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The Satisficing Role of Emotions in Decision Making
El Papel Satisfaciente de las Emociones en la Toma de Decisiones

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Herbert Simon's (1967) early speculations about emotion and goal selection have inspired several lines of research into the role of emotion in information processing. In this paper we review emotion research that has been directly and indirectly inspired by Simon's model of emotion as a goal interruption mechanism. One particularly promising approach to the study of emotion and goal regulation focuses on Simon's (1967) view of emotions as quick and ready goal-selection mechanisms. The implications of this approach for our understanding of mood, affect, and emotion are discussed.

Las primeras especulaciones de Herbert Simon (1967) sobre las emociones y la selección de objetivos han inspirado varias líneas de investigación acerca del papel de las emociones en el procesamiento de la información. En este artículo se revisan investigaciones que han sido directa e indirectamente inspiradas en el modelo de Simon de las emociones como mecanismos de interrupción de objetivos. Una perspectiva particularmente promisoria en el estudio de las emociones y la regulación de los objetivos se centra en el modelo de Simon de las emociones como mecanismos rápidamente disponibles de selección de objetivos. Se discuten las implicancias de esta perspectiva para nuestra comprensión del ánimo, los afectos y las emociones.

How does one decide, from day to day or moment to moment, which of many possible goals to strive for? The answer might be that this is a central function of emotions. This idea springs from a model of emotion described by Herbert Simon thirty years ago (Simon, 1967), which, along with the rest of Simon's views, has received surprisingly little attention since then (see Oatley & Johnson-Laird, 1987, for a rare exception). Simon proposed that emotions function to interrupt ongoing goals and plans when new demands arise from unexpected circumstances. Daily, we make innumerable decisions, which range from relevant but pedestrian (where to locate our next meal, or which toothpaste to buy) to the complex and life-altering (whether to accept a proposal of marriage, or which stock fund to invest in). When one goal assumes greater importance, the ongoing pursuit of other goals might need to be delayed or interrupted. This can be easily illustrated by considering the example of a Pleistocene hunter-gather stalking a deer (searching for prey) when he suddenly discovers that he too is being stalked, by a lion. This fellow is faced with the important decision of whether to continuing run after his dinner (continue hunting) or to begin running for his life (avoid being eaten). Selecting the right goal to work on first can have important adaptive consequences. We explore the possible role of emotion in this goal selection process.

Different goals require different resources and varying amounts of time and effort to be realized. Furthermore, not all achieved goals pay equal dividends, and the benefits accrued by achieving one goal may not substitute for the rewards of achieving another goal. For these reasons, the choice of which goal to pursue can be as important in itself as the specific strategies one employs to achieve a particular goal state. Moreover, the choice of one goal can affect one's ability to accomplish other goals. In some cases the pursuit of one goal merely delays the pursuit of another. Should I spend the weekend balancing my checkbook or should I invest this time in a potential romantic partner? Should I spend this morning writing the lecture I will give this afternoon or should I utilize this time to finish writing the discussion section of my latest scientific paper?. The "mere" timing of goal pursuits can affect those pursuits in important ways. If I put off balancing my check book for too long, I might suffer harmful financial consequences. However, the quality of a newly begun romantic relationship can drop drastically if I invest too much time in other

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facets of my life. Similarly, spending the entire morning enhancing your teaching effectiveness by preparing a particular lecture could leave you with little time to finish an important manuscript, thus jeopardizing your research productivity and possibly your academic career. In all these examples, the pursuit of one goal indirectly affects the pursuit of other goals by delaying their completion.

Organisms continually face the problem of which problem to face. The resolution of this problem might be one of the important functions of emotion. In some cases, pursuing one goal does not merely delay the pursuit of another, but makes the other goal more difficult to achieve, as is the case when opposite actions are required to achieve two mutually inconsistent goals. Should I try to win this game of squash against my boss, or should I cultivate a productive relationship by showing good sportsmanship? In times of poverty, should I satisfy my own hunger by eating this piece of bread, or should I give it to my child? In general, one can strategically enhance one's social relationships by giving away things that are valuable to other members of one's social group, and the things that are valuable to them are often valuable to you, so that gift-giving situations are typically matters of choosing which goal to pursue, and pursuing one goal typically impairs the pursuit of the other.

There are a few broad, universal categories of goals upon whose existence everyone agrees, such as obtaining food, water, and sex, and avoiding predators and injuries. Even from this relatively short list, choosing which one to pursue might be complex, particularly under the real-world conditions of limited time and cognitive resources. For example, suppose I am very hungry and have some food at my disposal, but that I lack a monogamous mate, that a potential mate is also very hungry, and that, as part of her mate selection process, she is monitoring my ability and willingness to provide for her welfare in deciding whether to accept me as her mate. What should I do? From a naively evolutionary perspective, one could try to answer this question by finding the single, evolutionarily "optimal" solution that maximizes "inclusive fitness," but such efforts would be misguided for several reasons (see Cosmides & Tooby, 1987; Dawkins, 1982). First, it is not clear that a single optimal response could be computed in the first place and second, even if such a solution could be computed in principle, it is not clear that our mental capacities could provide the amount of time and cognitive resources necessary to perform such computations. Thus far, the complexities involved in producing optimal models of goal selection have daunted all comers. Most evolutionary psychologists now consider the mind as a collection of domain specific problem solving devices (see Barkow, Cosmides, & Tooby, 1992; Buss, 1995; Pinker, 1997) and not as an inclusive fitness maximizing inference engine designed to "do the right thing" in every possible set of circumstances. The field is thus ripe for satisficing models of goal selection, including those which consider the role of emotions.

Overview

Do emotions operate as psychological mechanisms that helps us to select goals? This is not a conventional notion in the literature on either emotions (Ekman & Davidson, 1994) or judgment and decision making (Gigerenzer & Todd, in press), but there are seeds of it in both fields (see Pinker, 1997 for one treatment of this approach). Simon (1967) attempted to introduce the realm of emotions into cognitive psychology, positing that emotions function as interruption mechanisms which modify information processing priorities whenever important changes in the environment occur. Emotion theorists such as Mandler (1984), Tomkins (1978) and Oatley & Johnson-Laird (1987) have expanded on Simon's notion of emotions as goal prioritization mechanisms. More recently, Frank (1988), Damasio (1995) and Clore, Schwarz and Conway (1994) have, in various ways, introduced cognition into the study of emotion, claiming that a central function of emotion is information processing. In this paper we will summarize the extant literature that is suggestive of a goal-selection function (which we term "goal-satisficing") for emotions, and indulge in some speculation on the directions in which this notion might lead in the future.

What is an emotion?. Affect, moods, and emotions. Despite their antiquity in the literary and popular press, or perhaps because of it, the basic terms of emotion research -affect, mood and emotion itself- have proved difficult to define in ways that are both clear and consensual (see Kleinginna & Kleinginna, 1981). Nevertheless, certain points of agreement have emerged (Ekman & Davidson, 1994b). The broadest of these terms is *affect*, which can be defined as any valenced, hedonic reaction, typically but not always considered to be a conscious feeling

state (Clore, 1994; Clore & Ketelaar, 1997; see Bargh 1997). The valences associated with affect are binary and can be expressed, depending on one's theoretical orientation, as pleasant vs. unpleasant feelings, appetitive vs. aversive motivational states, or approach vs. avoidance reactions. Affective reactions are commonly experienced in the context of emotions, where an affective feeling state is seen as a necessary but not sufficient condition for emotion (see Clore, 1992). *Moods*, by contrast, are typically defined as affective reactions for which a specific stimulus or cause is not salient. Moods can either be truly "free-floating" in the sense of not having been elicited by a single stimulus, or they can have a single, true cause that is unknown to the person experiencing them. A mood is simply an affect without a clear causal attribution. In this sense, it is not surprising to discover that mood states can often be misattributed to irrelevant sources and thus bias judgment and processing (see Clore, Schwarz, & Conway, 1994 for a good review). Finally, *Emotions* are affective states that are associated with particular causes, and which have a cognitive structure that is specific to that particular emotion (See Ortony, Clore, & Collins, 1988 for one view of the cognitive structure of emotions). Thus, what makes guilt and anger/reproach emotions rather than moods or simply affects, is that the source of one's affective reaction is readily known to the individual feeling these emotions and there is an accompanying cognitive structure that aids the individual in interpreting this affective state. These cognitive structures are typically described as cognitive appraisals, judgments or attributions of various aspects of one's environment. In the case of guilt and anger/reproach, it is the appraisal of the blameworthiness of the actions of a social agent, either oneself (in the case of guilt) or another person (in the case of anger/reproach) that elicits a negative affective reaction (Ortony, Clore, & Collins, 1988). In sum, we treat *emotions* as having a corresponding *affective state* (clearly tied to it's source or cause) and a corresponding *cognitive structure* that places the good or bad feeling state (affect) in context (what is it that I feel bad about?).

These distinctions between affects, moods, and emotions are important because much of the research on emotion and cognition has focused on mood (unattributed affect) and considerably less research has examined correctly attributed affective states associated with particular emotions. In other words, many studies which purport to study emotion, can be considered studies of misattributed affect, that is, mood. We know a lot about the proximate effects of good and bad moods, but much less about the functions of emotions (see Ketelaar & Clore, 1997).

Emotions and goal satisficing

Simon (1967) introduced the view that emotions actively coordinate the hierarchy of goals/tasks that one considers. Several emotion theories share important features with Simon's model and define a general approach to theorizing about emotion and decision-making. These are summarized in this section, followed by an application of this general approach to examples from recent research on affect and mood.

If one assumes, as Simon (1967) did, that humans are serial processors living in a world where threats and opportunities often present themselves in parallel, then one problem that we face is goal selection. The problem of goal selection, by definition, occurs under conditions of limited time and information, thus making a satisficing solution viable. Here "satisficing" refers to a term coined by Simon to convey a blend of sufficing and satisfying. In this sense, "satisficing" solutions are not optimal solutions, but rather, simple workable solutions that can get the job done under conditions of limited time, knowledge, or computation (Gigerenzer, 1997).

The satisficing class of solutions to the goal-selection problem can be expressed in the following four propositions:

1. The range of possible goals that the organism can work on at any given moment is, in principle, limitless.
2. The range of possible goals that the organism can actually perform at any given time is, practically speaking, limited.
3. In many cases, the temporal ordering and duration of the pursuit of goals can make a difference in their attainment.
4. Therefore, organisms face an important adaptive problem in the form of goal prioritization, the problem of which goal to work on at a particular moment.

We now take a critical look at these four assumptions.

Assumptions 1 and 2. We often take for granted the overarching problem of goal prioritization because many of our goals seem to arise naturally and spontaneously. Many of the goals we work on seem dictated more by the routines we present

ourselves with each day than by conscious deliberation. We pursue the goal of eating breakfast in the morning, the goal of working on a project when we arrive at the office at 9 AM, the goal of sleeping at the end of the day. But there are more goals than those which we encounter as part of our normal conscious daily routine. Some goals occur once in a lifetime (e.g., the goal of marrying a particular person); others are so arcane as to never be encountered by most human beings (e.g., the goal of living on Mars). The spectrum of possible goals one might pursue is so large in number as to be practically infinite (see Little, 1993; Emmons, 1996). Possible goals range from the mundane (walking to work rather than taking the bus) to the magnificent (winning the Nobel prize) to the strange (surpassing the world record for eating hot dogs). When one considers the enormous number of goals that one could be working on, it is apparent that there will always be far more possible goals than an individual can work on at any given moment. It is in this sense that one assumes that the range of possible goals or tasks that the organism can work on at any given moment is, in principle, limitless, but the range of possible goals or tasks that the organism can actually perform at any given time is, practically speaking, limited. Simon (1967) claimed this came about because of constraints on the speed and amount of information that our minds could process. Simon also argued that information processing was largely a serial activity and that parallel processing models of mental activity were difficult to specify. For these reasons, Simon believed that mental activity required some sort of organizing mechanism for prioritizing goals. Although advances in Parallel Distributed Processing models (Baumgartner & Payr, 1995 for a good review) have rendered Simon's second concern -the difficulty of specifying how a parallel processing system would work- moot, we focus on the former criterion -limitations or constraints due to limited time and information- as a plausible rationale for assuming that many mental activities (i.e., conscious deliberative activities) can be describing in serial processing terms.

A serial information processing view of the mind must, of course, take into account recent advances in our understanding of information-processing brought about after Simon's (1967) paper. For example, it is now common to describe information processing tasks as lying on a continuum ranging from automatic to controlled processing (Hasher, & Zacks, 1979). "Automatic processing" refers to tasks that have become routinized (typically through repetition) such that their activation requires little or no conscious effort or thought. An example of this would be the well practiced task of tying one's shoe. Once this task has become automatized it can operate quickly and efficiently with little cognitive effort or awareness of how it is being performed. By contrast, controlled processing refers to activities that require conscious attention and effort. The task of learning how to tie one's shoe or hitting a backhand shot in tennis are common examples of controlled processing. These tasks at first require enormous effort and deliberate conscious monitoring to be performed with some semblance of effectiveness.

Automatic processing is often described as unconscious processing, whereas controlled processing is described as conscious processing. This reflects the common notion that conscious, controlled processing is serial, whereas automatic, unconscious processing allows parallel processing, such as driving a car while talking on a cellular phone. In sum, the sort of serial processing that Simon had in mind could be plausibly interpreted in terms of controlled, conscious processing. In essence, we are describing information processing as a type of behavior (i.e., the behavior of the computational machinery of the mind). While one's mind can engage in two automatized behaviors at once, it is usually obligatory to deal with conscious, controlled processing tasks one at a time, in a serial fashion. To the extent that all emotions involve consciousness -it is not possible to have an unconscious emotional feeling (see Clore, 1994)- one might consider emotional processing to be more analogous to controlled information processing strategies (but see Bargh, 1997 for a discussion of the link between affect and automatic, unconscious attitudes).

Assumption 3. The ordering and duration of goals can make a difference in their attainment. A third assumption of Simon's model was that some goals and tasks are more important than others. From an evolutionary perspective, our evolved problem solving machinery exists in the form that it does today, because these structures, modules, and mechanisms solved specific proximate problems (acquiring food, avoiding predators, detecting cheaters in social exchanges) that correlated with inclusive fitness in ancestral environments (Barkow, Cosmides, & Tooby, 1992; Buss, 1995). Because the theory of evolution by natural and sexual

selection is the best account of the *origins* of complex biological design, one expects that living organisms will possess specialized cognitive machinery -complex biological designs or adaptations- for achieving a variety of specific proximate goals, the success of which would have correlated at some level with inclusive fitness in ancestral environments. The question remains, what is the nature of these evolved cognitive mechanisms, and are some of them specialized to deal with the higher order problem of coordinating competing goals?.

Simon's argument for some goals being more pressing than others implied a type of biological imperative but he ever actually specified what these "biological" goals were. Biological goals could be defined as those goals that if failed or accomplished would have had an impact, however indirect, on the organism's inclusive fitness under ancestral conditions. Such goals would include finding food, selecting mates, provisioning offspring, avoiding predators, etc. Simon referred to such goals as "biological needs." To the extent that biological needs might take precedence over other, less directly biologically relevant goals (achieving a perfect score of 300 in bowling), one might expect that any specialized evolved cognitive machinery that we possess for goal prioritization would differentially weight goals on the basis of their relation to the relative importance (in ancestral environments) of these various biological needs. For example, the fellow who fails to accomplish his goals of the sub-90 golf game or of living to the ripe age of 120 has merely fallen short of obtaining two evolutionarily novel aspirations for which we are unlikely to possess specialized problem solving machinery. By contrast, the chap who fails to accomplish the goal of avoiding eating poisonous substances probably will not be anyone's ancestor. The fact that we possess certain specialized decision-making mechanisms for solving certain problems (e.g., food preference mechanisms) and not others (e.g., specialized bowling or golf putting mechanisms) tells us something about the history of selection pressures that our ancestors faced. To the degree that we possess reliably developing, species-typical cognitive mechanisms, we can infer something about which adaptive problems and therefore which goals would have been important in human ancestral environments (see Seligman, 1971; Sperber, 1995). In this sense, certain of our goals (food preferences, mate preferences) may seem more important today because they were important in ancestral environments. It is in this sense that certain goals, such as selecting a high quality long-term mate (Buss, 1989, 1994), may appear to be species-typical biological imperatives and other goals, such as achieving a perfect score of 300 in bowling, will exhibit much more cross-cultural variability.

Assumption 4. Finally, this approach assumes that an important higher order adaptive problem for any organism involves the prioritization of these goals and tasks. One expects that being confronted with several simultaneous and important goals would present an important information processing problem. Perhaps certain goals are evaluated as more important, in part, because they have specialized evolved cognitive machinery which is automatically activated in specific circumstances. What if one is confronted with an attractive mate and a charging lion? According to Simon (1967) this problem might be characterized by two questions: Which goal should I work on first? and how much time should I allocate to each?.

Which goal to work on first? It does no good to have specialized problem solving machinery if one fails to address the most pressing problems first. In ancestral environments the individual who automatically worked on the goal of eating first and avoiding predators second, or visa versa, would be at an adaptive disadvantage relative to individuals who possessed a more contingent goal prioritization mechanism. Such a mechanism would solve the problem of which goal to work on first, given a specific environmental structure. Again, biological imperatives could play an important role in determining which goals are most important to work on first in particular contexts.

How much time should I allocate to a specific goal? A second problem is also presented by simultaneous goals that must both be met, involving the differential allocation of time to various competing simultaneous goals. Many goals must remain active for a critical period of time, if they are to be achieved. Consider the obvious example of being interrupted while foraging for food to deal with the immediate problem of avoiding an approaching predator far off in the distance. The individual who abandons this goal too soon, before acquiring any the food is at a competitive disadvantage, evolutionarily speaking, compared to individuals who devote a bit more time to this goal before focusing on the competing goal of fleeing the predator. Yet, it is also possible to devote too

much time to a specific goal. To the extent that opportunity costs impose another form of selective pressure on organisms to prioritize goals, one expects any goal prioritization machinery we possess to be sensitive to the cost-benefit tradeoff of allocating various amounts of time to different competing goals.

Simon's role for emotion in goal satisficing. Given the nature of the goal selection problem, Simon speculated that one role that emotions might play is that of a goal-terminating mechanism. According to this view, emotions function in part to recognize when "conditions have arisen that require ongoing programs to be interrupted." As intuitively interesting as this is, Simon specified few details of how this process would work. Instead of describing the details of the solutions that emotions might supply, Simon focused instead on elaborating the nature of the problem of goal-satisficing: given many goals and limited processing capabilities, one requires a mechanism that can (a) stop current goal pursuit and (b) substitute it with another, more pressing, goal.

Contemporary models using the Simonian goal-satisficing idea

More recently, several emotion theorists (Mandler, 1984; Oatley & Johnson-Laird, 1987) have developed views similar to, or in some cases directly inspired by, Simon's goal satisficing model. These approaches have focused on two elements of Simon's model: (1) the interruption function as a solution to the problem of managing multiple goals and (2) the relation between the concept of "arousal" and the emotional "interrupt" signals that trigger the goal prioritization mechanism.

1. *The interruption function and the role of emotions in managing multiple goals.* The concept of a general interrupt mechanism dates back at least as far as Miller, Galanter and Pribram's (1960) work on information-processing approaches to problem-solving. Indeed, versions of cognitive interruption models in psychology appear as early as John Dewey's (1895) notion of "emotional disturbance," a view which developed as a reaction to William James's (1894) initial model of emotion as a system whereby bodily signals of action preparedness are amplified into emotional experience. Although research on human emotion was rather dormant for the next half century, interruption models saw a resurgence in the work of Mandler (1964, 1984) and Simon (1967). It appears that these theorists may have been swayed by the arguments of Miller, Galanter, & Pribram (1960) who argued that emotions may serve an "interrupt function" in the course of goal conflicts.

Indeed, Mandler's theory of emotion was expressly inspired by Miller, Galanter, and Pribram's (1960) work on planning and decision-making. According to Mandler (1984, p. 158), "The central postulate of our interruption hypothesis is that interruption leads to a state of arousal that is followed by emotional behavior." For Mandler (1984, p. 159) the most important consequence of interruption was the "innate arousal of the autonomic nervous system." This served as a signal system to initiate a meaning analysis wherein the individual takes stock of the current situation in relation to relevant goals. In this sense, emotion was seen as an arousal signal that alerted the individual to the disruption of, or conflict between, important goals. This view is consistent with Simon's (1967) model, which associates emotion with the arousal that accompanies the interrupt signals that emerge when managing multiple goals.

Oatley and Johnson-Laird (1987) offer a similar view of the functions of emotion. Whereas Mandler's model doesn't refer to Simon's (1967) paper, Oatley and Johnson-Laird (1987, p. 31) saw their model as following from Simon's idea that emotions serve a goal-prioritization function where emotions "are part of a management system to co-ordinate each individual's multiple plans and goals under constraints of time and other limited resources." Oatley and Johnson-Laird viewed their theory as an attempt to begin constructing computational models of emotion, models that would allow formal tests of the design of emotional processes. A central concern of their view was that, despite the clear relevance of emotion to information processing, computational theories of the role of emotions in problem-solving are few in number (see Clore, Schwarz, and Conway, 1994 for a good overview of the current state of research in this area). Simon (1967) had made a similar argument 20 years earlier.

According to Oatley and Johnson-Laird's (1987, p. 33) model, emotions function "to enable one priority to be exchanged for another in the system of multiple goals, and to maintain this priority until it is satisfied or abandoned". Like Simon, they identified emotion most with autonomic nervous system (ANS) activity, assuming that emotions serve

as a sort of signal that an on-line goal had been interrupted. More recently, the idea that emotions are associated with ANS signals that intrude on the goal selection process has appeared in Demasio's (1994) Somatic marker hypothesis. Marshaling evidence from brain-damaged patients, Demasio (1994) views emotions as body-based mechanisms which provide "automated alarm signals" and "beacons of incentive" to alert the individual to whether a particular goal path portends danger or benefit. In this sense, Demasio argues that emotions serve as somatic markers that carry information about the differential value of different courses of action. Without these somatic markers, individuals suffering from certain types of brain damage no longer have access to these useful emotional intrusions and interruptions of conscious decision-making (Demasio, 1994).

Differences between these models and Simon's model. Because it was explicitly influenced by Simon's (1967) ideas, perhaps it is most meaningful to compare the Oatley and Johnson-Laird (1987) model with Simon's approach. Unlike its predecessor, the Oatley and Johnson-Laird model deals with coordination among cognitive modules, rather than the problem of coordination between serial goals, as the central problem that emotions help solve. Thus, Oatley and Johnson-Laird envision the goal satisficing role of emotion as operating in a parallel processing system (e.g., McClelland, & Rummelhart, 1985, 1986). According to this view the primary function of emotions is to act as "a form of internal communication that sets cognitive processes into one of a small number of characteristic modes" corresponding to specific emotions (Oatley & Johnson-Laird, 1987, p. 58). Such emotions are seen as relatively few in number, corresponding roughly to the list of "basic" emotions (see Ekman, 1992) for which universal facial displays exist. For example, the emotion mode of disgust may arise when a gustatory goal has been thwarted, whereas sadness may be evoked by the failure of a major plan or the loss of an active goal (Oatley and Johnson-Laird, 1987). These emotions function as cognitive processing modes which reprioritize the hierarchy of goals whenever an interruption ensues. These characteristic emotion modes maintain this re-prioritization scheme until the current goal is satisfied or abandoned. Although Oatley and Johnson-Laird's restriction of this goal-organizing role to just a few emotions (as few as five!) has been criticized as unnecessarily restrictive (see Frijda, 1987), the basic tenets of their model -that emotions are responses to goal interruptions, which cause reprioritization of plans- is consistent with other recent views of emotion, including Mandler's (1984).

Historically, the idea of an emotional interrupt system traces its roots back at least as far as the Freudian influences on learning theorists (see Oatley and Johnson-Laird, 1987; Mandler, 1964, 1984). The early learning theorists took Freudian urges and drives and translated them into more concrete learning drives and motivations (see Miller, 1951). Even Lewin's (1951) theory of motivation, saw a role for "emotional tension" in the regulation of needs and drives (see also Miller, 1951 for a historical review). Essential to all of these models was the notion that the organism's constantly changing drive and motivational states could be translated into a signal system that would enable the organism to consciously prioritize goals and plans. In effect, "the signaling function of the ANS would also be highly useful to indicate that new behavior is required, that the situation needs to be further explored, and that a variety of new and old behavior patterns may be appropriately brought into play" (Oatley & Johnson-Laird, 1987, p. 61). Such models necessitated an intermediate construct, one which lies between the environment and the organism's emotional (behavioral) reaction. In many contemporary approaches to emotion, this role is served by cognitive appraisal processes. Historically, other views of emotion, especially those which influenced Simon (see Lindsey, 1951) avoided reference to intervening cognitive processes, preferring physiological constructs instead. For these models, the intermediate mechanism linking the organisms reaction to the environment with its behavior was the construct of arousal. Interestingly, although "there is very little empirical evidence on the effects of interruption on the ANS" (Mandler, 1984, p. 161), the view that "arousal signals interruption" has become a central element of Simonian views of emotions and goal satisficing. We shall argue that this element is unnecessary and can be eliminated.

2. *The "arousal" concept and its relation to emotional "interrupt" signals.* Many emotion theorists believe that emotions are associated with corresponding, specific behavioral states and action tendencies (see Frijda, 1987), a view that has important implications for the claim that emotions help to coordinate among competing goals and plans.

As such, emotions are viewed as a central part of the solution to the problem of "coordinating a modular nervous system" that must figure out which behavior goes with which goal. This view of emotion -as a set of behavioral tendencies and action dispositions- has often carried with it certain assumptions about the role of ANS arousal in helping serve this goal satisficing function (see Cornelius, 1996). Does Simon's model of goal satisficing imply an arousal concept? The answer is clearly yes.

In discussing the interrupt process, Simon (1967, p. 35) noted that "sudden intense stimuli often produce large effects on the autonomic nervous system, commonly of an 'arousal' and 'energy marshaling' nature." It is to these effects that Simon attached the label of emotion. Such a view is quite similar to Mandler's (1984) conceptualization of emotional arousal and goal prioritization under conditions of interruption. For example, Mandler (1984) notes that "the interruption of an organized response produces a state of arousal that... develops into one or another emotional expression" (p. 159) or more simply, "interruption leads to a state of arousal that is followed by emotional behavior" (p. 158). Although Mandler believed that arousal was somewhat distinct from the "automatic" behaviors associated with emotion, he viewed all emotions as incorporating specific ANS activity. Although some research points to distinct ANS activity among several emotions (e.g., greater skin temperature for anger than for fear, lower heart rate for disgust than anger, fear, and sadness, see Levenson, 1994 for a good review) many researchers note that such findings are not consistent across studies (see Davidson, 1994b; Ekman & Davidson, 1994b for brief reviews).

Most models of emotion and goal regulation, including Simon's, can be characterized by the following, simplified assumptions concerning the role of arousal in the interrupt system.

1) Specific adaptive circumstances (e.g., a bear attacking) occur and provoke specialized adaptive behavioral response preparations or action tendencies (e.g., preparation for fleeing).
2) These tendencies are accompanied by specific bodily states associated with the corresponding action tendency (e.g., increase blood flow to the legs, increased muscle tension in the running muscles).
3) These bodily responses get amplified such that they become signals which are experienced as felt emotions. (e.g., terror).
4) These amplified signals, experienced as arousal-like emotional feelings, alert the organism as to its current situation and preparatory responses.

This view, that adaptive behavioral responses get amplified, a bit like turning up the "gain" or volume knob on the signal, is perhaps most explicitly endorsed by Tomkins' (1978) Amplification theory of emotion. According to Tomkins (1978, p. 202): "The affect system is... the primary motivational system because without its amplification, nothing else matters-and with its amplification, anything else can matter." Tomkins clearly viewed these bodily signals as amplifications of basic drive-like states, the absence of which would prevent the experience of emotion, arguing that "a world without affect would be a pallid, meaningless world" (Tomkins, 1978, p. 203). A similar view is expressed in Demasio's (1994) Somatic Marker hypothesis. Although Demasio's model (1994, p. 209) does not necessarily view ANS activity as amplification of action tendencies per se, the Somatic Marker hypothesis sees ANS activity as a necessary component of emotional experience, suggesting that: "If you do not have a skin conductance response, it does not appear that you ever will have the conscious body state characteristic of emotion". In this sense, more recent models of emotion (Demasio, 1995) still see emotional feelings operating as a signal system, alerting the organism to its current situation and preparatory responses. Interestingly however, in his later work, Tomkins (1978, p. 202) saw problems with this view of ANS activation and emotion. Specifically, he noted:

> "the theory of affect amplification was flawed by a serious ambiguity. I had unwittingly assumed that in both electronic amplification and affective amplification there was an increase in gain of the signal...If that were the case, what was amplified would remain essentially the same except that it would become louder. But affects are separate mechanisms, involving bodily responses quite distinct from the other bodily responses they are presumed to amplify."

It turns out that these "emotion equals amplified arousal" models have garnered only weak and inconsistent empirical support, both because (1) the claim that emotions consist of undifferentiated ANS arousal that gets amplified and cognitively labeled as specific emotions (see Cornelius, 1996 for a review) and (2) the claim that emotions have specific ANS activation (see Davidson, 1994b; Ekman & Davidson, 1994a) have had so little empirical support (but see Levenson, 1994 and LeDoux, 1994, for more cautious reactions to these criticisms). In short, it is not clear that the concept of ANS arousal

is essential to our understanding of the role of emotion in goal selection.

If the Simonian view, that emotions correspond to amplified ANS arousal signals that indicate goal interruption, has dubious empirical support; what then, are the implications for our understanding of emotions and goal regulation? One might argue that because the "emotions equals ANS arousal" assumption has, by definition, focused attention on the role of physiological and muscular behavior, that this focus has diverted attention from the study of emotions and cognitive "behavior," including the study of goal planning and goal organization. It is not that emotion researchers reject the notion of physiological specificity in emotion, so much that it is the case that many (but not all) emotion researchers believe the central nervous system (CNS) is the better place to look for physiological specificity (see Grey, 1994).

How "arousal" implies behavioral satisficing and why we focus instead on goal satisficing. Arousal amplification models suggest that emotions are nothing more than "listening in on" the body's specific physiological preparations for fight and flight responses. This implies that emotions play a direct role in the selection of behaviors. As such, one might ask why focus on goal selection? Why not instead focus on behavioral selection -how behaviors are selectively activated to correspond to specific goals and situations- and avoid the middle step of cognition? We suggest a more cognitive view because, as promising as the behavioral view advocated by many theorists once was, after a century of concerted effort to identify specific emotional behavior patterns, only inconsistent and weak empirical evidence has emerged (Davidson, 1994b; Ekman & Davidson, 1994a; Gray, 1994). Schwarz and Clore (1996, p. 51) argue that:

> "It is common to assume, for example, that fear involves behavioral tendencies to escape, that anger involves activation of aggressive responses, that shame involves tendencies to hide, and so on... Such words as 'behavior,' 'response,' and 'action,' even when qualified by such words as 'tendencies,' 'readiness,' or 'inclinations,' imply that specific muscle groups and motor circuits are activated when one is angry, fearful, or ashamed. Such claims suggest, rather implausibly, that one's legs are programmed to run when afraid, one's arms are programmed to hit when one is angry, or one's hands programmed to cover one's face when ashamed."

Like Schwarz and Clore (1996), we do not deny that emotions have corresponding physiological states or behavioral implications. In a trivial sense, all psychological states must have corresponding physiological states or behavioral implications. Rather, we emphasize that the experiential feeling states of affect and mood may play a role in shaping "implicit decisions regarding the distribution of attention...and processing priorities" (Clore, 1992, p. 135). In other words, we think it is important to explore how affect and mood may indirectly shape behavioral choices by playing a more direct role in goal selection. Our main claim is that affective feelings -conscious or "felt" valenced states- are a promising area of exploration for those interested in the role of emotion and goal selection. The promising nature of this approach is supported by a large body of evidence showing that affective feeling states do affect subsequent judgments and processing strategies (see Clore, Schwarz, & Conway, 1994 for a review). What is lacking, perhaps, is research on specific affective states (e.g., guilt, anger, fear), as opposed to research on simply good and bad moods. Much of the work on how feelings affect judgment and decision-making has focused on unattributed or misattributed reactions, i.e., mood states, rather than on correctly attributed feeling states and the role they might play in functional information processing. Because the existing literature has been reviewed elsewhere (see Clore Schwarz, & Conway, 1994; Ketelaar & Clore, 1997), we focus in the remaining part of this paper on promising directions for research on the role of affective feelings and mood states in goal selection and goal satisficing.

Future Directions

Emotions-as-information: Emotional feelings and goal selection. One model of emotion and cognition that can be translated into a goal-satisficing view of emotion is the "affect as information" model developed by Schwarz and Clore (1983, 1988, 1996; Clore, Schwarz, & Conway, 1994). According to this model, individuals make evaluative judgments by consulting their affective feelings. The affect as information perspective views this process as a sort of "How do I feel about it?" heuristic that individuals consult whenever they must evaluating something, whether it is a movie option, an item of food, or a person (Clore, Schwarz, & Conway, 1994; Schwarz & Clore, 1988). According to this view, people let their feelings be their guide; in this way, affect can be information for judgments. Here we explore how the affective feeling states that accompany emotion

could influence choice of goals. This view could be labeled an "emotions-as-information" view (Ketelaar & Clore, 1997) because it follows closely from the "affect-as-information" model articulated by Schwarz and Clore (1983, 1988), but is applied to the affective feelings associated with specific emotion states, rather than more general "positive vs. negative" affects.

There is now good evidence that individual's often use the affect associated with emotions to make evaluative judgments (Clore, Schwarz, & Conway, 1994). Cognitively oriented emotion researchers have begun exploring the informative functions of specific emotions, and this research holds promise for an emotion-as-information view as it might relate to goal satisficing. For example, Keltner, Ellsworth, and Edwards (1993) have demonstrated the informative functions of stimulus-oriented anger, showing that angry individuals are more likely to attribute agency and blame than individuals who are not experiencing angry feelings. Such findings suggest that specific emotions provide individuals with specific information states (e.g., anger provokes thoughts of assigning blameworthiness), which can be used to make subsequent judgments (see Ketelaar & Clore, 1997). While these results have explicitly focused on the role of the cognitive structures of emotion (i.e., anger involves appraisals of blame), they are also potentially relevant to our understanding of the role of affective feelings in goal satisficing. For example, the emotion of anger is necessarily accompanied by a corresponding unpleasant affective state. One might speculate about the motivational properties of such affective feelings. Does anger motivate you to remove the barrier to your goal so that you can continue working on the goal which has been interrupted?

One promising research direction comes from the work of several economists who have recently rediscovered Adam Smith's views on the role of emotion in regulating social behavior. These approaches have emphasized the roles of emotion and reputation in the achievement of self-interested behavior (see Hirschleifer, 1987, Frank, 1988) and suggest that one function of feeling states involves selecting goals where the long-term payoff is greater than the immediate payoff. In particular, the writings of Robert Frank (1988) are consistent with the view that affective feeling states can motivate strategic behavior precisely because they make the pursuit of long-range goals (as opposed to short-term goals) more salient.

The influence of emotion on goal selection is particularly evident in situations where one must decide between short-range vs. long term goals. Should I pursue my immediate goals of gratification by eating this piece of cake now or should I opt for a piece of celery instead so that I can maintain progress toward my long term goal of losing weight? There is considerable empirical evidence suggesting that this preference for goals which reap immediate rewards (over goals that provide returns only in the long run) are "apparently part of the hard-wiring of most animal nervous systems" (Frank, 1988, p. 80). However, there are instances in which people go against the principle of pursuing short term goals and immediate rewards. For example, people often leave a tip for their waiter even when visiting a strange town where there is little chance of being remembered. The economist Robert Frank (1988) has argued that emotional reasoning can account for such examples. He suggests that emotions such as guilt provoke individuals to make binding commitments that run contrary to the rigid pursuit of goals which reap immediate rewards.

According to the Commitment model, emotional feeling states such as guilt serve as competing information representing the long-term consequences of cheating and can sway an individual away from pursuing a short-range goal. Frank (1988, p. 82) notes that:

> "If the psychological reward mechanism is constrained to emphasize rewards in the present moment, the simplest counter to a specious reward from cheating is to have a current feeling that tugs in precisely the opposite direction. Guilt is just such a feeling. And because it coincides with the moment of choice...it can negate the spurious attraction of the imminent material reward."

According to this view, to "feel guilty" is to mentally represent the long-term (negative) consequences of pursuing a goal that works against one's long-term material well-being. In cases where one must decide, for example, whether to leave a tip in a restaurant, the long-term consequences can range from a bad reputation (as stingy) to poor service in the future. Because this competing information -about the future consequences of pursuing a short range goal- is in the form of a feeling state, it is experienced right now. By virtue of moving the costs of the decision (to not leave a tip) into the present, in the form of a feeling state, guilt coincides with the activation of the reward mechanism which tugs in the opposite direction, toward pursuing the immediate goal of maximizing

one's current wealth. Because the emotion system has become activated, the individual now has two pieces of information that can be taken into account in making a decision on which goal to pursue (immediate self-interest or long-term well-being). One piece of information (from the reward mechanism) informs the individual about the immediate consequences and the second piece of information (from feelings of guilt) informs the individual about future consequences. Because affective feeling states like guilt can make certain goals -pursuing *immediate* rewards- appear more costly than other goals -pursuing *long-term* gains- emotions could serve a goal satisficing function.

In a specific implementation of Frank's commitment notion to the emotion of guilt, Ketelaar and Au (1997) examined naturally-occurring feelings of guilt during a negotiation task known as a repeated ultimatum game. The ultimatum game is a two person social dilemma in which the task is to divide a sum of money, say $19. One person proposes an offer, or ultimatum, on how to split the money and the second person can either accept or refuse the offer. If the offer is accepted, the sum of money is divided in the manner proposed by the first person, if the offer is rejected no money is distributed to either person.

In the ancestral environments in which our emotion mechanisms are believed to have evolved, it is likely that over the long run the immediate benefits of making a selfish offer in a repeated series of negotiations would have been less than the long-term benefits of mutual cooperation and occasional self-sacrifice (i.e., reciprocal altruism). For example, it is know that in modern day hunter-gather groups, people who violate a norm of egalitarianism and sharing (by being repeatedly selfish) are likely to be punished or excluded from future social exchanges than those who are consistently generous or at least fair (Axelrod & Hamilton, 1981, Axelrod, 1984; Cashdan, 1989; Kaplan, Hill, & Hurtado, 1990). Because the immediate attractiveness of the benefits of selfishness can loom large, one expects, according to Frank's (1988) model, that feelings of guilt might operate in such circumstances as a type of strategic information state, that informs the individual of the future costs of selfish behavior, and tugs in the opposite direction, toward pursuit of mutual cooperation and generosity.

Applying the logic of Frank's (1988) Commitment problem to the role of emotion in the Ultimatum game would suggest that individuals who experience guilty feelings after pursuing the short range goal of gaining immediate reward (by proposing a selfish division of the money at Time 1) are "informing" themselves that over the long run, the costs of pursuing this short range goal loom larger than the long range benefits of proposing a more generous offer. We might therefore expect that people who behave selfishly at Time 1 *and feel guilty* should be more likely to behave generously the next time that the transaction is repeated (at Time 2). In other words, we would expect that feelings of guilt make pursuit of one's immediate self-interest less palatable than pursuit of the more distal goal of acquiring resources through an a series of equitable exchanges (e.g., reciprocal altruism). Thus, we would predict that individuals who feel guilty after pursuing their immediate self-interests (at time 1) will reverse their decision upon encountering their negotiation partner a second time (one week later in the study cited above). By contrast, those individuals who behave selfishly at Time 1 but do not feel guilty about it should continue to pursue the same goals (immediate self-interest) at Time 2. These predictions stem from the idea that guilty feelings can have motivational properties which provoke individuals (who feel guilty) to select one goal (be generous) over another (be selfish). This might be the case because, according to Frank's (1988) model, individuals who experience guilt after making a selfish offer at Time 1 are representing their selfish choice as reflecting not only an immediate benefit (receiving more money) but also a future cost (punishment or ostracism from the group).

In fact, this is what occurred (Ketelaar & Au, 1997). In the study of the effects of guilt in a repeated ultimatum game, the vast majority of individuals (91%) who made slightly selfish offers at Time 1 and reported feeling guilty (at Time 1) switched their offer at Time 2 (one week later) by making a more generous offer. By contrast, a much smaller proportion (22%) of the individual who felt no guilt after making a slightly selfish offer at Time 1, switched their offers at time 2 to a more generous offer. These results are consistent with the idea that emotions could serve a goal satisficing function. Specifically, it appeared that feeling of guilt made certain goals -pursuing *immediate* rewards- appear more costly than other goals-pursuing *long-term gains*. Thus, it would appear that emotional feeling states -like guilt- can have an impact on the selection of goals.

Summary. Given that organisms are often

confronted with several competing goals -Should I maximize short-term or long-run returns? Should I be selfish or generous?- how can affective feelings help individuals solve the problem of which goal to work on first? One possibility is that affective feelings, such as the unpleasant affect associated with emotions such as guilt, make salient the long term consequences of pursuing particular goals. In the case of guilty feelings, the unpleasant affective state may cancel out the pleasant reaction to the thought of the immediate benefits gained by pursuing a short-range goal, such as making a slightly selfish offer in a negotiation. In this way affective feeling states can motivate individual to pursue one set of goals rather than others. This interpretation need not be limited to negative affect. For example, in situations where one must decide whether to engage in an act of infidelity or to remain faithful to one's partner, feelings of romantic love might map onto the long-term benefits of investing in a particular romantic partner. Such positive feelings might over-ride any inclinations to pursue the immediate benefits of alternative partners and motivate the individual to continue to invest in one's current partner, even though the returns on the investment come in the long run, whereas some of the benefits of an act of infidelity are immediate. By virtue of moving the benefits of investing in one's current partner into the present, in the form of a feeling state, romantic love coincides with the activation of the reward mechanism which tugs in the opposite direction (toward pursuing the immediate rewards of infidelity). Because the emotion system has become activated, the individual now has two pieces of information that can be taken into account in making a decision on which goal to pursue (infidelity or commitment to one's current partner). One piece of information (from the reward mechanism) informs the individual about the immediate positive consequences of infidelity and the second piece of information (from feelings of love towards one's partner, perhaps with concurrent feelings of guilt about considering an act of infidelity) informs the individual about the future consequences of continued investment in one's current partner. Because affective feeling states like guilt and love can make certain goals -pursuing immediate rewards- appear more costly or less beneficial than other goals -pursuing long-term rewards- emotions could serve a goal satisficing function by provoking individuals to select one goal over another. In these examples, the positive or negative feeling state produced by an emotion -love or guilt- is correctly attributed to its source and provides relevant information about the costs and benefits of pursuing various goals. The goal satisficing functions of feelings states however, need not be limited to cases of correctly attributed feeling states (i. e., affects).

Mood as information: Mood and goal selection. We turn now to a discussion of the possible functions of unattributed feeling states, or moods, in goal satisficing. Moods are traditionally distinguished from emotions as being generalized, that is, not focused upon a particular stimulus or eliciting condition (Ekman & Davidson, 1994). What purpose could such a mechanism possibly serve? The definitions that have emerged of moods and emotions seems to condemn moods to the status of errors (see earlier definitions). Defined as cases in which an affect exists, but where the person experiencing the affect does not know to what to attribute that affect, moods might be construed as failures of attribution. Traditionally, the implicit belief has been that moods, like missattributions, can not serve an adaptive function. For example, it is not only immoral to beat your children when you had an unpleasant encounter with your boss; it also would have likely had a negative impact on their reproductive fitness in ancestral environments (relative to children who did not suffer physical punishment under such circumstances). Accordingly, research on moods has stressed misattribution: people's judgments of all sorts of objects and events vary as a function of their moods, which in turn are influenced by factors irrelevant to the object to be judged (see Clore, Schwarz, & Conway, 1994; Ketelaar & Clore, 1997 for reviews). Following this causal chain, we see that the stimulus that induced the mood had an influence on the judged variable, even though the two have nothing to do with each other.

This influence of one variable on another, when the two objectively have nothing in common, is universally taken as an error, and the literature on affect and social information processing abounds with such misattribution effects. For example, this literature reports that people evaluate things more positively when they are in good moods than when they are in bad moods, even if the things they are evaluating are unrelated to the cause of their moods (see Ketelaar & Clore, 1997). People rate their life satisfaction higher on sunny days than on cloudy days (Schwarz & Clore, 1983). People in good

moods also evaluate arguments less critically than people in bad moods, being equally swayed by counter-attitudinal messages regardless of the strength of the argument. And people in good moods tend to employ stereotypes more often and appear to utilize biased styles of information processing about people, about political parties and movie genres, more so than people in bad or neutral moods.

From an evolutionary perspective, however, misattribution can not be the end of the story. Moods, an obvious and salient feature of everyday life, could not have evolved with the function of making stupid misattributions (Nesse, 1990). If moods exist as complex, species-typical characteristics, then they are likely to have had (or have been the byproduct of) some adaptive function in evolutionary history. Thus the question arises: What adaptive problem could mood have solved in evolutionary history? Oddly enough, the utility of moods, commonly viewed as among the most special of human attributes, may be best reflected in the beneficial consequences of sensitization and habituation processes (Peeke & Petrinovich, 1984), which occur in nearly all species and response systems.

In sensitization, if a stimulus that would not otherwise elicit a strong response is preceded by a stimulus that elicits a strong response (such as food or an electric shock), it elicits a stronger response than if it were presented on its own. This is nothing more than the well-known phenomenon of a jolt making one "jumpy" for some time after it's occurred. If you've just received an electric shock, an unexpected tap on the shoulder is liable to startle you. You wouldn't ordinarily react strongly to a tap on the shoulder; you only do so on this occasion because you earlier received a shock. By contrast, in habituation, repeated exposure to a stimulus that proves unimportant reduces responding to that stimulus. When a child watches acts of violence on television, these violent images initially produce reactions of fear and revulsion. But if they occur repeatedly without any physical harm to the person viewing them (as is often the case when a child watches television), they may begin to lose their effect. In the case of viewing acts of violence on television, many people are concerned that once children habituate to violent images, they may not respond with the appropriate urgency when they are confronted with violence in real life.

Sensitization and habituation can be viewed as two sides of the same coin: a stimulus that occurs repeatedly and signals nothing of importance might well come to be ignored (habituation); and a stimulus that occurs and portends the presence of additional relevant stimuli might well come to evoke more responding (sensitization). In fact, the more popular name for habituation as it applies to the television viewing of children is de-sensitization. It is also intuitively plausible that sensitization and habituation would enhance an organism's adaptive fitness, provided that the positive events really do predict subsequent positive events, and negative events subsequent negative events.

The adaptive properties of sensitization and habituation were elegantly demonstrated by Todd and Miller (1991). They showed by computer simulation that in "clumpy" environments, where the presence of one clump of food is associated with a greater likelihood of encountering another nearby clump of food, organisms capable of sensitization and habituation have a selective advantage over organisms without these learning tools. A clumpy environment as Todd and Miller (1991) defined it is one where, if food has just arrived, more food is especially likely to arrive again in the near future. Clumps can and will occur in random environments of any sort: if you toss a coin many times, you will occasionally see five heads in a row, for example. What Todd and Miller (1991) did in their simulations was to create environments that were systematically clumpy, in other words, where if you flip heads once, you always flip five subsequent heads in a row. This is not a phenomenon restricted to computer simulations, however. The real world has rain forests, where everything is abundant, and deserts, where everything is scarce except sand. Food is a predictor not only of more food but also of water, and hunger predicts thirst. Todd and Miller (1991) demonstrated that under such clumpy conditions, sensitization and habituation make sense. If you've recently been shocked, then you are likely to be shocked again soon, and it makes sense to jump away from the next stimulus, whatever it is. This might prove embarrassing if the next stimulus happens to be a simple tap on the shoulder, but this is a small price to pay if, over the long run, you manage to avoid a good number of shocks. Similarly, habituation makes sense when an initially startling stimulus reliably has no undesirable consequences for the short-term future. While there might be an adaptive advantage to fear of the dark, many dark situations are harmless, and it makes sense to grow confident in encountering them. Of course, once one has been mugged in a dark alley, the harmless

"clump" has come to an end; sensitization becomes the appropriate strategy, and the quicker it can happen, the better (see Pinker, 1997, p. 348-351 for discussion of related research on probabilistic reasoning).

In a world where good events (such as food) clump together not only with similar good events (other food) but also with other good events (such as water), moods are eminently sensible, in the same way that sensitization and habituation are sensible. A good mood may be interpreted as sensitization to good events (or as habituation to bad ones). Such sensitization might take the form of increased search and gathering, regardless of what one finds. Identically, a bad mood may be sensitization to bad events (or habituation to good ones). This could take the form of inactivity, an attempt not to encounter anything, since the things you encounter are likely to be harmful. If good things have come your way recently, it makes sense to prepare for more good things of all kinds; and if bad things have been your lot, it makes sense to prepare for, and protect against, more of them. If you have suffered a major loss, in the natural environment, more troubles may be on the way, and a generalized reduction in activity might be an adaptive reaction to that loss. This may be taken as a model of depression, which is often triggered by significant life losses and includes among its most important manifestations a general reduction in normal activity of both vocational and recreational varieties (see Nesse & Williams, 1994).

Conclusion

There is a bright future for the study of the role of affective phenomena in information-processing mechanisms. Research on these lines has begun already, sometimes without the researchers' awareness. We believe that one promising approach stems from Simon's (1967) view of emotions as quick and ready goal-selection mechanisms. This view has produced two distinct lines of research: one on the interruption of ongoing goal pursuit operations, and the other on the arousal function of emotions. We believe the former to be the more promising avenue, and have presented evidence for this view that is sometimes empirically based, sometimes simulation-driven, and sometimes more speculative. Obviously, this is only a first step. Empirical research on the problem of goal selection and the role of affective and emotional processes in this domain is still rather sparse, but important groundwork has already been laid.

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