Solman & Lagnado, 2015). We operate as though everything that happens has been caused by something that happened previously and will be the cause of something that happens subsequently. Treating the links in a temporal sequence of past and fresh events as *causal* makes the sequence into a story, a *narrative* about how events in the moderately distant past led to (caused) events in the immediate past, and how this culminated (caused) in the fresh event that is happening right now.

 Because this narrative about current experience is the foundation for so much else that we will discuss—threat detection, focus of action, communicating with oneself and others—and to distinguish it from the narratives that pour from the media and social interactions, it deserves a distinctive name, the *prime* *narrative*. And, it is, in fact, *conscious* *experience*; the story about what is going on in our lives at the moment, what we are thinking about and what we talk about with others.[[5]](#footnote-5)

 Causal links in the prime narrative have direction and strength. Direction means that occurrence of an event influences the occurrence of subsequent events, which reflects the links’ temporal origins. Strength is how directly that influence is exerted. That is, causal links aren’t necessarily direct but the more direct they are the stronger they are.

 The strongest, first-order links, are between a cause and its direct effect, A→Z. Slightly weaker second-order links are between effects that are result of an intermediary event that was itself directly caused, A→(K)→Z. Even weaker third-order links are even more indirect, A→(K→M)→Z. And so on. But, in most cases the link is thought about and talked about as being between events A and Z; everything in-between is merely supportive of that link.

 Indirect causality is weaker than direct causality because it is less determinate, less reliable. This is because intermediate events have their own links (lateral links) with events that are largely irrelevant to what is happening at the moment. Lateral links enrich the prime narrative by increasing interconnections among a wider range of previously experienced and simultaneous subsidiary events, providing context. But, they also introduce opportunities for things to go in unpredictable ways. Thus, if the prime narrative contained only first-order links, everything would be simple (no lateral links) but highly determinant (reliable) because every event would have only one cause and one effect. A mixture of first-order and second-order links would be richer (because of lateral links), but less determinant and the results would be less reliable. Adding third-order links would be even richer (even more lateral links) and even less reliable. And so on.

**The Implied Future**

 The prime narrative tells a causal story that unfolds over time, ending with the fresh event that is happening at the moment. ‘This happened because of that, which caused something that resulted in something else that is happening right now.’ In principle, the story ought to stop at the present because the future has yet to happen so there are no events to add to the narrative.[[6]](#footnote-6) But it does not. Because past and present events are organized by time and causality in the narrative, the future always is implicit as yet-to-occur effects of present causes; future events will be the results of what is happening right now and what led up to it. Causality implies predictability; if, in the past, X caused Y, then if X is occurring now, the future occurrence of Y is implied. At the moment that X is occurring, Y is merely a causal implication because it has not yet happened, but, depending upon the strength of the causal link between X and Y, it is the best prediction about what, in fact, will happen.[[7]](#footnote-7)

 And, each of those implied future events imply events further into the future, and those imply even more remote events. As a result, it ought to extend to infinity, but, in fact, the implied future has a *time* *horizon*, a functional end point. Time horizons exist, in part, because creatures, including humans, lack the capacity for dealing with long sequences of implications. Time horizons mark the point at which the implied future contains so many possibilities it simply is not possible to differentiate them or assert that one future is more credible than another.

**Language and the Predicted Future**

 The superior ability of humans to predict the future is due in large part to our ability to use language. Although each newborn has the propensity for language, he or she must acquire the language of his or her own culture over the first few years of life. Key to this is the labeling of events and their concomitant emotions and linguistically linking them to other events and emotions. The result is that by the time he or she can produce even simple utterances, language is integral to the structure of both his or her past and present experience, giving it both breadth and depth of meaning.

 By the time a child begins speaking in coherent sentences, his or her prime narrative contains a rich causal network involving a large number of events in the past and present and predicting a large number of events in the immediate and extended future. Subjectively, this is experienced as understanding what is going on, even though it is not wholly elaborated in words. But this rich understanding is far more complex than is either essential or convenient for communication, which requires a simpler, more straightforward story. The result is that the story contained in the prime narrative is abridged to make it suitable for communicating with ourselves in the form of subvocal thought or with others in the form of informative statements. Abridgment usually keeps to the strongest causal links in the prime narrative, relegating less strongly linked events to the background.

**Language and Communication**

 The abridged stories we construct by for communication are called *derived* *narratives*, of which there are two kinds (Beach, 2010; Bruner, 1990). The first kind, called *chronicle* *narratives*, are what we tell ourselves and others about what is going on, including the future. The second kind, called *procedural* *narratives*, are about how to do things; how to implement changes in the environment that will change the future from what currently is predicted to happen to something more favorable.

 To complicate things a little more, there are two versions of chronicle and procedural narratives, those for *sharing* with others and those for *thinking*. Derived narratives for sharing are for informing other people about the content of one’s prime narrative and what one plans to do about the future. This requires at least a modicum of order and clarity, which is aided by clear temporal order, proper grammar, and semantic coherence. In contrast, derived narratives for thinking are for informing ourselves, as it were, about the content of our prime narratives and our plans to about altering the future. But, in contrast to communications for others, derived narratives for thinking require less orderliness; thinking often is rather messy and only partially encoded in language—emotions and mental imagery contribute heavily. Nonetheless, narratives for both sharing and thinking retain the past→present→future narrative form.

**Threats, Actions, and Decisions**

 When you were an infant, an acceptable future was simply one in which current physical discomfort wouldn’t continue. As you grew older and accumulated sufficient past experience upon which to base predictions, you could anticipate both continuation/discontinuation of existing discomfort as well as discomforts that hadn’t yet occurred—bad things happening, the loss of good things that already are happening, or the failure of good things to happen, all of which are emotionally negative. Part of that accumulated experience was personal life experiences and part was the result of instruction by your parents, friends, and teachers about what is good and bad, what is desirable and undesirable, what is dangerous and what is not.

 In addition to learning what is good and what is not, you learned how good or how bad you can expect to feel when they occur or fail to occur. It is your expectations about how bad you’ll feel that define threats. That is, threats are anticipated negative emotion associated with events in the predicted future. And the anticipated intensity of the negative emotion is the degree to which a predicted event is threatening, called *threat* *intensity*.[[8]](#footnote-8)

 When the threat posed by a predicted event is too intense, something must be done to mitigate it; either prevent it or reduce its impact. The point at which this happens is called an *emotional* *standard*, a threshold derived from both previously experienced negative emotion and socially transmitted rules about what will/should evoke negative emotion and how much is too much. The premise is that anything that was experienced as negative in the past will be negative in the future and anything you’ve been taught is negative will be so in the future.[[9]](#footnote-9) And, though a single intensely threatening event may prompt action, it usually is the aggregate of the threats associated with events in the prime narrative’s predicted future that does it. When this aggregate exceeds threshold, action is taken to make sure things don’t turn out as unpleasantly as anticipated.

 Socially learned emotional standards can be divided into enduring values and transient preferences. Values consist of your morals, ethics, and ideals—equity, justice, solidarity, stewardship, truth, beauty, and goodness—together with your moral, civic, and religious precepts and the responsibilities you assume in the course of performing your daily duties and engaging in social interactions. Preferences are your wants and partialities. Their emotional intensities may vary over time and circumstance but the often are no less compelling than your ethics and ideals. Together, your values and preferences dictate what about the future exceeds the threshold for negative emotion and what does not. (Remember, the potential for negative emotions resulting from something good *not* happening is as much a threat as the potential for negative emotions resulting from something bad happening.)

 It is the urge to prevent having to experience highly negative emotions that motivates action. When the overall emotional negativity of the predicted future exceeds a tolerable maximum, it is deemed too threatening and action is taken to make the future, when it becomes the present, as unthreatening as it can be given the time constraints. After all, the immediate future is just about to happen and even the remote future is often not that far off.

 Decisions

 Decisions about threats are based upon the degree of negative emotion, of threat, associate with the events in the predicted future.[[10]](#footnote-10) Some negative emotion is acceptable but when it becomes too much, when the threat exceeds some threshold, the future is deemed too threatening to be acceptable and mitigating action must be taken. That is, the threat must be reduced or eliminated before the future becomes the present.

 The basic decision mechanism is called the *discrepancy* *test* (Beach & Mitchell, 1987; Beach, 2010; Beach, Bissell, & Wise, 2016, Beach, 2019). It begins with the assumption that the predicted future is unthreatening until it is proved to be otherwise. Testing requires comparison of the **p = 1 to n** properties of the predicted future with the **s = 1 to m** corresponding properties (standards) of the normative future and identification of differences between them. Then the magnitudes of these differences, **dps**, weighted by the imperativeness of their respective standard, **i**, are summed to appraise the overall level of threat in the predicted future:

*n m*

***T = ∫ Σ Σ (dps is)***.

***f=1 s=1***

 The larger **T** is, the more threatening the predicted future is. At some point, **T** becomes too large to sustain the assumption that the predicted future will prove to be unthreatening and the assumption is rejected (called the *rejection* *threshold*). Rejection prompts consideration of a salient course of action.

 If the expected future is sufficiently threatening, mitigating action is initiated to ensure that the when the future arrives it actually is less negative than anticipated. For immediate and low-level threats, action is immediate and brief; quick fixes involving reflexes and habits. For intermediate and extended threats, automaticity is insufficient. But, putting the threat into words—a derived chronicle narrative—delineates the problem, and putting the action sequence into words—a derived procedural narrative—allows us to talk to others about our problem and how to deal with it.[[11]](#footnote-11), [[12]](#footnote-12) Perhaps more important, language allows us to talk to ourselves about our problem and our distress, and allows us to talk ourselves through the required steps to effect a remedy. Language serves to bind time, allowing consideration of the distant future right now instead of having to wait until it happens. This is what makes planning and sequential actions possible. Mitigation can begin immediately even though the threat is in the distant future. Moreover, if mitigation fails, we can talk ourselves through a different action sequence, a different procedural narrative.

**Actions**

 Actions are manipulations of the physical and social environments. This includes both applications of muscular movement of your body to physical objects and symbolic acts, largely involving language. For example, you pull up a chair, sit down, take off your left shoe, and massage your blistered toe—physical acts to stop the pain from continuing into the future. Or, you tell your friend how sorry you’re for having forgotten an appointment—a symbolic act of contrition that is successful if it makes both you and your neglected friend stop feeling negative emotions. Use of language to express sorrow, love, anger, and so on, is action (Austin, 1962: Searle, 1969) in that it causes both ourselves and other people to change future behavior in ways that that are less threatening than they otherwise would be expected to be.

 Actions are guided by contextualized instantiations of causal bonds in the form of *causal* *rules* in a *plan*—a procedural narrative. *Contingent causal rules* specify the results your actions can be expected to cause, thereby telling you what to do to produce a specific result. *Non*-*contingent causal* *rules* specify the results other people’s or natural forces’ actions can be expected to cause, either spontaneously or in response to your own actions, thereby telling you the expected repercussions of your actions. A plan, a procedural narrative, is a conditional sequence of contingent and non-contingent causal rules (conditional sequences allow for doing either this or that depending upon the result of what you just did).

 Action consists of the execution of each step in the procedural narrative.[[13]](#footnote-13) As each step produces a change in the environment, the change is sensed, perceived as an event, and integrated into the prime narrative, thus changing its predicted future—hopefully for the better. Because actions in the sequences are conditional, if an action (or series of actions—because feedback isn’t always immediate, especially when changing the distant future) results in the predicted future becoming more desirable, the next action(s) in the sequence is executed. If this reduces desirability, new action(s) is selected from procedural memory to correct for the setback and improve desirability.

 All of this should be familiar: You think of something that you’ve to do—because something undesirable will happen if you don’t do it—and ways of doing it immediately spring to mind. That is, pertinent procedures are retrieved from memory. If what you’ve to do only involves the immediate future, you just do it. Little or no thought is required unless what you do doesn’t work, whereupon you stop to ‘think about it—which means you put it all in words and talk to yourself through it. If extended action is required, ways of doing it also spring to mind, primarily in the form of verbalized, conditional sequences, called plans. And, as you talk to yourself about this plan, you consider the ways in which it could succeed or fail, and adjust it accordingly. Then, as you take action (i.e., implement your plan) you monitor progress toward the more desirable future, making changes in the plan as required.

Choice and Ambiguity

 The decisions discussed above may not seem like the choices that are investigated in the expert-as-criterion decision research, but they are. All decisions are choices between courses of action, each of which offers the potential for a different future. For decisions about the predicted future the choice is between retaining or rejecting (which is an action) the assumption that it is unthreatening. If the assumption is rejected the next decision is a choice between doing nothing and letting the future unfold as expected or intervening to change it. If the decision is to intervene the next decisions are a series of choices about accepting or rejecting alternative possible courses of action. The latter is done by anticipating the potential of each to make the future, when it arrives, less dangerous than it is currently expected to be—using the same decision mechanism as used for the preceding decisions.

 However, the present formulation of decisions differs in an important way from the formulation in mainline decision research--there are no probabilities. This is because, in my view, cognition is causal and causal ambiguity is, in and of itself, threatening because it implies reduced control of the future—this is why the future’s time horizon is where credibility ends. But, unless trained to do otherwise, decision maker’s conceptions of ambiguity do not conform to the mathematical rules of probability theory. We all use words like probably, possibly, possibility, and even probability but we seldom mean precisely the same thing a statistician would mean. (And, of course, probability theory was invented as a derived procedural narrative to deal with this ambiguity, but it has developed far beyond anything useful for everyday decision making, even if most people knew about or understood it.)

 As I said earlier, the causal bonds among episodes in the implied future vary in strength and weak bonds result in branching and reduced coherence—setting a time horizon. This means that some implied futures are very short, as are the actions required to deal with their threats. Longer futures require more sustained action. Paring down longer, even branched, futures to encode them in language and create derive narratives allows the time horizon to move further into the future. But, encoding branches also encodes the ambiguity that the branches represent. For decision making, this is resolved in either or both of two ways, each conservative. The first is that the most threatening of an ambiguous bonds’ possible effects is treated as its sole effect for the appraisal of discrepancies. This makes the predicted future starker and more threatening than it otherwise would, but it is safer than the alternative. The second is the lowering of the discrepancy test’s rejection threshold so that what would otherwise be a marginally acceptable future is rejected as too threatening.

 Finally, whatever disagreements I may have with the expert-as-criterion research movement, it has performed a very important cultural service—warning decision makers to distrust their intuitions. From my viewpoint, this is important because for the larger part of 200,000 years the prime narrative and its predicted futures constituted the only truth most people knew. And the willingness to take them at face value remains deeply rooted. But, as science reveals previously undreamed of complexity in the physical world and as travel and communications reveal similar complexity in the social world, personal truths are not always sufficient. Indeed, it can be argued that the greatest threat facing individuals and societies comes from equating personal truth with universal truth and being wrong. On a personal scale this leads to ignorance and error; on a social scale it leads to demagoguery. The only defense is to temper our truths with caution and inquiry.

Summary

 I have presented an alternative way of conceptualizing the role of decision making in cognition, which can be called the ‘narrative view’. It is based the proposition that conscious experience is structured in narrative form by time and causality—the past caused the present which will cause the future. The result is that the expected future, which has yet to happen, is a necessary implication of this temporal/causal structure. Decisions are about (1) the seriousness of future threats and, when it is decided that they are too serious, about (2) how to mitigate them and, when mitigation is undertaken, about (3) progress toward reducing or eliminating future threats before they become present discomfort or worse. This theory and decision mechanism can account for the decisions studied in mainline decision research without recourse to the expert-as-criterion. The focus here is on decision making as intrinsic to conscious experience and cognition as an evolved system for furthering the decision maker’s well-being and survival.

**References**

Beach, L. R. (2010). *The psychology of narrative thought: How the stories we tell ourselves shape our lives.* Bloomington, IN: Xlibris.

Beach, L. R., Bissell, B. L., & Wise, J. A. (2016). *A new theory of mind: The theory of narrative thought*. Newcastle upon Tyne, UK: Cambridge Scholars.

Beach, L.R., & Wise, J.A. (1980). Decision Emergence: A Lewinian Perspective. *Acta* *Psychologica*, 45, 343-356.

Beach, L. R., & Wise, J. A. (2018). The structure and uses of conscious experience. Downloadable PDF at www.leeroybeach.com.

Beach, L. R., & Mitchell, T. R. (1987). Image theory: Principles, goals, and plans in decision making. *Acta Psychologica, 66*, 201-220.

Beach, L. R., & Mitchell, T. R. (1990). Image theory: A behavioral theory of decisions in organizations. In B. M. Staw & L. L. Cummins (Eds.), *Research in organizational behavior (Vol. 12)*. Greenwich, CT: JAI.

Beach, L. R. & Wise, J. A. (1969). Subjective probability and decision strategy. *Journal of Experimental Psychology, 79,* 133-138.

Braybrooke, D., & Lindblom, C. E. (1963). *A strategy of decision: Policy evaluation as a social process.* New York: Free Press.

Brooks, D. (2019). The wisdom your body knows. *New York Times*, November 29, 2019, p. 27.

Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.

Connolly, T. (1988). Hedge-clipping, tree-felling and the management of ambiguity: The need for new images of decision-making. In L. R. Pondy, R. J. Boland, Jr., & H. Thomas (Eds.), *Managing ambiguity and change* (pp. 37-50). NY: Wiley.

Connolly, T., & Wagner, W. G. (1988). Decision cycles. *Advances in Information Processing in Organizations, 3*, 183-205.

Dennett, D. C. (2017). From bacteria to Bach and Back: The evolution of minds. New York:

 Norton.

Donaldson, G., & Lorsch, J. W. (1983). *Decision making at the top: The shaping of strategic direction*. New York: Basic Books.

Dunsworth, H., & Buchanan, A. (2017). Sex makes babies. [*https://aeon.co/essays/i-think-i-*](https://aeon.co/essays/i-think-i-) *know-where-babies-come-from-therefore-i-am-human?*

Etzioni, A. (1988). *The moral dimension: Toward a new economics*. New York: Free Press.

Etzioni, A. (1993). *The spirit of community.* New York: Crown.

Falzer, P. R. (in press). Naturalistic decision making and the practice of healthcare. *Cognitive Engineering and Decision Making.*

Hershey, J. C., & Sheomaker, P. G. H. (1980). Prospect Theory’s reflection hypothesis: A critical examination. *Organizational Behavior and Human Performance, 25,* 395-418.

Isenberg, D. J. (1984, November/December). How senior managers think. *Harvard Business Review*, 81-90.

Johnson, Samuel and Tuckett, David, Narrative Decision-Making in Investment Choices: How Investors Use News About Company Performance (September 15, 2017). Available at SSRN: [https://ssrn.com/abstract=3037463](https://ssrn.com/abstract%3D3037463) or [http://dx.doi.org/10.2139/ssrn.3037463](https://dx.doi.org/10.2139/ssrn.3037463)

Jungermann, H., & Thüring, J. (1987). The use of causal knowledge for inferential reasoning. In J. L. Klein, G. A. (1989). Recognition-primed decisions. *Advances in Man-Machine*

 *Systems Research, 5*, 47-92.

Kabadayi, C. & Osvath, M. (2017). Ravens parallel great apes in flexible planning for tool-use and bartering. *Science, 357*, 6347, 202-204.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus, & Giroux.

Klein, G. A. (1993). A recognition-primed decision (RPD) model of rapid decision making. In G. A. Klein, J. Orasanu, R. Calderwood, & C. E. Zsambok (Eds), *Decision making in action: Models and methods*. Norwood, NJ: Ablex.

Klein, G. A. (1996).*Sources of power: The study of naturalistic decision making*. Mahwah, NJ: Erlbaum.

Lerner, J. S., Ye, L., Valdesolo, P., & Kassam, K. S. (2015). Emotion and Decision Making. *Annual Review of Psychology, 66*, 799-823

Lindbloom, C. E. (1959). The science of “muddling through.” *Public Administration Review, 19*, 79-88.

Lipschitz, R. (1993). Decision making as argument-driven action. In G. A. Klein, J. Orasanu, R. Calderwood, & C. E. Zsambok (Eds), *Decision making in action: Models and methods*. Norwood, NJ: Ablex.

Mintzberg, H. (1975 July/August). The manager’s job: Folklore and fact. *Harvard Business Review*, 49-61.

Peters, T. (1979, November/December). Leadership: Sad facts and silver linings. *Harvard Business Review*, 164-172.

Pennington, N., & Hastie, R. (1988). Explanation-based decision making: Effects of memory structure on judgment. *Journal of Experimental Psychology: Learning, Memory and Cognition, 14*, 521-533.

Pennington, N., & Hastie, R. (1992). Explaining the evidence: Tests of the story model for juror decision making. *Journal of Personality and Social Psychology, 2*, 189-206.

Peterson, C. R., & Beach, L. R. (1967). Man as an intuitive statistician. *Psychological Bulletin, 68*, 29-46.

Pigliucci, M. (2019). Consciousness is real. *Aeon*. https:aeon.co/essays/consciousness-is-

 neither-a-spooky-mystery-nor-an-illusory-belief.

Rutten, M. E. J., Doree, A. G., & Halman, J. I. M. (2013). Exploring the value of a novel decision-making theory in understanding R&D progress decisions. *Management Decision, 51*, 1, 184-199.

Simon, H. A. (1957). *Models of man*. New York: Wiley.

Thüring, M., & Jungermann, H. (1986). Constructing and running mental models for inferences about the future. In B. Brehmer, H. Jungermann, P. Lourens, & G. S. Sevòn (Eds.), *New directions in research in decision making*. Amsterdam: North Holland.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 18, 5*, 1124-1131.

Wise, J. A. (1981), Decision Theory and Design Methodology. *Design* *Methods* *and* *Theories*, *15*, 3, 91-103.)

Wise, J.A. (1985). Decisions in Design: Analyzing and Aiding the Art of Synthesis. In G. Wright (ed.), *Behavioral* *Decision* *Making*: *Theory* *and* *Analysis*. New York: Plenum, pp. 283- 308.

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1. Interestingly, it is widely recognized among decision consultants that clients seldom embrace decisions prescribed by the decision aids if those decisions substantially disagree with their ‘intuition’, which suggests that those intuitions are, in fact, the foundations of decision making. [↑](#footnote-ref-1)
2. Mar (2004) reviewed the neuropsychological research related to story comprehension and story production, their common neural mechanisms, and their implications for cognitive science. [↑](#footnote-ref-2)
3. Which is what motivated the establishment view’s adoption of the gambler metaphor and the use of probability theory to describe decision maker uncertainty. [↑](#footnote-ref-3)
4. It might seem that raw pain or pleasure would negate this statement. But, aside from reflex withdrawal from tissue- damaging events, even pain—and especially pleasure—are context dependent. Even for something as basic as sex, what is pleasurable in one context may be repellent, perhaps painful, in another. [↑](#footnote-ref-4)
5. Note that the prime narrative incorporates what was called the current narrative in the 2016 book and the present formulation supersedes the current narrative’s formulation. [↑](#footnote-ref-5)
6. Boundaries between the past, present, and future are slippery. The past is reasonably knowable; it is memory. And, aside from inferences about it, the future is unknowable because it hasn’t happened yet. The present is the hard case because, technically, it almost doesn’t exist—in an instant what was the future becomes the past and it is that instant that is the present. But this isn’t how the experienced present appears to us—it isn’t just an instant, it has extension. In fact, what we experience as the present is a trick of the nervous system, usually referred to as working memory. The trick consists of bundling together the most recent memories (the last few milliseconds) to give the illusion of extension. In this sense, we’re always living in the past, it is just that in this case the past was a millisecond ago, so it is as good as being right now. It is this argument that justifies packaging experience as events for our discussion. [↑](#footnote-ref-6)
7. Johnson & Tuckett (2017) present three experiments using novice investors demonstrates that their predictions of future stock prices were based upon financially irrelevant, but narratively relevant, information about companies’ past and future performance. The authors conclude that the results could not be explained by neoclassical financial models or as behavioral anomalies. [↑](#footnote-ref-7)
8. Emotion is a complex topic (Lerner, et al., 2015) but the emotional response to discrepancies is the resultant of all emotions in play at the moment. [↑](#footnote-ref-8)
9. In an interesting essay on values, Professor Troy Jollimore (2018) states; ... “[M]uch contemporary scientific research also supports the Aristotelian idea that rather than seeing emotions as mere drives or urges, we should see them in some ways as analogous to beliefs: mental states that reflect and hence inform us about the world. Although the contrast between reason and the emotions, like the distinction between fact and value, is a deep assumption in most post-Enlightenment scientific thinking — and one that lay at the root of the positivism that ruled by science and philosophy for most of the 20th century — the more recent trend among many scientists, as well as philosophers, is to complicate if not deny the distinction. For example, Antonio Damasio, professor of neuroscience at the University of Southern California, argues in Descartes’ Error (1994) that there are close and complicated relations between emotions, physiological states, and rational thought. [↑](#footnote-ref-9)
10. One’s narrative is the entirety of one’s understanding about what is going on. Decisions are both informed by and constrained by that understanding. In short, the bounds of the narrative defines the bounds of ‘bounded rationality’ (Simon, 1957). [↑](#footnote-ref-10)
11. Language is action (Austin, 1962: Searle, 1969) if only in that it causes both ourselves and other people to behave in ways that we otherwise wouldn’t. [↑](#footnote-ref-11)
12. Remember, other people function the same way you do When you talk to them (or to yourself), what you say becomes part of their (your) environment, is sensed, perceived, integrated into their (your) prime narrative, and changes their (your) expectations about the future. Thus, every interaction (even with yourself) is, on the one hand, an exchange about expected threats and, on the other hand, modifies what the other person (and you) subsequently thinks and says. [↑](#footnote-ref-12)
13. The way in which procedures are translated into physical action is beyond the scope of the theory. Perhaps the next phase can attempt it. Clearly the foundation is in procedures that are executed almost automatically. Deliberate action is most likely an elaboration of these automatic actions. Research (e.g., Guillot, et al., 2007) shows that muscles, while apparently unmoving, reflect mental imagery about movement; suggesting that imagery may be at least part of the link between thought and movement. [↑](#footnote-ref-13)