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CONTENT AND DISCONTENT: INDICATIONS AND IMPLICATIONS OF DOMAIN SPECIFICITY IN PREFERENTIAL DECISION MAKING

William M. Goldstein and Elke U. Weber

I. Introduction

Research on preferential decision making has been and largely continues to be dominated by the use of a particular kind of stimulus material: simple monetary gambles. Sometimes other highly structured stimuli are used (e.g., apartments described in terms of monthly rent and distance from work), but almost always the stimuli have an incomplete and schematic form that conveys a generic quality to the choice alternatives. Although research has also been conducted on moral decision making (Baron, 1993; Mellers & Baron, 1993), legal decision making (Hastie, 1993; Lloyd-Bostock, 1989), medical decision making (Bursztajn, Feinbloom, Hamm, & Brodsky, 1990; Schwartz & Griffin, 1986), and political decision making (Sniderman, Brody, & Tetlock, 1991), as well as some other content-specific forms of decision making, the fact remains that the vast majority of studies on preferential choice and judgment have employed simple monetary gambles or other highly structured and content-impooverished stimuli. This state of affairs contrasts sharply with several other areas of psychology, where the *semantic content* of the stimuli, that is, what the task is "about," has been found to influence behavior, and where energetic research has been undertaken to identify functionally distinct domains of content, to isolate the

affected stages of psychological processing, and to delineate the responsible psychological mechanisms (Hirschfeld & Gelman, 1994).

Our impression is that decision researchers have regarded these developments in neighboring fields with considerable suspicion, but for reasons that may not be readily apparent to others. It may appear that decision researchers fear a loss of parsimony. It may indeed seem a poor trade to exchange familiar content-free taxonomies of decision problems (e.g., decisions under uncertainty, risk, and certainty) for an explosion of content-specific categories of decisions (e.g., career decisions, housing decisions, animal, mineral, and vegetable decisions, etc.), each of which may require a different theory. However, in addition to a desire for parsimony, we believe that decision researchers have reservations that are theoretically based. The prevalent use of simple gambles as stimuli is sanctioned by fundamental metatheoretical assertions about the "essence" of decision making, coupled with the belief that generalizability is enhanced by studying decision making in its "essential" form. If the metatheory of decision research has been underappreciated by others, we believe that decision researchers often reciprocate by failing to appreciate the reasons why many researchers have come to accept content specificity as a fact and as a research topic. Various areas of psychology have had their own metatheories to contend with, and have given up the dream of content-free accounts of behavior only when forced to by the data.

The purpose of this chapter is to critique the metatheory that guides most research on preferential judgment and choice, which we call the *gambling metaphor*, but to do so specifically with respect to the issue of content effects. Others have voiced concerns at the level of general metatheory, but these have related mainly to other issues (which will be discussed later). Some possible exceptions notwithstanding (Beach & Mitchell, 1987; Hastie, 1991), these criticisms need not be interpreted as questioning the content-impoverished nature of the stimuli that are used almost universally in studies of preferential decision making. Such a critique is the burden of this chapter.

It should be emphasized that we are restricting our scope to the study of preference and evaluation, that is, to decisions about what is "good." Although judgment and decision researchers collectively have devoted less attention to the possibility that behavior may depend on the semantic content of the stimuli than have researchers in other areas of psychology, within decision research, attention (or inattention) to the issue has been uneven. Researchers interested in learning have shown the most concern toward content, those studying probabilistic judgment have shown less (these areas of research will be discussed later), and investigators of preference and evaluation appear to have shown the least concern. Although

research on probabilistic judgment has shifted from reliance on bookbag-and-poker-chip problems to word problems, an analogous shift has not taken place in research on preferential judgment and choice. In this area of decision research, simple monetary gambles remain as important to researchers as fruit flies to geneticists (Lopes, 1983).

The use of gambles as stimuli in psychological experiments is a reasonable extension of some time-honored lines of thought. We review this background to show how compelling the use of gambles can be. Then, we critique the gambling metaphor in two ways. First, we briefly review several areas of psychology in which the semantic content of stimuli has been found to be an important determinant of behavior: in memory, animal learning, categories and concepts, deductive reasoning, problem solving and expertise, and cognitive development. The psychological mechanisms underlying preferential decision making overlap sufficiently with those in other areas of psychology that decision researchers *should* draw from the substantive results concerning the effects of semantic content. We also find interesting historical parallels between developments in decision research and those in some of the other areas we discuss (especially memory), suggesting that thinking in decision research may evolve in similar ways. Our second line of criticism is more direct. We review the research on preferential decision making that bears on the issue of content dependence. We find a number of studies that might be interpreted as supporting the view that content effects are present and interesting, but they do not necessarily impugn the core theory of the gambling metaphor. Other recent studies, however, are much more damaging. They provide evidence that the central variables of the gambling metaphor—degree of belief and degree of desirability—cannot support generalizations at the level of analysis to which the gambling metaphor aspires. Finally, we sketch our views of what a theory of content effects in preferential decision making might look like if it is to maintain a reasonable degree of parsimony.

II. Metatheory of Preferential Decision Research: History of the Gambling Metaphor

In the late 1940s and 1950s, a number of psychologists became aware of work in economics and statistics that had direct implications for psychological measurement. The view that psychological measurement is central to the establishment of a scientific psychology goes back to Immanuel Kant, who concluded that psychological measurement was unattainable and that psychology therefore could never be more than a “merely” empirical science. Gustav Fechner (1860) proposed a method of psychological measurement,

but because it relied on the prior measurement of response probabilities, it failed to achieve the goal of “fundamental” measurement, that is, measurement without any prior measurement of any kind. Nevertheless, Fechner’s work was extremely influential and, as developed further (especially by Thurstone, e.g., 1927; see [Thurstone, 1959](#)), became the basis for much of the work on psychological measurement in the first half of this century.

In 1947, von Neumann and Morgenstern published the second edition of their book, *Theory of Games and Economic Behavior*, in which they listed conditions under which a person’s choices among gambles could be used to infer a “utility function” for the outcomes of the gambles, which in turn could be used to describe the person’s choices. That is, if the conditions were satisfied, people’s choices could be described as if they were choosing so as to maximize the expected utility of choice outcomes. Expected utility was seen by psychologists as an interesting model of individual choice behavior, and they (and others) soon undertook to test it (Preston & Baratta, 1948; Mosteller & Noguee, 1951). Even more exciting was the fact that von Neumann and Morgenstern were a hair’s breadth away from fundamental measurement of a psychological variable: utility. However, because von Neumann and Morgenstern required the prior measurement of the probabilities with which events occurred in the gambles offered to subjects, they did not quite achieve fundamental measurement. Nevertheless, von Neumann and Morgenstern’s approach was quite different from Fechner’s, and it generated much interest. By 1954, Leonard J. Savage had extended the von Neumann and Morgenstern approach to gambles whose payoffs depended on the results of uncertain events, for example, the result of an election or the weather, without prior measurement of the probabilities. In his book, *The Foundations of Statistics*, Savage provided conditions under which a person’s choices could be used to infer a “subjective probability function” as well as a “utility function,” and thus Savage spelled out conditions for true fundamental measurement of these psychological variables.

Psychologists then began to test whether these conditions were satisfied, and this stream of psychological research on decision making was off and running (Edwards, 1954; Thrall, Coombs, & Davis, 1954). In this research, one of the presuppositions that psychologists adopted is what we call the gambling metaphor. The examples in Savage’s book make it clear that gambling decisions were believed to be prototypical of virtually *all* decisions. Almost any contemplated action, for example, where to go to school, what job to take, or whom to marry, will have consequences that cannot be predicted with certainty but which vary in their likelihood and desirability. In this sense, then, real-life decisions have the same structure as gambles. Moreover, because this applies to virtually all decisions, *life is a gamble*.

The generality of this metaphor leads directly to an argument for a simplification in research practice: if all interesting real-life decisions are fundamentally like gambling decisions, then real-life decision processes can be studied in the laboratory by asking people to make gambling choices. Bolstered by this argument, simple monetary gambles have become the primary stimulus material used in research on preferential decision making. Also, because of the appeal of the argument that all decisions can be reduced to the same structure, decision researchers have resisted the implications of recent findings on domain specificity, namely that *content* influences psychological processes.

Although the metaphor of life as a gamble apparently came to psychology via von Neumann and Morgenstern (1947) and Savage (1954), its origins are considerably older, dating back to Jakob Bernoulli's (1713) *Ars Conjectandi*. Discussions of gambling figured heavily in the mid-seventeenth century correspondence between Pascal and Fermat, but unlike Bernoulli, these early probabilists did not consider gambles to be representative of all decision problems. Rather, the very early probabilists turned to the law, both for a source of ideas (about degrees of certainty) and for a source of applications (e.g., aleatory contracts in matters of insurance, annuities, fair shares of uncertain profits, and games of chance; see Daston, 1988). By contrast Bernoulli made it clear that he was pursuing probability as "a general theory of rational decision under uncertainty, not just a mathematization of legal practice" (Daston, 1988, p. 44). He was seeking a theory that would apply to "choices about which witness (or creed) to believe, which venture to invest in, which candidate to elect, what insurance premium to charge, which scientific theory to endorse" (Daston, 1988, p. 50).

The generality of the gambling metaphor was reinforced by Bernoulli's interpretation of probability. Daston (1988) says:

We owe to Bernoulli the classical interpretation of probability as a state of mind rather than a state of the world. . . . Bernoulli insists that the throw of a die is "no less necessary (*non minus necessario*)" than an eclipse. The only difference between the gambler and the astronomer lies in the relative completeness of their respective knowledge of dice and eclipses, and a people ignorant of astronomy might well gamble on the occurrence of eclipses. "Contingent" events only exist relative to our ignorance, so that one man's contingency might easily be another's necessity. (pp. 34–35)

This view of probability as a degree of knowledge is entirely consistent with Savage's (1954) notion (anticipated by Ramsey, 1931) of "personal probability" as a degree of belief. Moreover, by so enlarging the scope of events to which the concept of probability applies, this view strengthens the position that all of life's decisions have the same structure as games of chance.

The generality of the gambling metaphor was supported in an analogous way by Jakob Bernoulli's nephew, Daniel. Daniel Bernoulli (1738), although preceded by Gabriel Cramer (1728) as Bernoulli himself states, is usually credited with the idea that people do not (and should not) deliberate directly about the monetary amounts that might accrue to them in a game of chance (or from an insurance contract, etc.) (correspondence of Gabriel Cramer to Nicholas Bernoulli in a letter dated May 21, 1728.). Instead, people deliberate about the *worth* of that money to them, its *utility*, which depends on people's individual circumstances (e.g., their wealth). As Cramer (1728) put it, "Mathematicians value money in proportion to its quantity, commonsense men in proportion to its use" (quoted by Jorland, 1987, p. 159). Bernoulli's detailed examples referred to the utility of money, and the specific (logarithmic) utility function that Bernoulli proposed is only defined for a quantitative argument (e.g., money). Nevertheless, in his discussion, Bernoulli at least implied that the concept of utility was to be applied to other "items" as well, including the abstract notion of a person's "productive capacity" (D. Bernoulli, p. 25; see Daston, 1988, p. 74, for links to contemporary economic theory). In this way, Daniel Bernoulli's work can be seen as enlarging the scope of the "outcomes" that must be addressed by a theory of behavior under uncertainty. Whether a gamble paid off in monetary amounts or in another "currency" was immaterial. What mattered was the subjective *value* placed on the potential outcomes by the decision maker.

In laying out the logic and history behind the gambling metaphor's position that monetary gambles may be taken as emblematic of all of life's decisions, we have implicitly relied on another assumption. So far, the argument has proceeded roughly as follows. Monetary gambles are characterized by two sorts of variables: (1) the amounts of money that might be won or lost, and (2) the probabilities with which these outcomes actually occur. Through Daniel Bernoulli's treatment of utility, we are led to think of the monetary outcomes merely as representatives of any valued consequences that might result from the choice of an alternative. What counts is that people place more or less *value* (desire, want, hope, fear, etc.) on different outcomes. By using Jakob Bernoulli's interpretation of probability, we are led to think of the probabilities of the monetary gamble merely as representatives of the degrees of *belief* that a person might hold about the prospects that ensuing events will actually produce the valued outcomes. The implicit assumption in this approach, the gambling metaphor's *reductionist* aspect, is that all of the considerations involved in a decision can be reduced to two types of variables: (1) (degree of) value and (2) (degree of) belief.

The position that people evaluate their alternatives in terms of beliefs and values—that people take deliberate actions (and only those deliberate actions) that they *believe* will advance their *valued* goals—is a position that stretches back to antiquity. Schick (1991) traces this view to Aristotle in *De Motu Animalium* and *Nichomachean Ethics*. Some philosophers have held that it is necessary to assume some form of this view (characterized as assuming that people are rational in a very general sense) to be able to infer someone's beliefs from his or her behavior, or indeed to infer that the person has any beliefs at all (Cherniak, 1986; Davidson, 1973, 1974, 1975; Dennett, 1978, 1987; Stich, 1990, chap. 2, traces all variants of this idea to a passage in Quine, 1960). The view that people evaluate alternatives in terms of beliefs and values is so intuitive and so entrenched in Western culture that philosophers tend to refer to it as “folk psychology,” and the connection to decision theory has not gone unnoticed (Pettit, 1991). (It should be noted that philosophers sometimes use the term in what seems to be a derogatory way. The claim is that a belief–value theory of behavior is a naive “folk” theory in much the same way that naive, intuitive, untutored physics is a “folk” theory, and moreover that both theories are empirically false. See Christensen and Turner, 1993, for papers on various aspects of these issues.)

The gambling metaphor is a special case of belief–value “folk” psychology that directs attention not to beliefs and values in themselves, but to the *degree* of belief and the *degree* of value. From this perspective, one's *reasons* for liking something or for thinking that an event is likely to happen, or more generally the *processes* by which one determines one's beliefs and values, are immaterial to the final choice among alternatives. Thus, the gambling metaphor is positioned at a level of analysis where the semantic content of the choice alternatives is irrelevant. It does not mandate the use of simple monetary gambles as stimuli, but it can be taken as theoretical justification.

It is important to note that the psychologists who drew inspiration from the work of von Neumann and Morgenstern (1947) and Savage (1954) didn't immediately, or unreflectively or exclusively, begin employing simple monetary gambles as stimuli. For example, Coombs and Beardslee (1954) reported an experiment in which the prizes in an imaginary lottery consisted of a rattan chair, an electric broiler, a typewriter, a radio, and a portable phonograph. Edwards commented in his well-known *Psychological Bulletin* paper (1954) that “Coombs is reluctant to use sums of money as the valuable objects in his experiments because of the danger that subjects will respond to the numerical value of the amount of dollars rather than to the psychological value. Therefore he used various desirable objects (e.g., a radio) as

stimuli,” Nevertheless, simple monetary gambles soon came to predominate.¹

III. Content and Its Discontents

A. NONSENSE SYLLABLES AND BRITISH ASSOCIATIONISM

The prototypical example of the use of content-impoverished stimuli in psychological research is provided by Ebbinghaus' (1964) study of memory. Among the many important contributions for which he is remembered, Ebbinghaus was the originator of stimulus materials known as “nonsense syllables.” Although the use of nonsense syllables has since lost its popularity, we think the use of nonsense syllables by memory researchers provides an illuminating and provocative analogy to the use of simple monetary gambles by decision researchers. This comparison is not meant to be disparaging (to either party). On the contrary, we think this comparison helps to illustrate why the use of content-impoverished stimuli can be so appealing. For both nonsense syllables and monetary gambles, the choice of stimulus materials was backed by theoretical frameworks that strongly suggested that the generalizability of results would be enhanced, not limited, by the use of these stimuli. In neither case were stimulus materials chosen lightly, or merely for convenience. Moreover, their use enabled researchers to make significant progress, discovering results and developing methods of enduring importance. Nevertheless, in the case of memory research, as well as in the other areas that we review later, the recurring finding is that behavior is affected by the semantic content of the stimulus materials employed. In these areas, the data force the conclusion that the exclusive use of content-impoverished stimuli simply cannot support theory at the level of generality implied by the metatheory. Similar data are beginning to become available in work on preferential decision making.

Ebbinghaus (1964) described his reasons for employing content-impoverished materials as follows:

The nonsense material, just described, offers many advantages, in part because of this very lack of meaning. First of all, it is relatively simple and relatively homogeneous. In the case of the material nearest at hand, namely poetry or prose, the content is now

¹ One of the present authors (W. M. G.) was a student of Coombs and recalls Coombs saying that he gave up the use of nonmonetary objects because monetary amounts seemed not to present the difficulty he had anticipated and because nonmonetary objects presented difficulties of their own. As an example, Coombs described a subject who placed high value on a pair of binoculars during football season, but low value on the binoculars after football season ended.

narrative in style, now descriptive, or now reflective; it contains now a phrase that is pathetic, now one that is humorous; its metaphors are sometimes beautiful, sometimes harsh; its rhythm is sometimes smooth and sometimes rough. There is thus brought into play a multiplicity of influences which change without regularity and are therefore disturbing. Such are associations which dart here and there, different degrees of interest, lines of verse recalled because of their striking quality or their beauty, and the like. All this is avoided with our syllables. (p. 23)

Ebbinghaus goes on to say that nonsense syllables can be used to generate an endless supply of new series that are comparable with each other, "while different poems, different prose pieces always have something incomparable" (p. 24). Also, series of nonsense syllables can be varied quantitatively, "whereas to break off before the end or to begin in the middle of the verse or the sentence leads to new complications because of various unavoidable disturbances of the meaning" (p. 24). Thus, Ebbinghaus used meaningless materials because they conferred certain practical advantages, and because their use reduced response variability caused by factors outside the main focus of his study.

It is good experimental practice to reduce error variance by careful selection of stimuli and by control of extraneous factors. However, this by itself is not enough to account for the popularity of nonsense syllables and gambles. In both cases, the stimulus materials were sanctioned by widely respected *theoretical frameworks* that (1) provided guidance about exactly which factors should be regarded as "extraneous" (e.g., meaningful content), and (2) provided a rationale for believing that the simplified stimuli retained exactly the structure required to get to the bottom of issues at the very foundation of psychology.

To understand this in the case of Ebbinghaus' meaningless materials and his experimental task of serial recall, one must consider a combination of the following beliefs: (1) empiricism (i.e., the assumption that all knowledge comes from experience), (2) sensationist atomism (i.e., the assumption that elementary sensations and memories of sensations form the indivisible "atoms" of experience which are combined to form "complex ideas" and which occur in sequences to form the "train of thought"), and (3) associationism (i.e., the assumption that ideas or sensations experienced in contiguity, at the same time or in quick succession, become "associated" and are thereby capable of eliciting one another in sequence or of coalescing into "complex ideas"). Given such a position, a study of the way that new materials without prior associations (e.g., nonsense syllables) come to be associated as a result of exposure to sequences (as in the serial recall task) is nothing less than a study of the ontogeny of mind. Titchener, who was perhaps the most outspoken and influential proponent of this theoretical position, considered "the recourse to nonsense syllables, as the means to

the study of (conscious) association, . . . the most considerable advance in this chapter of psychology, since the time of Aristotle" (Titchener, 1909, pp. 380–381; quoted by Verhave & van Hoorn, 1987, p. 89). (To be fair, it should be noted that Ebbinghaus himself did not subscribe to any simple version of associationist theory; see Hoffman, Bamberg, Bringmann, & Klein, 1987; Verhave & van Hoorn, 1987. In fact, some of Ebbinghaus' own experiments demonstrated that a simple chaining of associations between adjacent items in a list could not account for the observed behavior. Moreover, Ebbinghaus *was* concerned with meaningful material as well as nonsense syllables; throughout his book, Ebbinghaus made comparisons between the learning of nonsense syllables and the learning of poetry.)

Simple gambles are as prevalent in decision research as nonsense syllables ever were in memory research (see Newman, 1987). In both cases, the content-impooverished stimuli, and the associated theoretical frameworks, have facilitated the discovery of many important phenomena and the development of many important methods. Our concern in this chapter, however, is with the limitations. Although neither early memory researchers nor current decision researchers have devoted all their efforts to the study of meaning-free materials, and although many insights have resulted from studies employing such materials, it is also true that the exclusive study of nonsense syllables would have prevented memory researchers from learning about such intrinsically content-based phenomena as: (1) the distinction between verbatim memory and memory for gist (Sachs, 1967), (2) distinctions among semantic, episodic, and procedural memory (Anderson, 1976; Tulving, 1972), (3) semantic priming effects (Meyer & Schvaneveldt, 1971), and (4) schema-based intrusions, deletions, and reorganizations (Bransford & Franks, 1971; Jenkins, 1974).

The point is not merely that the experimental practice of using content-impooverished stimuli would have failed to discover a number of interesting phenomena, but that the particular phenomena that would have been overlooked are those that *conflict* with the overarching theoretical framework. The demonstration that the *meaning* of material exerts a causal influence on psychological processing violates associationism. Fodor (1992) put it this way:

. . . precisely because the mechanisms of mental causation were assumed to be associationistic (and the conditions for association to involve preeminently spatio-temporal propinquity), the [British] Empiricists had no good way of connecting the *contents* of a thought with the effects of entertaining it. They therefore never got close to a plausible theory of thinking, and neither did the associationistic psychology that followed in their footsteps. (p. 20, emphasis in original)

By analogy, our concern is not only that decision researchers may be overlooking a similarly rich set of phenomena, but that the gambling

metaphor may be supporting an experimental practice that makes it impossible to detect its limitations. To be clear about this, we do not object to the use of gambles as stimuli per se, but we argue that the predominant use of these stimuli may impede the *theoretical* advance of recognizing the limited circumstances in which degree of belief and degree of value (rather than the beliefs and valued goals in themselves and the knowledge base in which they are embedded) suffice to account for behavior.

B. THE GENERAL CLIMATE IN PSYCHOLOGY

In this section, we briefly review a number of areas of psychology in which initially content-independent accounts of behavior have been forced to change in the face of content-dependent effects. We believe these reviews are relevant for two reasons. First, we think decision researchers should draw from the substantive findings of researchers in related areas. Second, we think it is useful to see how researchers in neighboring fields have dealt with the often unwelcome prospect that behavior depends on the semantic content of the stimuli.

1. *Learning*

Contrary to Plato's doctrine of formal discipline, according to which study in abstract fields (e.g., arithmetic) provides general training for reasoning in all domains, early research on the transfer of learning (Thorndike & Woodworth, 1901) indicated remarkably little generality in the matter of *what* is learned. As a consequence, regularities in an organism's overt behavior were taken to depend on the historical accident of its specific experiences (i.e., its reinforcement history). No particular behavioral regularities could be expected on theoretical grounds to generalize across situations or organisms. Nevertheless, the matter of *how* learning takes place was considered to be entirely different. Behaviorists' refusal to distinguish among stimuli or responses on the basis of their content indicated a commitment to extremely general, abstract, content-independent laws of learning. However, the *how* of learning turned out to be not entirely independent of *what* was being learned, and the commitment to content-independent laws of learning could not be maintained. In a historical review of learning studies, Kimble (1985) chided himself for having failed to see this sooner. Commenting on his earlier opinion that "just about any activity of which the organism is capable can be conditioned, and these responses can be conditioned to any stimulus that the organism can perceive" (Kimble, 1956, p. 195), he remarked:

Kimble should have known better. As early as 1930, C. W. Valentine had reported being unable to repeat Watson's demonstration of fear conditioning in children, using a pair of opera glasses instead of a white rat as the conditioned stimulus. It was well-known laboratory lore that training a rat to press a bar or a pigeon to peck a key to turn off shock was next to impossible. More formal evidence along these lines was soon to accumulate to prove that the assumption of *equipotentiality* is wrong: animals are *prepared* to form certain associations and *counterprepared* to form others (Seligman & Hager, 1972). (Kimble, 1985, pp. 60–61, emphasis in original.)

Results indicating violations of equipotentiality (e.g., Garcia & Koelling, 1966) were slow to win acceptance (Lubek & Apfelbaum, 1987). However, behaviorists did eventually take steps toward content dependence in the laws of learning.

2. *Categories and Concepts*

Categories were classically conceived to be collections of entities that satisfy individually necessary and collectively sufficient conditions of membership (e.g., an “even” number is an integer that is divisible by 2 with no remainder). However, the discovery that natural categories have graded structure, that some members are considered “better” or more “typical” members than others, contradicted the classical conception, at least as a psychological model of category representation (Rosch & Mervis, 1975; Smith, Shoben, & Rips, 1974; people even discriminate among different examples of even numbers, see Armstrong, Gleitman, & Gleitman, 1983). In subsequent research conducted to account for typicality and related effects, debate has arisen as to whether categories are represented abstractly (e.g., by prototypes; Posner & Keele, 1968) or by storage of specific categorized instances (Brooks, 1978; Medin & Schaffer, 1978). Although it can be difficult to distinguish between prototype and exemplar models (Barsalou, 1990), the weight of evidence seems to favor the specific over the abstract (see Medin & Ross, 1989, for a review).

Exemplar models are specific in that they posit that categories are represented by memory traces of the particular instances encountered, and therefore they posit that regularities in people's categorization *behavior* depend on the historical accident of their specific experiences (i.e., history of encounters with exemplars). Nevertheless, they portray the matter of *how* categorization takes place as being entirely different, proceeding according to general, abstract, content-independent laws. However, a recent program of research on the coherence of people's categories appears to be forcing a modification of this view (Medin & Ortony, 1989; Murphy & Medin, 1985; Wattenmaker, Dewey, Murphy, & Medin, 1986; Wattenmaker, Nakamura, & Medin, 1988). These investigators found that the “structure” of encountered exemplars (i.e., the pattern of presences and absences among

abstractly coded features of the exemplars) is insufficient to account for category learning. Rather, the identity of the features according to the cover story—and the activated knowledge structure—is crucial to the behavior. For example, Wattenmaker et al. (1986) found that they could facilitate the learning of linearly separable categories, or the learning of nonlinearly separable categories, depending on the knowledge structures they made salient. Wattenmaker et al. (1988) observed that “it is not the case that ease of learning can be specified in terms of the configuration of independent features inherent in the category structure” (p. 220). Rather, these investigators emphasize a knowledge-based approach to conceptual coherence and an explanation-based approach to categorization. In other words: (knowledge about) content matters.

3. *Deductive Reasoning*

Some of the earliest and most sustained interest in the role of semantic content has been shown by researchers who study deductive reasoning. One line of research concerns the effects of stimulus material that arouses people’s emotions or prejudices (Janis & Frick, 1943; Kaufmann & Goldstein, 1967; Lefford, 1946). This research might be seen as a precursor to recent work on “motivated” cognition (Kunda, 1990; Larrick, 1993). A second line of research, stretching back nearly 70 years (Wilkins, 1928), compares the effect of material that is (1) abstract and symbolic, versus (2) concrete but unfamiliar, versus (3) concrete and familiar. A still energetic wave of research on this topic was begun some 23 years ago by Wason and Shapiro (1971) and by Johnson-Laird, Legrenzi, and Legrenzi (1972). These studies investigated Wason’s (1966) well-known “four-card problem.” Subjects are shown a deck of cards, each of which says on one side either “p” or “not p,” and on the other side says either “q” or “not q.” Four cards are dealt on the table so that the sides facing the subject read “p,” “not p,” “q,” and “not q.” Subjects are then asked to indicate exactly those cards that must be turned over in order to test whether the rule “if p then q” is satisfied by the deck. When the problem is given to people in the abstract form just described, they do spectacularly badly at it. However, the studies by Wason and Shapiro (1971) and by Johnson-Laird et al. (1972) showed that when the task is fleshed out with understandable content, there is remarkable improvement. Wason and Johnson-Laird (1972) commented that “Taken together, these two experiments force on us a radical reconsideration of the role of content in reasoning. The nature of the material would seem to be decisive in terms of whether the subjects exercise rational thought” (p. 193).

A great deal of research on the four-card problem ensued, and it was found that concrete stimulus materials did not always produce marked

improvement in performance (e.g., Manktelow & Evans, 1979). This led to the proposal (Griggs & Cox, 1982) that it is not the concreteness of the material per se that improves performance, but sufficient *familiarity* with the domain to allow the recall of specific instances that could falsify the rule. Once more, people's behavior was described as depending on the historical accident of their specific experiences. Thus, *behavior* could be content-dependent while relying on general, abstract, content-independent *mechanisms* of memory storage and retrieval. This version of content independence was, however, also challenged. In papers that provided the source for much of our own interest in content effects, Cheng and Holyoak (1985; Cheng, Holyoak, Nisbett, & Oliver, 1986) argued that "people often reason using neither syntactic, context-free rules of inference, nor memory of specific experiences. Rather, they reason using abstract knowledge structures induced from ordinary life experiences, such as 'permissions,' 'obligations,' and 'causations'" (Cheng & Holyoak, 1985, p. 395). Cheng and Holyoak argued that people reason according to *pragmatic reasoning schemas* that stand at an intermediate level of abstraction and relate to people's goals.

In one striking example that shows that improvement on the four-card problem relies on the cuing of an appropriate *schema* which is neither purely syntactic nor bound to any particular domain-specific content, Cheng and Holyoak (1985, Experiment 2) asked subjects to imagine themselves as authorities checking to see whether people were obeying regulations of the form, "If one is to take action A, then one must first satisfy precondition P." In contrast with only 19% who correctly verified an arbitrary rule ("If a card has an A on one side, then it must have a 4 on the other side."), 61% of the subjects correctly verified the regulation. Although there is debate about the origin and identity of the reasoning schemas that people use (Cheng & Holyoak, 1989; Cosmides, 1989; Gigerenzer, in press; Gigerenzer & Hug, 1992), there seems to be consensus about the appropriateness of an intermediate level of abstraction.

4. *Problem Solving and Expertise*

In the 1960s and early 1970s, work on problem solving and expertise focused on general heuristics (e.g., means-ends analysis) by which a person could limit search through an abstract problem space (Newell, Shaw, & Simon, 1958; Newell & Simon, 1972). Soon thereafter, it became apparent that expertise was not driven by superior general-purpose search heuristics so much as by domain-specific knowledge that could enhance memory and promote specialized inference patterns within the domain (Anderson, 1987; Chase & Simon, 1973a, 1973b; Chi, Feltovich, & Glaser, 1981; Larkin,

McDermott, Simon, & Simon, 1980; however, see Holyoak, 1991, for an argument that superior domain knowledge does not explain all phenomena of expertise).

One particular line of research that directly addresses the role of content in the acquisition of expertise is concerned with the way that people access and use previously learned (base) problems in constructing analogies to help solve new (target) problems (for reviews, see Medin & Ross, 1989; Reeves & Weisberg, 1994). The evidence indicates that spontaneous transfer from base problems is affected by similarities and differences in both the overall content domains of the cover stories (Gick & Holyoak, 1980; B. H. Ross, 1984) as well as by the content of particular objects appearing in important relationships in the problems (Bassok, 1990; Holyoak & Koh, 1987). When people are told that the base problem is relevant to the target problem, so that the use and not the access of the base problem is the issue, people are affected by content in a way that appears to indicate a conflict between mapping structurally analogous objects from base to target, on the one hand, and mapping superficially similar objects to corresponding relational roles in the two problems, on the other hand (Bassok, 1990; Gentner & Toupin, 1986; B. H. Ross, 1987, 1989). Of course, if people *knew* which features of the base problem reflected structural (i.e., solution-relevant) properties and which reflected merely superficial content, they would map only the structural features. The apparent conflict is thought to result from the attempt to map as many features as possible, in the absence of knowledge about what really is and is not relevant.

This theoretical approach to content effects in analogical problem solving may or may not be yet another example in which content-dependent behavior is thought to depend on content-independent mechanisms. If the processes of feature matching are hypothesized to be domain-general, then this issue hinges on whether the primitive “features” themselves are thought to originate in ways that are independent of the content of the base and target problems. This matter is usually considered to be outside the scope of the theories, and in practice, the experiments are generally conducted under the assumption that the features are known. However, recent research by Bassok, Wu, and Olseth (1995) addresses this issue directly. Bassok et al. (1995) argue that naive subjects, who do not have the experimenter’s understanding of the problem structure, use the content of the base problem together with its worked-out solution to abstract an *interpreted* structure which may or may not match the objective structure that the experimenter has in mind. Then subjects try to map from the base to the target problem on the basis of the features that are structural, given *their* interpretations.

To test their theory, Bassok et al. (1995, Experiment 2) first trained subjects on a base problem in which the manager of a country club assigned caddies at random to golfers and subjects had to compute the probability that the three most experienced caddies would be assigned to the three newest members, respectively. The correct answer depends on the total size of the “assigned” set (caddies) and not on the total size of the “receiving” set (golfers). Bassok et al. then tested subjects on target problems in which either carts were assigned to caddies (and so the correct answer depends on the number of carts) or caddies were assigned to carts (the correct answer depends on the number of caddies). If subjects transfer by mapping similar objects to similar roles, they should perform better on the caddies-assigned-to-carts problem because mapping caddies to caddies would give the correct answer. However, Bassok et al. predicted the reverse. They reasoned that the asymmetry in status between golfers and caddies would induce subjects to interpret the base problem in terms of a “get” relation rather than an “assign” relation: no matter who assigns what to whom, golfers “get” caddies and not the other way around. Likewise, for the target problems, caddies “get” carts (i.e., people “get” objects). Therefore, subjects should do better on the carts-assigned-to-caddies problem, because the “get” relation directs subjects to the number of to-be-gotten objects, carts, in this case the correct answer. In fact, 94% of the subjects answered correctly on the carts-assigned-to-caddies problem, and only 24% answered correctly on the caddies-assigned-to-carts problem. The results strongly support Bassok et al.’s argument that subjects map *what they interpret to be* structural features and that their interpretations are influenced by the *content* of the base problems.

5. *Cognitive Development*

Finally, we will briefly mention one more area of psychology in which content has come to be considered an important determinant of behavior. Because children begin as novices at virtually everything and become relative experts as they grow up, the literature on cognitive development has come to overlap that on the acquisition of expertise. In fact, the cognitive development literature shows a similar shift in emphasis from domain-general hypotheses (e.g., Piagetian stages of development, maturational increases in speed and capacity of the central processor) to an emphasis on the acquisition of knowledge. For example, Chi (1978) compared 10-year-olds and adults on two memory tasks: a digit-span task and a chess memory task of the sort studied by Chase and Simon (1973a, 1973b). The adults were superior to the children on the digit-span task, replicating a well-known result. However, the results of the chess task contradicted the

hypothesis of a domain-general difference in memory capacity. The children, all experienced chess players, remembered the positions of more chess pieces than the adults, all of whom were chess novices. (See Chi & Ceci, 1987, for a review of the role of content knowledge in memory development.) More generally, as remarked by Carey (1990):

It now seems unlikely that the grand simplifying description of universal developmental stages that Piaget proposed is correct—especially if the stages are interpreted as reflecting domain-general changes in the representational or computational capacity of the information processor. It seems that cognitive development is mainly the result of acquiring knowledge in particular content domains. (pp. 161–162)

(See also Hirschfeld & Gelman, 1994; Wellman & Gelman, 1992.)

6. *Summary and Interpretation*

It seems to us that a great deal of the reviewed research can be summarized in broad strokes as exhibiting one or more of four reactions to the prospect of content dependence, which can be arranged more or less in the following sequence. First, various areas of psychology initially sought to describe behavior at a level of analysis abstract enough to achieve generalizability across people, stimuli, conditions, and, in particular, semantic content (e.g., organisms strive to maximize reinforcement). However, because overt behavior and psychological mechanisms need not be analyzed at the same level of abstraction, it was a short step to the second stage. Specifically, by describing behavior in somewhat more concrete terms, researchers acknowledged that overt behavior depends on the individual, the stimuli, the conditions, and so on, while maintaining that this nongeneralizability of behavior was consistent with general, abstract, content-independent psychological mechanisms. Thus, differences in behavior were attributed to idiosyncratic factors of no particular interest to psychological theory (e.g., reinforcement histories, past encounters with exemplars, idiosyncratic utility functions, etc.). Third, particular psychological mechanisms of theoretical interest were deemed to be affected by content (e.g., encoding of stimulus information, retrieval of information, manipulation of encoded stimulus and/or retrieved information), but not the mechanisms considered to be of core interest (e.g., one could maintain that people employ content-independent rules of deductive inference, but that they systematically misinterpret the premises; see [Henle, 1962](#).) Fourth, content effects were acknowledged as potential influences on core mechanisms, and research was undertaken to determine the mechanisms affected and to identify functionally distinct domains of content.

A succinct, if somewhat crude rendition of this sequence takes the following form: (1) behavior is thought to be content-independent, (2) behavior is acknowledged to be content-dependent for “uninteresting” reasons that can safely be ignored, (3) behavior is thought to be content-dependent for reasons that are somewhat interesting but not central to core theory, and (4) content-dependent phenomena are seen to have important implications for theory that cannot be ignored.² In the next section, we will see that research on preferential decision making can be characterized as mostly falling in the second or third stage of this sequence, but that there are some indications that it may be moving into the fourth stage.

IV. Content Effects in Research on Preferential Judgment and Choice

Although simple monetary gambles have been the predominant stimulus material for studies in preferential decision research, the use of gambles has not been completely exclusive, and there is some research that is relevant to the issue of content effects. However, with the exception of a few studies to be discussed later, the issue of content has arisen only indirectly in (1) studies of phenomena that are attributed broadly to the way people encode decision inputs, and (2) studies of the way people deal with missing or degraded information.

A. FRAMING EFFECTS

A number of phenomena attributed to encoding are sometimes referred to collectively as “framing” effects (Tversky & Kahneman, 1981). Studies of framing address the influence of people’s perspectives, that is, whether, so to speak, it makes a difference to look at the glass as half empty or half full. To manipulate people’s perspectives, the studies all involve manipulation of decision inputs apart from net final outcomes and probabilities, and can be viewed as manipulating (aspects of) content. However, as far as we are aware, only a few studies (Schneider, 1992; Wagenaar, Keren, & Lichtenstein, 1988; discussed later) have been concerned with semantic content as such. Probably the most studied issue concerns the coding of outcomes as losses or gains relative to different reference points or aspiration levels (e.g., Kahneman & Tversky, 1979; Levin & Gaeth, 1988; McNeil, Pauker, Sox, & Tversky, 1982; Payne, Laughhunn, & Crum, 1980; Schneider, 1992; see also Lopes, 1987). Related phenomena include sunk-cost effects

² It has been said that there is a typical sequence of reactions to most new ideas. First, it’s not true. Later, it’s true but unimportant. Finally, it’s true and important but it’s old news. (This joke may contain an important truth, but it’s an old joke.)

(i.e., failure to restrict focus to future incremental outcomes without regard for unrecoverable costs already invested in particular alternatives; [Arkes & Blumer, 1985](#); [Staw, 1976](#)), status quo effects (i.e., privileged standing accorded to whichever choice alternative represents the status quo or default alternative; [Samuelson & Zeckhauser, 1988](#)), endowment effects (i.e., greater value placed on an object that is “owned” rather than on an identical object that is not owned; [Kahneman, Knetsch, & Thaler, 1990](#); [Thaler, 1980](#)), and loss aversion (subjective pleasure of gaining an object exceeded by the subjective pain of losing the same object; [Tversky & Kahneman, 1991](#)) (see [Kahneman, Knetsch, & Thaler, 1991](#), for a review of the last three effects). A set of issues known collectively as *mental accounting* concerns people’s preferences for and the effects of combining versus separating events ([Linville & Fischer, 1991](#); [Thaler, 1985](#); [Thaler & Johnson, 1990](#)) and decisions ([Luce, in press](#); [Redelmeier & Tversky, 1992](#)). An additional issue that relates to the way people encode decision inputs concerns problem formats that make the applicability of a decision principle transparent versus opaque ([Tversky & Kahneman, 1986](#)).

Each of the above “perspectival” effects is well established, but contains little or no reference to content *domain*, that is, what the decision is “about.” Possibly, content domain exerts an influence via perspectival effects by inducing people to look at things in a particular way (cf. [Bassok et al., 1995](#), discussed earlier). None of the preceding studies systematically examined content domain in this way. The following effect, however, suggests that there may be some validity to this hypothesis: in choosing between a sure loss and the risk of incurring a larger loss, people are affected by whether the problem is described as a gambling decision or an insurance decision ([Hershey, Kunreuther, & Schoemaker, 1982](#); [Hershey & Schoemaker, 1980](#); [Schoemaker & Kunreuther, 1979](#); [Slovic, Fischhoff, Lichtenstein, Corrigan, & Combs, 1977](#)). This effect is well known, but it seems to have been interpreted as demonstrating the general importance of framing, rather than as indicating a need to study the influence of content domain on preferential decision making.

B. MISSING OR DEGRADED INFORMATION

A good deal of research has been conducted on decision behavior in the face of incomplete or degraded information (e.g., [Fischhoff, Slovic, & Lichtenstein, 1978](#); [Slovic & MacPhillamy, 1974](#); [Yates, Jagacinski, & Faber, 1978](#)). One branch of this research examines whether, when, and how people draw inferences about the missing or degraded items of information ([Davidson, Yantis, Norwood, & Montano, 1985](#); [Einhorn & Hogarth, 1985](#); [Ford & Smith, 1987](#); [Huber & McCann, 1982](#); [Jaccard & Wood, 1988](#);

Johnson & Levin, 1985; Levin, Chapman, & Johnson, 1988; Simmons & Lynch, 1991; Yamagishi & Hill, 1983). Also relevant is research on the construal of information (Griffin, Dunning, & Ross, 1990; L. Ross, 1987, 1989; L. Ross & Nisbett, 1991). Although most of this research has not directly addressed the content domain of the decision problem, inferences about missing or degraded information presumably rely on knowledge about the domain. Recent research by Sanbonmatsu, Kardes, and Herr (1992; see also Kardes & Sanbonmatsu, 1993) has shown that domain experts and novices respond differently to missing information. Experts are likelier to notice that information is missing and to infer likely values for the missing items.

In sum, although the research on perspectival effects and the processing of incomplete information is voluminous, and although these topics lend themselves to the study of content effects, scholars of preferential judgment and choice have given relatively little attention to content domain as such. Perspectives taken and inferences drawn are occasionally discussed as depending on the *amount* of knowledge or *aspects* of content, but even then it is rare to connect these aspects of knowledge to what the decision is about. Our impression is that decision researchers view these streams of research as efforts to flesh out rather than test the gambling metaphor; these studies are thought to indicate how people go about arriving at their degrees of belief and degrees of value, but they do not challenge the sufficiency of these variables to account for behavior. In this sense, we think these studies represent what we refer to as a “stage 3” reaction to content effects: interesting, but not of central importance to core theory (or metatheory). Of course, challenges to a content-independent metatheory cannot be discovered if researchers rely only on content-impooverished stimuli or stimuli from a single domain. Although the results of gambling studies may well replicate in other settings, and indeed often have, we think there is reason to be cautious about the generalizability of gambling studies, and therefore reason to be dubious of the gambling metaphor.

C. CHALLENGES TO THE GENERALIZABILITY OF GAMBLING BEHAVIOR

Wagenaar et al. (1988) presented subjects with a variety of cover stories, all of which had the same deep structure, namely, versions of Tversky and Kahneman’s (1981) well-known Asian disease problem. Manipulating such aspects as the identity of the potential victims (e.g., islanders subject to a disease vs. children held hostage by terrorists) and the role of the subject as decision maker (e.g., islander vs. public health officer for the islander version; parent vs. authority for the hostage version) had a profound effect

on the choices of subjects who were all considering the “same” problem. In a sense, as Wagenaar et al. (1988) suggest, this result is a matter of framing (Tversky & Kahneman, 1981). In any case, generalizability across content domains is problematic, even when attempts have been made to hold constant the deep structure of the stimuli. Schneider (1992) obtained similar results, in that the magnitude of framing effects varied widely across scenarios that differed “only” in content (see also Frisch, 1993).

Heath and Tversky (1991) studied subjects’ choices among gambles with identical potential outcomes, but whose payoffs were contingent on different sorts of events: a random event with stated probability, having one’s answer to a general-knowledge question turn out to be correct, or giving a correct prediction for a football game or political election. Heath and Tversky (1991) found that subjects’ choices were determined not solely by the perceived likelihood of the event yielding the favorable outcome and the precision with which this likelihood could be estimated, but also by the subject’s self-perceived knowledge and “competence” in the domain of events. In one experiment, subjects predicted the results of various football games and the results of the (then future) 1988 presidential election in various states. Later, subjects rank ordered their preferences among gambles that were matched to have the same probability of winning on the basis of: (1) a chance device, (2) the subject’s own prediction in his or her strong domain (politics or football), and (3) the subject’s own prediction in his or her weak domain. Only when the probability of winning was 100% did subjects prefer to bet on the chance device. Otherwise, independent of the numerical probability of winning, subjects preferred to bet on their strong domain, the chance device, and their weak domain, in that order. In a sense, subjects were indicating that they had definite preferences among “identical” gambles; probabilities and outcomes did not capture all the relevant factors: domain still mattered.

Hogarth and Kunreuther (1995) asked subjects to assess the probability that they would buy 1-year maintenance contracts for various consumer durables (personal computer, stereo, VCR, CD player). Subjects were given the price of the product, the price of the maintenance contract, and a description of the manufacturer implying either high or low product reliability. After judging their purchase intentions for all four products, subjects considered each product again, this time judging their subjective probabilities and the likely costs of breakdowns should they occur. In a second session, subjects again rated their intentions to buy maintenance contracts for the same products, but this time subjects were given additional information about the probabilities and costs of breakdowns, specifically the same values that the subjects themselves previously had said were most likely. The result was that self-rated probability of purchase was reduced by the

explicit information by approximately the same amount as increasing the price of the maintenance contract from 5 to 10% of the product price. Again, probabilities and outcomes did not capture all the relevant factors; subjects responded differently to “identical” gambles.

In addition to these results, indicating that subjects’ purchase intentions did not generalize as one might have expected, Hogarth and Kunreuther (1995) also provided evidence that the decision *processes* did not generalize. At particular points in the experiment, they asked their subjects (1) to give free-form explanations of the reasons and arguments they had considered in judging their purchase intentions, and (2) to evaluate how much weight they had given to specific arguments listed by the experimenters. Hogarth and Kunreuther (1995) found that the kinds of arguments subjects reported depended on the information that was explicitly displayed in the problem description. Among other differences, the ratio of single-attribute arguments to multiple-attribute arguments was much smaller when probabilities and repair costs were explicitly displayed (in the neighborhood of 1.5) than when probabilities and repair costs were not explicitly displayed (approximately 3). Also, there was a subset of subjects whose arguments, independent of the display conditions, were insensitive to the attributes of the maintenance contracts or products (e.g., “I never buy these types of warranties.”). Although subjects using these “meta” strategies, as Hogarth and Kunreuther called them, did not vary their strategies across display conditions, we speculate that subjects might vary their use of attribute-insensitive strategies across content domains.

In sum, despite numerous other areas of psychology in which content domain has been found to affect behavior, despite the evidence that neither behavior *nor* underlying processes may generalize from studies of gambling to other decisions, and with only a nod in the direction of “amount” of knowledge and “aspects” of content, decision researchers have continued to rely almost exclusively on simple monetary gambles or highly schematic stimuli that are just barely fleshed out with content, and to rely on the gambling metaphor as justification for this practice. It may not *always* be incorrect to think that decisions are mediated (only) by degree of belief and degree of desirability, but we think the evidence contradicts the universality to which the gambling metaphor aspires. Indeed, the gambling metaphor has proved inadequate even when applied to games of chance (Heath & Tversky, 1991).

D. INFLUENCE OF CONTENT DOMAIN ON JUDGMENT AND DECISION MAKING

In this section, we briefly summarize selected results from two experiments that we conducted for three purposes: (1) to gather additional evidence

that semantic content influences the psychological processes underlying preferential judgment and choice, (2) to test some hypotheses about the way that processing is affected by content, and (3) to begin an exploration of the distinguishing characteristics of content domains that elicit different modes of processing. The experiments will be reported more fully elsewhere (Goldstein & Weber, in preparation).

In Experiment 1, we examined whether people would be differentially sensitive to an experimental manipulation when making evaluative judgments of stimuli from different content domains. We decided to contrast judgments about social relationships with judgments about inanimate objects (e.g., consumer items) in order to explore a broad distinction between the evaluation of people and things. Specifically, the two domains were (1) people with whom one might pursue a long-term romantic relationship potentially leading to marriage, and (2) compact disk (CD) players. We expected that people would evaluate CD players by weighing the advantages and disadvantages of the models. By contrast, for potential spouses, the work of Pennington and Hastie (1988, 1992, 1993; discussed later) suggested to us that people might try to construct stories or story fragments about what life might be like if they were to pursue the relationship.

It should be emphasized that we hypothesized the semantic content of the domain to affect only people's *preferred* mode of processing. We do not suppose that people are incapable of implementing unpreferred modes of processing. Certainly, people *could* evaluate potential spouses by enumerating and weighing their separate features, but doing so seems depersonalizing and inappropriate. Also, people *could* evaluate CD players by trying to imagine how life would unfold if the CD player were obtained, but this seems unlikely. The thrust of our hypothesis was that people have preferences for the type of decision strategy to be used, and that these preferences are affected by the semantic content of the decision domain. We hypothesized that people would tend to use the mode of processing they preferred in the content domain, unless we made it difficult for them to do so by our experimental manipulation, which is exactly what we tried to do.

A crucial difference between constructing a story and tallying up advantages and disadvantages is that story construction requires that one possess an overarching knowledge structure or schema (i.e., knowledge of what constitutes a coherent story; see Schank & Abelson, 1977; Stein & Glenn, 1979; Trabasso & van den Broek, 1985), which is used to draw inferences and to organize the information into a unified whole. That is, for people to construct a story, they must augment the presented information by filling in gaps and going "beyond the information given," to use Bruner's (1957) famous phrase. We expected people's inferences to be both semantically

and evaluatively consistent with the information that was presented, thereby *accentuating* the attractiveness or unattractiveness of the stimuli relative to the evaluation produced by weighing (only) the presented information (without augmenting inferences). With this in mind, two stimuli in each content domain (marriage partners and CD players) were designed to be relatively attractive overall, and two were relatively unattractive.

Each stimulus was described by a set of "schema items," intended to promote the inference of interitem relations and the construction of an integrated representation, and a set of "nonschema items" that were more akin to isolated features. For the potential spouses, the nonschema items consisted of a list of personality traits. The schema items consisted of sentences describing how the decision maker had met the person, how the relationship had developed so far, and how things had been left. (To make it more plausible that the subject might be deciding which of several relationships to pursue, each relationship was described as having ended relatively amicably and on a somewhat ambiguous note.) For each potential spouse, we targeted a recognizable (stereotypical) story. The targeted stories could be labeled: (1) childhood sweetheart, (2) college friend turned lover, (3) intense and stormy romance, and (4) stagnant relationship.

To make the CD players a more comparable domain, we tried to design these stimuli with a structure parallel to that of the potential spouses. However, in a sense, the very difficulty of doing this helps to make our larger point: people are not inclined to use the same processes in evaluating CD players and potential spouses. People are capable of constructing a story of what life would be like with a CD player, but it seems unlikely that they would do so. More plausible, and still requiring the use of an overarching knowledge structure to draw inferences and organize the information, is that people would construct and decide on the basis of an image associated with a CD player (as in, "We don't sell a product, we sell an image") and/or a story of the act of purchasing the item. As with the potential spouses, we targeted a recognizable (stereotypical) image for each stimulus. The targeted images could be labeled: (1) Rolls Royce of CD players, (2) good-value-for-money model, (3) basic no-frills model, and (4) low-quality-but-cheap model. For each CD player, the schema items described the reputation/prestige of the brand, the reputation/prestige of the store and service, the reliability and standards of an acquaintance recommending the model, and the convenience of the store location. The nonschema items related the CD player's price, its capacity to hold multiple CDs, the manufacturer's warranty and availability of an extended warranty from the store, and the availability and features of a remote control.

Taking our cue from manipulations used by Pennington and Hastie (1988, 1992), we manipulated the order in which subjects received the items of

information describing each stimulus. Specifically, we varied whether the schema items or the nonschema items were presented early in the description of each stimulus. The rationale for this manipulation is that people with foreknowledge of the task are likely to process the information online as they encounter each item of information ([Hastie & Park, 1986](#)). Presenting nonschema items early (personality traits for the potential spouses and product features for the CD players) encourages people to begin with an attribute-weighting decision strategy and may make it difficult for them to switch in midstream to a schema-based decision strategy when they later encounter the schema items, even if they are so inclined. [Pennington and Hastie \(1988, 1992\)](#) found analogous effects by presenting items in the sequence versus out of the sequence that would be required by a narrative.

As predicted, we found a three-way interaction between content domain, order of information, and attractiveness of stimuli. The differences in ratings given to attractive versus unattractive potential spouses were responsive to the order manipulation. When schema items were presented early, making it easy to implement the preferred (schema-based) mode of processing, we obtained a relatively large difference between attractive and unattractive spouses (4.91 rating points on a scale from -10 to $+10$). When the schema items were presented late, making it difficult to implement the preferred mode of processing, we obtained a relatively small difference between attractive and unattractive spouses (2.61 rating points). This difference between differences is as expected, because people using schemas (i.e., stories, images) to draw inferences beyond the information presented were predicted to accentuate the differences between attractive and unattractive stimuli. By contrast, the differences between ratings given to attractive and unattractive CD players were unresponsive to the order manipulation, presumably because subjects were *not* inclined to use schema-based (i.e., image) processing even when it was easy (mean differences of 3.21 and 4.02 rating points for schema items presented early and late, respectively). This pattern supports our hypothesis that people are inclined to employ schema-based processing when thinking about potential spouses, provided that conditions make it easy to do so (schema items early), but not when it is hard (schema items late). By contrast, when thinking about CD players, people seem predisposed to employ an attribute-weighting strategy of evaluation, irrespective of the order manipulation.

Experiment 2 was designed to compare the effect of content domain with another factor, apart from content per se, which might drive a shift in decision strategy. To state the obvious, choosing a spouse is more important than choosing a CD player. [Payne, Bettman, and Johnson's \(1993\)](#) theory of meta-decision making predicts that important decisions induce

people to use decision strategies that are more effortful and more likely to reach the correct conclusion. Experiment 2 was designed in part to separate the effects of decision importance and content domain to see whether we could obtain evidence of a strategy shift that would be more clearly related to content per se.

In addition, we tried to push our notions about content domain and preferred decision strategy a bit further. In Experiment 1, we tested the hypothesis that decisions about social relationships tend to elicit a version of Pennington and Hastie's (1988, 1992, 1993) story model, in which people tell themselves story fragments about what life would be like if they were to pursue a course of action. Narratives describe events, actions, and reactions as they unfold over *time*. The basic temporality of narratives suggested to us that people might construct story fragments for a wider class of issues than social relationships. In some decisions, it is a salient fact that the chosen course of action will require monitoring and tending, unforeseeable subsidiary decisions and adjustments, all of which will evolve over time and be experienced as an ongoing stream of events and actions. For example, choosing a profession, weighing a permanent job offer, considering whether to have a child, all involve actions that will produce a flow of consequences to be experienced and managed over a lengthy period of time. In a sense, these are decisions about whether to embark on a "journey" or to undertake an "endeavor." For lack of a better label, we will refer to these as decisions about "endeavors," stressing the activity and ongoing experience that will follow after having made a choice, in contrast to decisions about "objects." We hypothesized that decisions about endeavors would tend to elicit the construction of story fragments. In contrast, for decisions about objects whose consequences do not require monitoring and tending, we predicted people to use schemas other than narratives, if they used schema-based processing at all, or to use a strategy in which attributes are weighed against each other directly, that is, without drawing inferences to construct an integrated, mediating representation of the alternative.

To test these ideas, we asked people their opinions about the strategies they thought they would use for various decision problems, and the strategies they thought typical, appropriate, and inappropriate. Despite concerns that people may not be in a position to report accurately on the decision strategies they would (or did) use (Ericsson & Simon, 1980; Nisbett & Wilson, 1977), inferring people's strategies from their decision patterns (as in Experiment 1) involves its own set of assumptions, and we thought we should seek converging evidence from a procedure with different assumptions. We constructed four decision problems in a 2×2 design. Two problems concerned matters that we thought undergraduates would construe as decisions about "endeavors" (roommates and jobs) and two concerned

matters that we thought they would construe as decisions about “objects” (stereo systems and houses). Within each domain, one decision was more important than the other (jobs are more important than roommates, and houses are more important than stereo systems). This design let us examine the importance of the decision and the domain of the decision independently.

Each respondent was asked to consider all four decision problems, which were about: (1) a prospective roommate, (2) a postgraduation job offer, (3) the purchase of a house, and (4) the purchase of a stereo system. In each case, a short paragraph fleshed out a scenario to give some context to the decision problem. For example, in the roommate problem, respondents were asked to imagine that they were single, unattached, and continuing next year at the University of Chicago. After mentioning to a same-sex acquaintance, a fellow student, that an apartment would be needed, the acquaintance suggests looking for an apartment to share. The decision was whether or not to accept the suggestion.

After reading the description of a decision problem, people were shown descriptions of six decision “methods.” (We avoided the word *strategy*, unsure of the connotations this word might have for undergraduates.) For each decision problem, people were asked to make four judgments about the listed decision methods. Specifically, they were asked to indicate the single decision method that best described: (1) the method they would use, (2) the most typical decision method for that problem, (3) the most appropriate method, and (4) the most inappropriate method. Although decision methods were described procedurally and not labeled for respondents, the six methods might be labeled: (1) follow gut feeling, (2) seek and follow advice, (3) social comparison, (4) feature-focused processing, (5) similarity to ideal, and (6) story-based processing. For our present purposes, we will concentrate on whether people said that they would use feature-focused processing (“Try to think it through ‘rationally.’ . . . See if the favorable points are more numerous and/or more important than the unfavorable points.”) or story-based processing (“Try to think about what life would be like Picture how your life would unfold, and construct a story about the way things would go.”).

The average respondent reported that he or she would use 2.3 distinct strategies across the four problems. Evidently, people believe that they would engage in considerable strategy shifting. For each decision problem, people most frequently said they would use the feature-focused strategy, with story-based processing running a not-too-distant second for the decisions involving endeavors (roommate and job decisions). Consistent with our hypothesis about domain-dependent processing, significantly more respondents said they would use story-based processing for at least one

endeavor decision (roommate and job) than said they would use it for at least one object decision (stereo and house; 17/38 vs. 7/38 respondents; $p = .021$ by binomial test for equality of correlated proportions). The popularity of the feature-focused strategy, however, was not so sensitive to the domain. The proportion of respondents saying they would use feature-focused processing for at least one endeavor decision (25/38) did not differ significantly from the proportion saying they would use this strategy for at least one object decision (28/38). Evidently, the greater popularity of the story-based strategy for the endeavors than for the objects comes at the expense of strategies other than feature-focused processing (see Goldstein & Weber, in preparation).

In contrast to the domain of the decision, the importance of the decision seemed to have little impact. Although there was a slightly greater tendency for the story-based approach to be used in the *more* important decision of each domain (job vs. roommate and house vs. stereo), the proportion of respondents saying they would use story-based processing for at least one relatively important decision (16/38) did not differ significantly from the proportion saying they would use it for at least one relatively unimportant decision (11/38). Neither did the proportion saying they would use the feature-focused strategy for at least one relatively important decision (30/38) differ from the proportion saying they would use it for at least one relatively unimportant decision (26/38). Thus, the content of these decisions seems to exert a greater influence on the decision strategy that people say they would use than does the importance of the decision.

In sum, Experiment 2 provides additional evidence that decision strategies are influenced by the content domain of the decision problem. Although story-based processing was never the most frequently selected strategy, people believed themselves more likely to use it for decisions involving endeavors rather than objects. The importance of the decision problem did not affect the strategies people thought themselves likely to use. (Both content domain and decision importance marginally affected the strategies that people thought were typical; see Goldstein & Weber, in preparation.)

V. Toward an Outline of a Theory of Domain-Specific Decision Making

A. LEVEL OF ANALYSIS

The gambling metaphor represents an austere parsimony with its insistence that any decision whatsoever, in any content domain, can be explained with reference to only two relevant variables: degree of belief and degree of

value. We have argued, however, that the evidence accumulated in neighboring fields of study, and in a number of studies specifically on judgment and decision making, demonstrates that psychological processing and overt responses are often sensitive to the semantic content of the stimuli used in the tasks. Therefore, we think that the gambling metaphor must be rejected as a general theory.

In defense, one might object that the issue is one of the level of analysis, and that choosing a level of analysis is to some extent a matter of strategy and of taste. It is legitimate to decide, for the sake of parsimony, to look first for highly general, content-independent results, and to put off until later the pursuit of more specialized content-specific phenomena. It is also legitimate to decide that one's scientific interests as a decision researcher focus on matters that transcend the semantic content of the choice alternatives and generalize across content domains.

Although we acknowledge the cogency of this objection as an argument in support of research at a content-independent level of analysis, we do not think it works as a defense of the gambling metaphor. The gambling metaphor does not merely assert that behavioral regularities are to be found at a content-independent level of analysis, but it also makes a powerful statement about the nature of those regularities, namely, that they depend only on degree of belief and degree of value. In fact, there is a trade-off to be faced between the *generality* or scope of a theory, that is, its applicability across people, alternatives, and conditions, and its *power* to make detailed statements about the cases to which it specifically applies (Coombs, 1983, chap. 5). Theories with extremely general applicability can be obtained at the price of vagueness and triviality (e.g., "people generally choose whatever seems best to them at the time"). Conversely, extremely rich and powerful descriptions may be obtained for the decision processes of particular individuals on specific occasions (e.g., President Kennedy's 1962 decision to impose a naval blockade on Cuba; see Allison, 1971), but the lessons to be drawn from these descriptions are unclear. It is entirely legitimate to choose a level of generality (e.g., content independence) and then pursue research to obtain the most powerful theory possible at that level. The gambling metaphor, however, presupposes a degree of power at the content-independent level of generality that we think is contradicted by the evidence (e.g., Heath & Tversky, 1991; Hogarth & Kunreuther, 1995).

If the gambling metaphor is rejected, then what? Do we have another metaphor or an alternative theoretical framework to offer? Unfortunately not. At present, we are in a position only to sketch what we see as possible directions and to take a few steps in a direction that seems promising. In very general terms, we see only two possibilities. On the one hand, one can continue the search for content-independent regularities of decision

making, but do so with variables other than the two identified by the gambling metaphor's reductionist aspect, the degrees of belief and value. On the other hand, one can change the level of analysis and aim for a collection of theories of more limited scope.

Pursuing the first possibility, Shafir, Simonson, and Tversky (1993) have reviewed a number of studies that reveal violations of traditional models of value maximization, and they interpret these violations in terms of the reasons (e.g., *number* of reasons) that a person might offer in support of a decision. For example, a richly described alternative, with both good and bad aspects, provides many reasons why it should be chosen over a more neutral or sparsely described alternative. However, it also provides many reasons why it should be rejected. Shafir (1993) found that subjects instructed to choose, chose the rich alternative, and that subjects instructed to reject, rejected it. The concept of "number of reasons" can explain this effect. In another example, the fact that alternative A dominates alternative B, whereas alternative C does not, provides a reason for selecting A over C (Tversky & Shafir, 1992). Because the reasons under discussion by Shafir et al. (1993) are rather abstract and content-independent, we view them as shifting the focus away from degrees of belief and value as the key explanatory variables while retaining the goal of a content-independent level of analysis of the psychological mechanisms.

By contrast, we view the study of Hogarth and Kunreuther (1995), as pursuing the other alternative to the gambling metaphor, namely, changing the level of analysis. By shifting their focus toward a study of the *types* of reasons and arguments that subjects entertain, Hogarth and Kunreuther (1995) have opened the door for content to become a central matter in the explanation of psychological mechanisms. For the moment, we prefer to explore this latter possibility. However, we do not propose to go from one extreme to the other. The extreme opposite of content-independence, that is, the position that each decision is unique and cannot be explained without detailed information about the decision maker's content knowledge, is antithetical to the development of theoretical principles. Instead, we are seeking: (1) an intermediate level of analysis, neither content-free nor completely dependent on the minutiae of the content (cf. Cheng & Holyoak, 1985), and (2) a principled way of coordinating the various domain-specific theories that will result. To see how it might be possible to satisfy these criteria, we consider how content effects might exert their influence.

The semantic content of stimuli can affect psychological processing in various ways. In the literature we reviewed earlier, some of the content effects are attributed to the encoding and representation of information (e.g., Bassok et al., 1995). Some are attributed to the use of domain-specific rules for manipulating encoded information (e.g., Cheng & Holyoak, 1985).

Still others may be attributable to attentional mechanisms (e.g., [Garcia & Koelling, 1966](#)), in that people or animals may be predisposed to notice certain kinds of events or contingencies between certain kinds of events. One striking feature of the explanations that have been proposed for content effects, with the possible exception of innate mechanisms ([Cosmides & Tooby, 1994](#)), is the reliance on *prior knowledge* to guide the encoding, organization, and manipulation of information. In the remainder of this chapter, we explore the way that prior knowledge might affect psychological processes relevant to decision making.

B. DOMAIN KNOWLEDGE AND REPRESENTATION

Any theory of decision making, including the gambling metaphor, must leave room for domain knowledge to affect certain psychological processes. Knowledge is required for a person to identify and encode the relevant aspects of a situation, to extract the relevant implications, and to organize the information in a manner conducive for subsequent processing. From the perspective of the gambling metaphor, this is to say that people must use their knowledge to assess the subjective likelihood and desirability of possible events. It is even consistent with the gambling metaphor to assert that developing expertise in a content domain might change the way a person perceives this “deep structure” (i.e., subjective likelihood and desirability) in the domain (cf. [Chi et al., 1981](#)). Thus, domain knowledge might affect the reference points people use to frame outcomes as gains versus losses, or the manner in which people combine or separate events in their “mental accounting.”

From our perspective, the undue limitation of the gambling metaphor is its assumption that all content domains are transduced through the same deep structure. We think that content knowledge permits people to organize situation-specific information in a variety of ways, and that different organizations of information are conducive to different modes of deliberation about the choice alternatives. We will consider next how processes of deliberation relate to different ways of representing and organizing knowledge. Then, we will discuss how semantic content influences knowledge representation and organization, thus constraining the applicable repertoire of decision strategies within the given circumstances. We will also consider how the semantic content of the decision problem might exert a direct influence on the selection of a decision strategy, in addition to its indirect influence via knowledge organization.

C. KNOWLEDGE STRUCTURES AND DELIBERATION

We briefly describe four broad categories of decision making, distinguished according to the way knowledge is used (or not used) to evaluate alterna-

tives: nondeliberative, associative, rule-based, and schema-based. The boundaries between categories are not entirely sharp, however, and we acknowledge that hybrids and combinations of strategies from different categories are also possible.

1. *Nondeliberative Decision Making*

For a decision that is repeated and routinized (Ronis, Yates, & Kirscht, 1989), procedural memory might direct the overt behavior in much the same way that it directs overlearned motor tasks. For example, one might select the same brand of milk from the grocer's shelf time after time without so much as looking at the price. Habitual behavior may barely deserve to be called decision making, but it illustrates the fact that choices may be made in nondeliberative ways (cf. Langer, 1989). Additional examples of *nondeliberative* decision making include choosing at random or by whim, and "passing the buck" (i.e., giving decision making authority—and responsibility—to someone else). For an example of nondeliberative decision making that is driven by distributed representation of information and composite memory storage, see the chapter by Weber, Goldstein, and Barlas, this volume (see also Weber, Goldstein, & Busemeyer, 1991.)

A particularly noteworthy *nondeliberative* decision strategy draws on declarative memory. In a strategy we call *category-based* decision making, the decision maker recognizes the alternative or situation as a member of a category for which a judgment or action has already been stored. There may have been deliberation on previous occasions, but if judgment or action is required subsequently, it is only retrieved. For example, consider a decision maker who responds to others on the basis of stereotypes. In this case, a judgment is already stored in memory in association with the category (the stereotyped group), and if needed, it is retrieved rather than computed (cf. Fiske, 1982; Fiske & Pavelchak, 1986). Despite the negative connotations of stereotyping, having a large repertoire of categories whose members can be recognized quickly, together with associated and easily retrieved judgments or actions, is one way to characterize expertise (Chase & Simon, 1973a, 1973b). Such expertise could be driven by a rich episodic memory, in which the current situation reminds the expert of similar situations encountered in the past (i.e., situations in the same category), the actions taken then, and their consequences (Weber, Bockenholt, Hilton, & Wallace, 1993). If this reminding is unconscious (cf. Logan, 1988), episodic memory may provide a basis for the "intuitive" decision making of the expert.

2. *Associative Deliberation*

By *associative deliberation* we refer to a process of deliberation that was described by William James (1890):

At every moment of it [i.e., deliberation] our consciousness is of an extremely complex object, namely the existence of the whole set of motives and their conflict . . . Of this object, the totality of which is realized more or less dimly all the while, certain parts stand out more or less sharply at one moment in the foreground, and at another moment other parts, in consequence of the oscillations of our attention, and of the 'associative' flow of our ideas. (vol. II, pp. 528–529)

If habitual behavior barely deserves to be called decision making, it may be something of a stretch to refer to associative deliberation as a decision strategy. In associative deliberation, the decision maker is not actively guiding the process of deliberation by following a well-defined procedure so much as he or she is being buffeted by the stream of considerations that come to mind. Each successive consideration inclines the decision maker toward a particular course of action, either augmenting or counteracting the effects of previous considerations. The decision is resolved when the cumulative effects of the considerations sufficiently incline the decision maker toward a course of action.

When applied to very simple stimuli (e.g., monetary gambles), fluctuations in attention to the various probabilities and outcomes drive the fluctuations in the decision maker's inclinations. When applied to complex alternatives that are not completely described in explicit detail, the process of associative deliberation is driven by knowledge as represented in a semantic associative network and retrieved by spreading activation (Anderson, 1984). For these stimuli, the successive considerations can be regarded as inferences about the implications of a course of action, occurring in a stream-of-consciousness flow. A sophisticated mathematical model of associative deliberation that accounts for choice latency as well as choice probability has been offered by [Busemeyer and Townsend \(1993\)](#).

3. *Rule-Based Deliberation*

Whenever deliberation follows a plan, that is, a set of rules for acquiring and using relevant information, procedural memory is required to guide the implementation of the plan. For example, if a lexicographic strategy is to be implemented, the decision maker must have the procedural knowledge to direct his or her attention to the most important attribute of the alternatives, select the subset of alternatives that are tied at the best level of this attribute, examine the second most important attribute for alternatives in this selected subset, select the subset of these that are tied at the best level of this attribute, and so on, continuing until a single alternative remains or picking nondeliberatively from the tied set that remains after the attributes have been exhausted.

Several comments about this example are in order. First, we mean the example of lexicographic decision making to indicate behavior that is actu-

ally under the guidance and direction of a plan (i.e., following the plan) and not merely a sequence of behaviors that happens to be describable by a plan (see Smith, Langston, & Nisbett, 1992, for a discussion of this distinction). Second, it is clear in the example that the lexicographic strategy, as a generally applicable strategy, is not purely procedural. Declarative knowledge, namely the importance ordering of attributes and the relative desirability of levels within attributes, is required to implement the strategy. If the lexicographic strategy were applied repeatedly in a particular content domain, in which the orderings of attributes and levels could themselves be brought under the governance of rules, the entire strategy could be proceduralized or “compiled” (cf. Anderson, 1987). Thus, the experience and expertise of the decision maker is virtually certain to affect the interplay of declarative and procedural memory in following a plan. Third, especially if the plan has been proceduralized, the decision maker may have little conscious awareness of the rules that are being followed; experts are often unable to describe the procedures they follow. Following rules that are inaccessible to consciousness may be one of the bases for intuitive decision making. By contrast, the relatively slow, laborious following of rules that are stored in explicit declarative form is probably a large component of analytic decision making (see Weber et al., this volume).

So far, we have implied, perhaps, that our third category of decision processes consists of rule-following or plan-following decision making. However, upon thinking about how a person might select a decision strategy, it seems to us that it would be more useful to employ a somewhat broader notion. Suppose that a person focuses on each alternative and considers which procedures in his or her repertoire would sanction the selection of that alternative. Suppose also that the person chooses the alternative that is sanctioned by the plan the decision maker deems most satisfactory (rational, defensible, justifiable, explicable, etc.). In such a case, rules and plans have influenced the decision in more than an incidental way, and yet the rules have not been “followed” in a strict sense. To include such instances of rule-sanctioned, but not quite rule-followed, decision making in our third category of deliberation processes, we will use the term *rule-based* deliberation. Our purpose in including this strategy in our third category is to capture the collection of strategies that rely heavily on procedural memory or on declarative knowledge of procedures.

4. *Schema-Based Deliberation*

Our remaining category, *schema-based* deliberation, to which we alluded in describing our experimental results earlier, focuses more fundamentally on the uses of declarative knowledge in decision making. Much of our

thinking about schema-based decision making was inspired by the work of Pennington and Hastie (1988, 1992, 1993) on explanation-based decision making. Explanation-based decision making, proposed by Pennington and Hastie and investigated intensively as applied to juror decisions in criminal trials, has three parts: (1) the decision maker constructs a causal model to explain available facts (e.g., a narrative story is constructed from witness testimony and attorney argument to explain the actions of the defendant and others in the case), (2) the decision maker endeavors to learn, create, or discover choice alternatives (e.g., the judge instructs the jury about the possible verdicts and the conditions for their appropriateness), and (3) the decision is made when the causal model is successfully matched to an available choice alternative.

The key property of explanation-based decision making is that it depends crucially on the construction of a mediating representation, namely, the causal model. The causal model organizes much (ideally all) of the information into a whole by promoting and guiding the inference of both supplemental items of information that were not presented explicitly (e.g., that the defendant formed a goal to harm the victim) and relations between items (e.g., various actions of the defendant are interpreted as efforts to achieve an overarching goal). Evidence for such inferences was provided by systematic intrusions into people's memories for presented items of information (Pennington & Hastie, 1988). Moreover, people's choices of action and the confidence they placed in those choices were shown to be mediated by their *evaluations* of the causal models they constructed (Pennington & Hastie, 1988, 1992, 1993). That is, causal models are subject to internal structural constraints (e.g., a story must be composed of related episodes that make reference to the goals and beliefs of the participants, the obstacles they face, their plans to overcome obstacles, etc.). The extent to which a person's causal model respects these constraints, accounts for a large portion of the information, and does so in the absence of competing causal models, affects both the likelihood that the person will accept the causal model as the basis for a choice and the confidence placed in that choice (Pennington & Hastie, 1988, 1992, 1993).

Our notion of schema-based decision making relaxes some of the restrictions that Pennington and Hastie explicitly place on explanation-based decision making, and some that are merely implicit in the studies they have conducted to date. We retain the central ideas of explanation-based decision making: (1) that judgments and choices proceed by fitting a preexisting knowledge structure to the available information and by fleshing it out with inferred information and relations, and (2) that the judgments and choices themselves depend partly on an assessment of the adequacy of the resulting instantiated structure as an organization of the information. (The require-

ments that inferences must fit into an overarching knowledge structure and that the assessed adequacy of the instantiated structure influences the decision, both distinguish schema-based processing from associative deliberation.) Our main relaxation of explanation-based decision making is that we do not require the mediating cognitive structure to be a *causal* model. Although Pennington and Hastie allow different sorts of causal models to be invoked in different content domains, they make it clear that they intend explanations to implicate causation, albeit with a liberal construal of causation. By referring to decision making as schema-based rather than explanation-based, we want to draw attention to the possibility that mediating cognitive structures may guide inferences and organize information by reference to relations that are typical, stereotypical, conventional, appropriate, meaningful, exemplary, ideal, and so on, as well as causal.³

We employ the notion of “schema” as an overarching or generic knowledge structure that provides the mental representation and organization of declarative information of all types. We regard as special cases the knowledge structures that represent categories (i.e., concepts; Smith & Medin, 1981),⁴ events and activities (i.e., scripts, plans, and narratives; Schank & Abelson, 1977; Stein & Glenn, 1979; Trabasso & van den Broek, 1985), and various other physical and social structures (e.g., mental models; Johnson-Laird, 1983). Nevertheless, schemas are not completely unconstrained (Barsalou, 1992).

³ Three additional differences between schema-based and explanation-based decision making should be mentioned briefly, although we think they may reflect matters of emphasis and interest rather than theoretical disagreement. First, Pennington and Hastie have used explanation-based decision making to account for people’s constructions of belief (i.e., about “what really happened” in the matters concerning a criminal trial). By contrast, we are using the idea of schema-based decision making to account for people’s constructions of value, that is, for preferential evaluations of various alternatives. Second, and related, Pennington and Hastie portray their subjects as constructing stories to explain events in the past. By contrast, we hypothesize that people instantiate schemas (including stories or story fragments) to project events into the future (cf. Schoemaker, 1993). Third, Pennington and Hastie have examined their model in the context of choice among alternatives (i.e., selection of a verdict), whereas we apply the notion of schema-based decision strategies to evaluations of single stimuli as well as choice.

⁴ The use of categories in schema-based decision making should not be confused with (nondeliberative) category-based decision making. The key property of category-based decision making is that an action or evaluation is merely retrieved from memory when an instance is categorized, and implemented or acted upon without deliberation. (“Oh, it’s one of *those*. Well, I know how much I like *them*.”) By contrast, categories may be used in schema-based decision making to guide nonevaluative inferences (“It’s a sports car; it probably has a manual transmission.”), to ground an assessment of one’s understanding of the situation (“This thing is ‘neither fish nor fowl.’ I’m not sure *what* to do with it.”), and to guide an assessment of gradation (via graded category membership).

D. SEMANTIC CONTENT, KNOWLEDGE REPRESENTATION, AND MODES OF DELIBERATION

1. *Amount of Knowledge*

Within each of the preceding categories of decision processes, there are ways of implementing particular strategies that require relatively more or less knowledge of the content domain of the decision problem. Category-based and schema-based decision making can be implemented with categories and schemas that are relatively abstract and content-general or relatively concrete and content-specific. Similarly, rule-based strategies can be geared to abstract attributes of alternatives (e.g., subjective probability and utility) or to relatively domain-specific aspects and relations (e.g., a prospective graduate student's glowing letters of recommendation should not be taken to compensate for mediocre grades or test scores unless you have personal knowledge of the recommenders' high standards).

We hypothesize, however, that the relative appeal of different categories of decision processes depends partly on the decision maker's experience and expertise in the content domain of the decision problem. Strategy selection clearly depends on a variety of factors. Nevertheless, category-based and schema-based strategies presumably are more attractive to decision makers who have rich, well-articulated sets of categories and schemas, whereas (non-category-based) nondeliberative strategies (e.g., passing the buck) and relatively abstract (and justifiable) rule-based approaches must appeal to less knowledgeable decision makers. Therefore, it is important to recognize that expertise in a content domain does not grow merely by increasing the number of facts in declarative memory, the number of associations in a semantic network, or the number of rules in procedural memory. Overarching knowledge structures emerge. New categories and schemas are developed. Because the various decision processes just discussed require knowledge to be represented and organized in different ways, growing expertise permits a broader array of strategies to be implemented and, we think, affects the relative attractiveness of the different strategies.

Given the prevalence within judgment and decision research of experiments that employ fairly abstract stimuli (e.g., explicit monetary gambles or sparsely described consumer items), it is not surprising that the typical findings indicate the use of rule-based strategies, albeit different rule-based strategies under different conditions. Even when the stimuli employed are not so abstract, the attributes of the stimuli are often varied orthogonally or otherwise without regard for the sorts of stimuli that people might experience outside the laboratory. This can easily create stimuli that appear

“strange” and which cannot be approached with the categories and schemas that people have developed, with the result that people are forced to rely on less knowledge-demanding strategies than they might otherwise have preferred (cf. Brunswik, 1956). These considerations argue once more not only that researchers may have unwittingly conducted their experiments in a way that is likely to overlook interesting decision processes, but that the overlooked processes are exactly the ones that contradict the gambling metaphor by failing to reduce the problem (merely) to the variables of degree of belief and degree of value.

2. *Semantic Content Per Se*

If expertise in a content domain affects the variety of ways a person can represent information and thereby affects the relative attractiveness of different decision strategies, it does not necessarily follow that semantic content per se should be regarded as anything more than a variable that interacts with individual differences in expertise. One might take the position that content expertise produces variance akin to individual differences in the shapes of utility functions. These individual differences may be of some interest, but they are not of fundamental significance to core theory. By contrast, we argue that people’s predilections for particular modes of deliberation in particular content domains are not idiosyncratic and are not merely the accidental product of idiosyncratic learning histories that have no bearing on core theory. We think the connections between semantic content, on the one hand, and representations of information and modes of deliberation, on the other hand, are more systematic and more significant than that. We have two classes of reasons for this belief.

First, there are intrinsic constraints on the types of content and the types of representations that are suited to each other. For example, story schemas have figured prominently in our earlier discussion. However, stories are necessarily about the way things unfold over *time*. This is the observation that led us to our notion of endeavors. Decision domains that do not involve a temporal dimension (e.g., aesthetic preferences for different styles of architecture) cannot be represented in story schemas. Because different decision processes require knowledge to be represented differently, constraints on the representations that *can* be used in particular content domains in turn constrain the repertoire of applicable decision processes.

Second, there is a cluster of considerations having to do with social norms and culture. In many domains, the nature of the knowledge that is considered expertise is socially constrained, or even socially constituted. Consequently, people do not become more idiosyncratic as they acquire expertise. Rather, they become socialized into a system of categories and

schemas and rules, ways of organizing information about items in the domain, and ways of deliberating about items and options. Thus, experts may become *less* idiosyncratic in the ways they organize information and deliberate about alternatives. It is probably easiest to appreciate that experts may become more uniform in their decision processes (if not in their final decisions) in arcane areas of knowledge, where it is obvious to the novice that the expert has specialized ways of thinking about the issues. What may be overlooked by concentrating too much on arcane knowledge is that we are all relatively expert, that is, thoroughly socialized, in the ways of our culture. Culture provides us with ways of organizing information in spheres of life both large and small, with constraints on the applicability and relative attractiveness of different modes of deliberation. Beyond this, culture also carries prescriptions: (1) for *appropriate* ways of representing information for certain kinds of decisions in certain domains, thus indirectly constraining deliberation processes, and (2) for *appropriate* modes of deliberation, thus affecting these processes directly as well as indirectly. For example, in making personnel decisions, it may be mandated that job applicants be represented and evaluated “objectively,” for example, via a profile of test scores, whereas it would be considered depersonalizing and inappropriate to represent and evaluate close personal relationships in this manner.

3. *Construal*

Despite the fact that we think semantic content is often connected in nonarbitrary ways to representation of information and to modes of deliberation, there is still room for people to *construe* domains and situations in ways that are sensitive to their idiosyncratic knowledge, preferences, and immediate goals (cf. Griffin, Dunning, & Ross, 1990; L. Ross, 1987, 1989). It is mainly for this reason that we emphasized earlier that we do not think people are compelled to use particular decision processes. We think that people’s deliberations about decision alternatives, and the knowledge they bring to bear on these deliberations, are guided by the way they *interpret* the alternatives and the implications of the decision (Bassok et al., 1995). Within limits, interpretations themselves can be matters of choice, or habit, or whim. One may or may not be inclined to regard the purchase of a house, for example, as initiating a long-term flow of events and constraints to be understood in terms of a narrative. One could construct a story about what life would be like in the house. On the other hand, one could evaluate the house in terms of relevant features (e.g., cost, location, size), either with inferences drawn to flesh out a (narrative) schematic understanding of the house (e.g., as a flawed example of the Second Empire style of

architecture) or without drawing these sorts of inferences at all. It seems clear that some of these possibilities depend on the decision maker's expertise (e.g., knowledge about architecture), and that a decision maker's inclinations to interpret the decision one way or another may also depend on his or her resources (financial and otherwise) and goals (e.g., planning horizon).

In sum, by focusing on the relationships among semantic content, ways of representing and organizing information, and ways of deliberating, we think that room can be found for an approach to research on judgment and decision making that satisfies the criteria we listed earlier. Because the emphasis is on the *types* of representations and *modes* of deliberation that are related to content, the approach is positioned at an intermediate level of analysis, neither content-free nor completely dependent on the minutiae of the content. Moreover, by developing taxonomies of representation types and deliberation modes, researchers can avoid a chaotic proliferation of domain-specific theories. Rather, the taxonomies can provide a principled means of relating domain-specific theories to one another.

VI. Discussion and Conclusions

In the final paragraphs of this chapter, we would like to offer some additional context for the issues we have raised here by relating our concerns to the work of others in judgment and decision research and to some other research projects we have been involved with.

A. OTHER AREAS OF JUDGMENT AND DECISION RESEARCH

We have restricted our scope in this chapter to the study of preferential decision making. We did so because it is researchers in this area who have been particularly dedicated to the use of content-impoverished stimuli and to content-independent analyses. It seems only fair to point out that researchers who study learning and probabilistic judgment have not shown the same reluctance to address issues of semantic content. Studies of learning have examined the influence of content with tasks involving (1) multiple cue probability learning (e.g., Hammond & Brehmer, 1973; Miller, 1971; Sniezek, 1986; see Klayman, 1988, for a general review not limited to content effects), (2) covariation detection and estimation (e.g., Billman, Bornstein, & Richards, 1992; Chapman & Chapman, 1967, 1969; Jennings, Amabile, & Ross, 1982; Wright & Murphy, 1984; for general reviews see Alloy & Tabachnik, 1984; Crocker, 1981), and (3) induction (e.g., see Klayman & Ha, 1989, for investigation of a rule discovery task; see Nisbett, Krantz, Jepson, & Kunda, 1983, for investigation of a task requiring subjects

to generalize from a sample to a population; see Holyoak & Nisbett, 1988, for a general review).

Research on probabilistic judgment has come into contact with issues of content in some indirect ways, all traceable to the seminal work of Tversky and Kahneman (1971, 1973, 1974; Kahneman & Tversky, 1972, 1973). First, work in this area has shifted away from content-impooverished bookbag-and-poker-chip tasks and toward the use of “word problems” about concrete situations. However, the typical use of word problems has been to demonstrate that a finding replicates across a variety of content domains—chosen intuitively for their diversity rather than for any theoretical distinction among the domains—suggesting that content domain is merely a nuisance variable that can safely be ignored. Second, Tversky and Kahneman’s work prompted a search for the heuristics underlying judgments (Kahneman, Slovic, & Tversky, 1982). Although the hypothesized heuristics generally transcend any particular content domain as such, some of them do require knowledge of content. For example, the availability heuristic rests on a search of memory and therefore is affected by the organization of knowledge. The representativeness heuristic rests on a judgment of similarity or typicality, which itself is affected by knowledge about the domain (Tversky & Gati, 1978). In these ways, then, research on probabilistic judgment opened a door for the study of content-specific effects. Third, some researchers have stepped through this door. In particular, the phenomenon of base-rate neglect (Kahneman & Tversky, 1973) has led researchers to consider extrastatistical factors such as (1) the salience or concreteness of information (Borgida & Nisbett, 1977; Fischhoff et al., 1979; Nisbett, Borgida, Crandall, & Reed, 1976), (2) the “relevance” of the base rate or the specificity of the group to which it applies (Bar-Hillel, 1980; Carroll & Siegler, 1977), and (3) whether the event described by the base rate is perceived to be causally related to the target event (Ajzen, 1977; Tversky & Kahneman, 1980; see also Einhorn & Hogarth, 1986). Some investigators have argued explicitly that content domain is important to the use of base rates (Gigerenzer, Hell, & Blank, 1988).

It is evident that judgment and decision researchers have not all been equally averse to investigations of content effects. Nevertheless, it seems to us that judgment and decision researchers as a group are a few steps behind the rest of cognitive psychology in recognizing the importance of semantic content in influencing the processes by which people represent, retrieve, organize, and manipulate information.

B. CRITICISMS OF METATHEORY

Researchers who study preferential judgment and decision making have been the least concerned with issues of content effects. We think this is

largely because the gambling metaphor offers a theoretical framework that encourages the belief that generalizability is enhanced by studying preferential decision making with simple monetary gambles or similar content-impoverished stimuli. We have argued at great length in this chapter against the general applicability of this metatheory and against this experimental practice. However, we are far from the first to argue that decision research should rethink its general metatheory.

For example, Simon's (1955, 1956) pioneering work on bounded rationality stressed the need for psychological theory to respect people's cognitive limitations. Payne et al. (1993) have emphasized the multiplicity of people's decision strategies and their ability to adapt them to the circumstances. Lopes (1987) has argued that research on risky decision making has overemphasized a psychophysical approach and neglected the way that stimuli raise motivational concerns and conflicts. Beach and Mitchell (1987) have argued that too much importance is placed on the selection of an optimal member of a choice set, as opposed to the way people screen individual alternatives for compatibility with their values, goals, and plans, and the way people monitor the progress of their ongoing plans-in-operation. Busemeyer and Townsend (1993) have urged researchers to put aside their static and deterministic perspectives and to face up to the time-dependent and inconsistent aspects of decision making with models that are dynamic and probabilistic. Tetlock (1991) criticizes the standard approach for its neglect of the social context of decision making. (For additional high-level reflections on decision research, see [Hastie, 1991](#); [Kahneman, 1991](#); [Kleinmuntz, 1991](#).)

In view of the relatively large number of recent discussions about the general metatheory of decision research, it appears that the area is experiencing some dissatisfaction with the prospect of business as usual. We are sympathetic to many of the criticisms that have been offered. The criticism that we add implicates the prevalent use of content-impoverished stimuli and the general reliance on content-independent analyses (see also [Beach & Mitchell, 1987](#); [Hastie, 1991](#)). We have argued that issues of semantic content should not be ignored in a rethinking of the metatheory of decision research, and we have tried to illustrate an approach that avoids the excesses of the opposite extreme.

C. SELECTION OF DECISION STRATEGIES

Elsewhere we have argued that researchers may have focused too narrowly on decision "strategy" as virtually the sole explanatory concept for a theory of judgment and decision making, and we urged that concepts drawn from the study of memory be included (Weber et al., this volume). To support

that argument, we demonstrated that content-independent aspects of memory, specifically having to do with distributed representation of information and composite memory storage, may account for some phenomena that are usually attributed to information combination strategies (see also Weber et al., 1991). Our present emphasis that the repertoire of strategies (or modes of deliberation) is constrained by the way the decision problem is represented may seem to be inconsistent with our other arguments. However, we believe that the concepts of decision strategy and strategy selection should be supplemented, not replaced. For example, we have argued (Weber et al., this volume) that distributed representation and parallel processing have implications for processes which, in turn, influence strategy selection (e.g., the assessment of the cognitive “effort” that a particular strategy will require; see Payne et al., 1988, 1990, 1993). Thus, our contention that semantic content influences the selection of a decision strategy, both directly and indirectly via the organization of knowledge, is not inconsistent with the position taken in the chapter in this volume by Weber, Goldstein, and Barlas. In fact, because memory is the repository of knowledge about content, our current chapter also draws on concepts from memory research. Therefore, we view this chapter as complementing the other chapter, in that it attempts to bring additional aspects of memory within the orbit of decision research, specifically content-dependent aspects of the way that knowledge is represented, organized, stored, and retrieved.

D. HISTORY AND FUTURE

In closing, we would like to point out one more wrinkle in our historical analogy between associationism and the gambling metaphor: the robustness of these theoretical frameworks. Frederic Bartlett, the best-known early opponent of associationist psychology, the psychologist who characterized “every human cognitive reaction—perceiving, imaging, remembering, thinking and reasoning—as an *effort after meaning*” (Bartlett, 1932, p. 44, emphasis in original) once asked, “Why is it that, although everybody now admits the force of the criticism of associationism, the associationist principles still hold their ground and are constantly employed?” (Bartlett, 1932, p. 307). In summarizing his own answers to this question, Bartlett said, “It [associationism] tells us something about the characteristics of associated details, when they are associated, but it explains nothing whatever of the activity of the conditions by which they are brought together” (p. 308). In other words, laws of association help to describe the products of thought, if not the processes of thought. Bartlett concluded that “therefore, associationism is likely to remain, though its outlook is foreign to the demands of modern psychological science” (p. 308).

We foresee a similar robustness for the gambling metaphor, and for similar reasons. In broad strokes, people generally prefer alternatives that offer them higher probabilities of obtaining more highly valued outcomes; the gambling metaphor helps to describe people's final judgments and choices, at least approximately. However, we are also a bit more optimistic than Bartlett was about the prospects for the future. Most researchers who study judgment and decision making do feel the need to explain psychological processes as well as overt behavioral products. Although we think the gambling metaphor fails on both accounts, it is somewhat easier to make the case on process grounds that the gambling metaphor cannot be sustained: people do not transduce all their decision processes through the variables of degree of belief and degree of value. We have tried to outline an approach to decision research that would acknowledge this fact without opening a Pandora's box of unrelated domain-specific theories. We think this approach is promising.

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