European Review of Social Psychology, 2003, 14, 1-49

Searching for Commonalities in Human Judgment: The Parametric Unimodel and its Dual Mode Alternatives

Hans-Peter Erb
Universität Halle-Wittenberg

Arie W. Kruglanski
University of Maryland

Woo Young Chun
University of Maryland

Antonio Pierro & Lucia Mannetti
University of Rome "La Sapienza"

Scott Spiegel
Columbia University

Chapter to appear in W. Stroebe and M. Hewstone (2002). European Review of Social Psychology. Chichester, UK: Wiley. This work was supported by NSF Grant (SBR-9417422), to Arie W. Kruglanski, NIMH pre-doctoral fellowship (1F31MH12053) to Scott Spiegel, and Korea Research Foundation post-doctoral fellowship to Woo Young Chun

Abstract

We outline a uniform model of human judgment wherein individuals combine situational information with relevant background knowledge to form conclusions. Several judgmental parameters are identified whose specific intersections determine whether given situational information would affect judgments. Abstraction of features from surface manifestations and focus on underlying commonalities afford theoretical integration across judgmental domains and across processes previously assumed to qualitatively differ. The resulting "unimodel" is juxtaposed conceptually and empirically to popular dual-mode frameworks, and its implications are drawn for a general rethinking of human judgment phenomena.

Introduction

The judgment of people and events is a pervasive human activity inexorably involved in management of our everyday affairs. From the moment we open our eyes, if not before, we pass judgments on an endless variety of issues in a steady succession. Is it time to get up? brush our teeth? get dressed ? what should we wear? what is the weather like? how should our day unfold? is it safe to cross the street? Should we buy or sell? Should we "order in" tonight? And so on in perpetuity, until the moment we shut our eyes and lull ourselves to sleep. And even then, in our dreams, we often confront imaginary crises that call for resolute responses; hence, we keep on intensely judging and deciding, while seemingly in a complete repose, totally "lost to the world" as it were.

Small wonder then that the mysteries of human judgment have fascinated theorists and

researchers in numerous areas of psychology including its social, cognitive, clinical, organizational, and personality sub-fields. Typically, scientific research on human judgment centered on either a specific domain of phenomena, such as persuasion (e.g., Chaiken, Liberman, & Eagly, 1989; Petty & Cacioppo, 1986), attribution (e.g., Kelley, 1967; Trope & Alfieri, 1997), person perception (e.g., Fiske, Lin, & Neuberg, 1999), judgment under uncertainty (e.g., Kahneman, Slovic, & Tversky, 1982) etc., or, around a specific phenomenon such as the base-rate neglect (e.g., Borgida & Brekke, 1981), dispositional attribution (Trope and Gaunt, 1999), stereotyping (e.g. Neuberg and Fiske, 1987), and many others.

Over the last several decades, this work has yielded invaluable insights into judgmental mechanisms potentially operative in diverse settings. Yet such insights have been scattered across judgmental topics and, outwardly at least, have had little in common. A possible reason for this is that the theoretical frameworks guiding judgmental research were typically domain-specific and largely foreign to each other in both emphasis and terminology. Thus, major models of persuasion (Petty and Cacioppo, 1986; Chaiken, Liberman and Eagly, 1989) had little to do with major attributional models (Kelley, 1967; Jones and Davis, 1965; Gilbert and Osborne, 1989; Trope and Gaunt, 1999); which in turn, were unrelated to models of stereotyping (Fiske & Neuberg 1990; Brewer, 1988), of group perception (Hamilton and Sherman, 1999; Sherman and Hamilton, 1999), or of statistical likelihood judgments (Tversky and Kahneman, 1974; Kahneman and Tversky, 1982).

There exists one feature that numerous judgmental models do share in common.

Preponderantly, they distinguish between two qualitatively-distinct modes of making judgments. This commonality only compounds the fractionation, however, because each judgmental model identifies a different, unique, pair of judgmental modes. Thus, a recent source-book edited by Chaiken and Trope (1999) contains 31 chapters of which most describe their own, distinct, dual-process models. Consequently, the current literature depicts nearly sixty qualitatively distinct modes of making judgments. In the field of persuasion, distinctions were drawn between heuristic and systematic modes (Chaiken, et al., 1989) or, peripheral and central routes (Petty & Cacioppo, 1986); research on judgment under uncertainty distinguished between extensional and intuitive reasoning (Tversky & Kahneman, 1983), or rational and experiential systems (e.g., Epstein & Pacini, 1999); yet other dualistic distinctions have been put forth in domains of dispositional attribution (Trope & Gaunt, 1999), person perception (Fiske et al., 1999) and so on. The picture these models paint of the human judgment field is quite heterogeneous and fragmented. It conveys the impression that each judgmental domain is governed by its own, qualitatively separate, processes that somehow add up to precisely two in number.

For “something completely different” then, we presently describe an integrative model of human judgment that cuts through the conceptual diversity extant in the field today. This model unifies the two judgmental modes within the separate dual-process models and, by the same token, effects a unification between models. Accordingly, we call it the unimodel. Our analysis suggests that the same property that gave rise to the dual-mode notion in the first place is responsible also for proliferation of the dual-process models. This property is the characteristic

content-boundedness of most dual-process models. Dispensing with that feature merges each pair of (allegedly) distinct modes into one, affording a within-model integration, while at the same time rendering the content-free model applicable across judgmental topics, affording a between-models integration. Our alternative emphasis on the fundamental factors affecting all judgments affords, additionally, a between-factors integration that has been missing thus far.

Our re-conceptualization at once radically differs from "business as usual" in the human judgment field and at the same time is strangely familiar. It radically differs because we propose to replace close to sixty divergent models of human judgment by just one! But we do not do it by invoking mysterious novel entities, or magical psychological forces no one before has deigned to imagine. Quite to the contrary, our fundamental constructs are relatively mundane and familiar to researchers in the field. Yet their role in the judgmental process may have been obscured by their inadvertent confounding in prior frameworks with a plethora of content-elements. These fundamental constructs are the common parameters of human judgment.

By these we mean several dimensional continua represented at some values in each judgmental instance. We assume that these parameters are (quasi) orthogonal and that they can intersect at their different values. Informational-contents can be attached to each of these intersections. At some intersections the information will affect judgments (i.e., it will be persuasive, convincing, and impactful). At other intersections it will not. Whether it will or will not has nothing to do with the informational contents per se and, everything to do with the parametric intersections to which the contents were attached. But that is getting ahead of the

story. Instead, let us first characterize the judgmental process, describe its parameters and apply our model to prior results and novel predictions.

The Judgmental Process: The Concept of Evidence

How does a person form a judgment? According to the lay epistemic theory (Kruglanski, 1989, 1990), he/she first comes up with some kind of information to serve as evidence for her or his assessment. Nearly anything can serve as evidence under the appropriate circumstances: What was being said (read or observed), the tone (facial expression, posture) in which it was said, who was it said by, whether others agreed with it, how it made one feel, the phenomenal experience (Schwarz & Clore, 1996) it fostered, etc. In order that a given bit of information serve as evidence, it should form part of a subjective syllogism. It should serve as a minor premise that combines with a previously held major premise, or an inference rule, to jointly afford a conclusion. For instance one might encounter the information "Laura is a graduate of MIT". This might serve as evidence for a conclusion "Laura is an engineer" if it instantiated an antecedent of a major premise in which the individual happened to believe, e.g., "All MIT graduates are engineers", or "If an MIT graduate then an engineer". In general then, information would form a basis for judgment only wherever background knowledge allowed one to draw conclusions from it. Such background knowledge may come in a variety of representations. It may contain stereotypic believes such as "MIT grads are intelligent", attitudinally-relevant knowledge about consumer products such as "low fat foods are healthy" self-relevant meta-

cognitive notions such as "If I feel good, I must be a generally happy person" (e.g., Schwarz & Clore, 1983), and so forth.

In describing the judgmental process as syllogistic we hardly mean to imply that individuals necessarily engage in explicit syllogistic reasoning (e.g., Newell & Simon, 1972; Wason & Johnson-Laird, 1972). Nor do we mean to imply that knowledge is always represented as an abstract rule of the "All X are Y" or "If X then Y" variety,[1] that it is consciously accessed in that form from working memory, or that individuals who use it (everyone, by present surmise) are familiar with the intricacies of formal logic, a proposition belied by over 30 years of research on the Wason (1966) card problem, among others. For instance, people might incorrectly treat an implicational "if a then b" relation as an equivalence relation ("only if a then b") implying also that "if b then a". We also accept that often people may be able to better recognize the "correct" implicational properties of concrete statements in familiar domains rather than of abstract, unfamiliar, statements (Evans, 1989). None of this is inconsistent with the notion that persons

[1]In cognitive psychology, considerable debate ensued about whether human reasoning is rule-based in the Newell & Simon (1972) sense of the term "rule" denoting a highly abstract statement, containing symbols, characterized by a great degree of generality, and applied consciously. As an alternative, some researchers (for a review see Medin & Ross, 1989) have put forth "instance-models" involving the retrieval of specific instances from memory that are then used as analogues to reach judgments about other instances. Other theorists (cf. Schank, 1982) put forth case-based models wherein particular cases are stored in memory along with information about how these exemplars can be generalized, etc. Our concept of rule is intended in a broad enough sense to be compatible with all those various proposals. Thus, we do not assume that the rule must be represented symbolically, that it must be abstract, general or consciously, and deliberately applied. All we are saying is that current information is used for judgmental purposes only if it fits a contingent background statement—this is our general sense of the "rule" concept. Thus, a former instance (e.g., experiencing an electric shock upon touching one's hair dryer) may be recorded in memory as a contingent expectancy linking the touching of that specific dryer with being electrocuted. This would lead to the judgment that Mary who uttered a shrill cry upon touching the dryer, did so because of the electric shock she suffered. In our analysis, this represents an instance wherein touching the dryer constituted evidence that Mary will be shocked, because of the background knowledge linking the two events in a contingent fashion.

generally reason from subjectively relevant rules of the "if-then" format (see also Mischel and Shoda, 1995) that may or may not coincide with what some third party (e.g., the experimenter) had intended, or pronounced as correct.

Fundamental Parameters of Judgment Formation

The notion of judgmental parameters is central to the present analysis. As already noted, these are dimensional continua whose specific intersections determine the impact a given information exerts on a requisite judgment. The several judgmental parameters are now described in turn.

Subjective relevance. The syllogistic nature of judgment formation was outlined earlier. Viewed against this backdrop, our first parameter is that of relevance, meaning the degree to which the individual believes in a linkage between the antecedent and the consequent terms in the major premise. For example, one may believe strongly or only weakly in the proposition "All MIT graduates are engineers", with all the different shades of belief or disbelief in between. A strong belief renders the antecedent category and the information that instantiates it (in our prior example, the knowledge that "Laura is an MIT graduate") highly relevant to the conclusion. In contrast, complete disbelief renders the information (instantiating the antecedent term) irrelevant as evidence. Consider the statement "All persons weighing above 150 lbs. are medical doctors". We all disbelieve this particular statement (we sincerely hope), and hence consider the information that a target weighs 162lbs. completely irrelevant to the judgment of whether she is a doctor. Degrees of belief in a linkage between the antecedent and the consequent terms in a

given inference-rule (a major premise) constitute a continuum defining the parameter of perceived relevance a given bit of information possesses regarding a given conclusion. We assume, quite unsurprisingly, that the greater the perceived relevance of the evidence to the conclusion the greater its impact on judgments.

The subjective-relevance parameter is of pivotal importance to the judgment process. It is the "jewel in the parametric crown", in reference to which the remaining judgmental parameters (described shortly) are auxiliary. As we shall see, the latter parameters refer to various enabling conditions affording the full realization of the relevance-potential of the "information given" to, or actively wrested by, the knower. These enabling parameters are considered next.

Experienced difficulty of the judgmental task. An important parameter in this category is experienced difficulty of the judgmental task. Its value may depend upon such factors as the length and complexity of the information confronted by the knower, the information's ordinal position in the informational sequence, its saliency, accessibility from memory of the pertinent inference rules, and our evolutionarily evolved capacity to deal with various information types (such as frequencies versus ratios, c.f., Gigerenzer and Hoffrage, 1995; Cosmides and Tooby, 1996, but see Evans, Handley, Perham, Over & Thompson, 2000).

Within the unimodel, perceived difficulty is treated as a parameter ranging from great ease (e.g., when the information appears early, is simple, brief, salient, and fitting a highly accessible inference-rule), to considerable hardship (e.g., when the information is late-appearing lengthy, complex, non-salient and/or fitting only a relatively inaccessible rule). Generally, the

ease of information-processing enables a quick, and relatively effortless realization of its degree of judgmental relevance, whereas the difficulty of processing hinders such a realization.

Magnitude of processing motivation. The magnitude of motivation to engage in extensive information processing en route to judgment is determined variously by the individual's information-processing goals such as the goals of accuracy (Petty & Cacioppo, 1986; Chaiken, Lieberman & Eagly, 1989), accountability (Tetlock, 1985), need for cognition (Cacioppo & Petty, 1982), the need to evaluate (Jarvis & Petty, 1996), or the need for cognitive closure (Kruglanski & Webster, 1996; Webster & Kruglanski, 1998). For instance, the higher the magnitude of the accuracy motivation or the need for cognition, the greater the degree of the processing motivation. By contrast, the higher the magnitude of the need for closure, the lesser the degree of such motivation.

Magnitude of processing motivation may be additionally determined by the desirability of initially forming beliefs. If such beliefs were desirable --the individual would be disinclined to engage in further information processing, lest the current conclusions be undermined by further data. On the other hand, if one's current beliefs were undesirable –the individual would be inclined to process further information that hopefully would serve to alter the initial, undesirable, notions (Ditto and Lopez, 1992).

We assume, again unsurprisingly, that the higher the degree of processing motivation the greater the individual's readiness to invest efforts in information processing, and hence the greater her/his readiness to cope with difficult to process information. Thus, if some particularly

relevant information was presented in a format that rendered it difficult to decipher, a considerable amount of processing motivation would be needed to enable the realization of its relevance.

Cognitive capacity. Another factor assumed to affect individuals' processing efforts is their momentary cognitive capacity determined by such factors as cognitive busyness, i.e. the alternative tasks they are attempting to execute in parallel, as well as by their degree of alertness and sense of energy versus feelings of exhaustion or mental fatigue (e.g., Webster, Richter, & Kruglanski, 1998) perhaps resulting from prior information processing. We assume that a recipient whose cognitive capacity is depleted would be less successful in decoding complex or lengthy information and hence, **less able to discern its degree of relevance** as compared to an individual with a full cognitive capacity at his or her disposal. Capacity-drainage will also favor the use of highly accessible as well as simple decision rules (and related evidence) over less accessible and/or more complex rules that are more difficult to retrieve from background knowledge (e.g., Chaiken et al., 1989). In short, the less one's cognitive capacity at a given moment, the less her or his ability be to process information, particularly if so doing appeared difficult, complicated and laborious.

Motivational bias. Occasionally, individuals do not particularly care about the judgmental outcome, i.e., the conclusion they may reach, or about the judgmental process whereby it was reached. Where they do care, we speak of motivational bias (see also Dunning, 1999; Kruglanski, 1989; 1990; 1999; Kunda, 1990; Kunda & Sinclair, 1999). In principle, all

possible goals may induce such bias under the appropriate circumstances, rendering conclusions (judgments) congruent with the goal desirable and incongruent with the goal undesirable. Thus, the ego defensive, ego enhancing and impression management goals discussed by Chaiken et al. (1989) may induce motivational biases but so many sundry other goals that would render the use of specific information (e.g. the use of specific, conversationally appropriate (Grice, 1975), inference-rules) or specific conclusions, particularly desirable to the individual, e.g., prevention and promotion goals (Higgins, 1997), goals of competence, autonomy or relatedness (Ryan, Sheldon, Kasser & Deci, 1996), etc. Motivational biases may enhance the realization (or use) of subjectively relevant information yielding such conclusions, and hinder the realization of subjectively relevant information yielding the opposite conclusions (cf. Kunda, 1999; Dunning, 1999). Again, we view the degree of motivational bias as lying on a continuum ranging from an absence of bias to considerable bias with regard to a given judgmental topic.

Processing sequence. Our final parameter concerns the sequence in which the information is considered by the knower. Specifically, conclusions derived from prior processing can serve as evidential input in which terms subsequent inferences are made. Thus, for example, several prior conclusions can combine to form a subsequent, aggregate, judgment (Anderson, 1971; Fishbein & Ajzen, 1975). In addition, prior conclusions can affect the construction of specific inference rules whereby subsequent, ambiguous, information is interpreted. Given that a source has been classified as “intelligent”, for example, her or his subsequent, ambiguous, pronouncements may be interpreted as “clever”. Given that an actor has been classified as a

"middle class housewife" the epitaph "hostile" may be interpreted as referring to "verbal aggressiveness", whereas given that she been classified as a "ghetto resident", "hostile" may be interpreted to mean "physical aggression" (cf. Duncan, 1976). The Parameters' Properties and Interrelations Continua versus dichotomies. The present parametric approach is distinct in major ways from the prevalent dual-process paradigm. A critical difference is that the dual-process models assume qualitative dichotomies (e.g., between central and peripheral processes, heuristic and systematic processes, heuristic and extensional reasoning, or category-based and individuating processing) whereas all our parameters represent continua (e.g. recipients may have differing degrees of processing motivation, or of cognitive capacity; they may experience greater or lesser difficulty in addressing a given judgmental task, or they may perceive the information given as more or less relevant to the judgmental topic).

Admittedly, some dual-process models explicitly incorporate continua into their formulations. Most notably, Petty and Cacioppo (1986) discuss a continuum of elaboration likelihood that runs from brief elaboration to extensive and thorough elaboration "received by the message" (ibid., p. 129). However, as shown later, the "brief and shallow" processing at one end of the continuum targets peripheral cues, whereas the thorough and extensive elaboration targets issue and message arguments. Thus, the elaboration likelihood model blends together the degree of elaboration and the information being elaborated (cues versus message arguments).

That is, perhaps, why Petty, Wheeler, and Bizer (1999) insist on the qualitative difference in modes of processing beyond mere quantitative variation inherent in the notion of a continuum.

As they put it (ibid., p. 161) “the key question is whether all persuasion findings can be explained by this quantitative variation. If so, then the qualitative variation postulated by the ELM (and..other dual-route models) would not be necessary”. Of course, they conclude that it is necessary, and that, contrary to our present claims, it is unrelated to differences in informational contents. To demonstrate this point, Petty et al. (ibid.) cite research by Petty and Cacioppo (1984) wherein counting the arguments (three versus nine) constituted the “cue”, juxtaposed to the substance of the “message arguments”. But note that the “number of arguments” represents a content of information every bit as much as the substance of the arguments, whatever it may be. Just as the substance of arguments may indicate to the recipient that the conclusion is valid, so too can the number of arguments (many versus few) to someone subscribing to the appropriate premise, e.g. “if there are so many arguments it must be good ” (as Petty et al., 1999, p. 161 explicitly recognize). Indeed, Petty et al. (ibid.) acknowledge, that both the processing of cues and of message arguments “could reasonably.. (represent) ..some type of if-then reasoning” (parenthesis ours). This is in accord with our present assumption that the “if-then” premises in the two cases contain different informational contents (i.e. “cues” or “message arguments”) as the antecedent terms in the appropriate “if-then” statements, defining what the persuasive evidence in each case consists of.

Similarly, Fiske and Neuberg (1990) propose a “continuum” model that extends from the early consideration of one type of content (i.e. “social categories”) to subsequent consideration of another content (“individuating” or “attribute” information), given sufficient motivation and

capacity. Hence, once again, the quantitative continuum of processing sequences from "early" to "late" processed information is intimately bound here with contents of the information processed (categories versus attributes), and it is the contents of information that lend the air of qualitative difference to Fiske and Neuberg's (1990) dual modes.

In short, whereas the dual-process models assume (content-laden) qualitative differences in the ways judgments are reached, the unimodel accounts for variability in judgments in thoroughly quantitative terms related to the parameter values.

(Quasi) Orthogonality of the parameters. The presently identified judgmental parameters are assumed to be quasi orthogonal to each other, hence, to form a multidimensional space containing a vast number of points, each representing a parametric intersection at different values. By contrast, the dual-process models typically isolate two such intersections (e.g. high processing difficulty, and high motivation and capacity versus low processing difficulty and low motivation and capacity), conjoin them to two separate types of content (e.g. message related, versus message-unrelated contents, or social-category based versus individuating contents) and treat them as qualitatively-distinct modes of forming judgments.

We assume that the judgmental parameters are generally orthogonal to each other, and that their values derive from largely independent determinants. Thus, subjective-relevance of information may derive from a prior forging of conditional "if then" links between informational categories, the magnitude of processing motivation may derive from the goal of accuracy, and the difficulty of processing may depend on accessibility of inference rules or the saliency of

pertinent information, all representing clearly separate concerns. Nonetheless, the parameters may share some determinants and occasionally may affect one another and in that sense, they are only roughly (or, quasi) rather than "pristinely" orthogonal. For example, highly relevant information may be used more frequently than less relevant information, resulting in its greater accessibility, which in turn should lower the value of the processing difficulty parameter. Conversely, high accessibility of information, may increase its perceived relevance in some contexts (e.g., Jacoby, Kelley, Brown & Jasechko, 1989; Schwarz & Clore, 1996).

A similar case can be made for the influence of motivation on subjective relevance in that a given bit of information may be perceived as more relevant, the more desirable the conclusion it points to (e.g., Lord, Ross, Lepper, 1979), or the more congruent its implications are with the knower's motivation. For instance, in order to justify their "freezing" on early information persons under high need for closure may perceive it as more relevant to the judgment at hand than persons under low need for closure (Webster & Kruglanski, 1998); by contrast, persons with a high need for cognition (Cacioppo & Petty, 1982) may perceive the early information as less relevant, so that they may carry on with their information-processing activity. Finally, limited cognitive capacity may reduce processing motivation or induce a need for cognitive closure (cf. Kruglanski & Webster, 1996), etc. Despite these inter-relations, however, the judgmental parameters are relatively independent ("quasi-orthogonal") because many of their determinants are in fact unique or non-overlapping.

The Parameters' Role in Judgment-Formation

What specific role do the foregoing parameters play in judgment-formation? As already noted, our key parameter is subjective relevance. All the remaining parameters define conditions allowing the subjective-relevance parameter to take effect. Thus, where the information-processing task is difficult, the information's (degree and type of relevance) may not be accurately realized unless the knower had an appropriately high degree of processing motivation and appropriately ample degree of cognitive capacity to handle the difficulty. The more difficult the task, the more motivation and capacity would be required to discern the information's (subjective) relevance to the judgment. Similarly, the ordinal position parameter may supply "grist" for the "relevance-mill" by yielding on-line conclusions serving as evidence for subsequent inferences, e.g., of combinatorial (cf. Anderson, 1971; Fishbein & Ajzen, 1975) or interpretative nature. It is in the foregoing sense that the parameters of motivation, capacity, task difficulty and ordinal position play an auxiliary or enabling role with respect to the crucial parameter of subjective-relevance.

Over the years, different judgmental models highlighted distinct judgmental parameters out of the present set. For example, the "probabilogical" models of McGuire (1960; 1968) or Wyer (1970) emphasized the syllogistic relation between evidence and conclusions, related to the present relevance parameter. Motivational bias was highlighted in models of cognitive dissonance (Festinger, 1957) or motivated reasoning (Kunda, 1990; with Sinclair, 1999). It was also accorded some attention in contemporary dual-process models (e.g. Chaiken, Liberman and

Eagly, 1989; Petty and Cacioppo, 1986), though these models emphasized in particular the factors of nondirectional motivation and cognitive capacity, to the relative neglect of evidential-relevance considerations. Most judgmental models in the social psychological literature paid relatively little attention to perceived difficulty of the judgmental task, and none of the prior models to our knowledge attempted to elucidate the full set of judgmentally relevant parameters. As a consequence, much judgmental research failed to control for some of these parameters leaving the door open to rival alternative interpretations of the findings.

For instance, in research claiming support for a qualitative difference in the processing of heuristic or peripheral cues versus message arguments (Chaiken, Liberman & Eagly, 1989; Petty and Cacioppo, 1986) one would need to control for the difficulty of processing these two types of information, their degree of perceived relevance to the judgmental topic, the desirability of conclusions each may yield given the participants' momentary motivation, etc. And the same holds for research claiming support for a qualitative difference in the processing of social category versus individuating-attribute information (Fiske & Neuberg, 1990), statistical versus heuristic information (Tversky & Kahneman, 1974), or behavioral-identity versus dispositional trait information (Trope & Alfieri, 1997). Such controls, have been conspicuous in their absence from large bodies of judgmental work. Instead, such work typically confounded informational contents with parameter values; hence, the latter provide a general alternative interpretation of results often cited in support of various dual process models.

In what follows, we consider such a reinterpretation in four major areas of dual process

work: (1) persuasion, (2) attribution, (3) impression formation, and (4) biases and heuristics. Space considerations make it impossible to exhaustively consider all of the various dual-process models in the literature (for a source book see Chaiken & Trope, 1999). Extrapolation of the present reasoning to alternative dual-process models is straightforward, however, and can be readily undertaken.

Persuasion

The ELM and the HSM

Influential dual-process models in the realm of persuasion have been (1) Petty and Cacioppo's (1983; 1986) Elaboration Likelihood Model (or ELM), and (2) Chaiken's (Chaiken, 1980; Chaiken, Liberman & Eagly, 1989) Heuristic Systematic Model (or HSM). Though distinct from each other in several respects (for discussions see Eagly and Chaiken, 1993; Petty, 1994) these models' fundamental view of persuasion shared significant commonalities: Both approached it from a cognitive perspective (cf. Greenwald, 1968; Petty, Ostrom and Brock, 1981) and located persuasive "action" within the recipient's ongoing mental processes. Relatedly, both assigned important role to recipients' processing motivation and cognitive capacity. Finally, and of special present interest, both drew a distinction between two qualitatively different informational inputs impinging upon the recipient. One of these, common to the ELM and the HSM, consisted of the processing of information contained in the message arguments or otherwise related to the issue or topic under consideration. The second, conceptualized somewhat differently in the two models, consisted of the processing of

information unrelated to the topic or the issue yet, nonetheless, capable of fostering persuasion under some circumstances.

In the HSM, the latter information went under the label of "heuristic cues" assumed to call to mind "simple decision rules" to which a recipient may subscribe (Eagly and Chaiken, 1993, p. 327). In the ELM it was referred to as "peripheral cues" that, while not formally defined, referred to a host of factors extraneous to the issue, such as source expertise, consensus information, number of arguments provided, speed of the communicator's speech, recipient's mood, etc. (for discussion see Petty and Cacioppo, 1986, p. 130). In both the ELM and the HSM then, "peripheral cues" or "heuristics" have been pervasively juxtaposed to message arguments or issue-related information.

A major common feature of the ELM and the HSM has been their integration of the motivation/capacity factors with the informational distinction between message arguments and cues or heuristics. It was that integration, specifically, that defined the two qualitatively-distinct modes of persuasion, of pivotal importance to both models: According to their analysis, when motivation and capacity are plentiful, persuasion is accomplished via the "central" (in the ELM) or the "systematic" mode (in the HSM), consisting of the extensive elaboration and processing of message or issue information. By contrast, when motivation and/or capacity are scarce, persuasion is accomplished via the "peripheral" (in the ELM) or the "heuristic" (in the HSM) mode consisting of a relatively brief and shallow processing of various ("peripheral" or "heuristic") cues.

Empirical Research in the Dual-Mode Paradigm

In a typical dual-mode persuasion experiment, the peripheral or heuristic cues are presented up-front, and the message arguments come subsequently. Moreover, the message arguments are typically lengthier and more complex than the heuristic or peripheral cues. Kruglanski & Thompson (1999a) have recently reviewed the persuasion literature and found this to be so in the preponderance of cases. Either length, complexity and/or the order of presentation could have rendered the message arguments more difficult to process than the heuristic cues. In terms of the present analysis, past persuasion research within the dual-mode framework might have confounded the contents of persuasive information (i.e. cues versus message arguments) with values on the processing-difficulty parameter. That could be the reason why the cues typically exerted their persuasive effect under low processing motivation or cognitive capacity, whereas the message arguments typically did so under high motivation and capacity. If so, controlling for processing-difficulty of cues and message arguments should eliminate the statistical interactions between information-type and motivation or cognitive capacity, that heretofore constituted one of the most robust bulwarks of evidence for the dual-modes notion in the persuasion domain.

Unimodel-Based Persuasion Research

(1). Impact of lengthy source information under high issue involvement. We proceeded to explore the above notions in several studies. Thus, in an early experiment (Kruglanski & Thompson, 1999a, Study 1) we presented the source information lengthily rather than briefly (as

was typically done in prior research). After having received the source information, all participants were given the same, one-page, essay in which the communicator argued in favor of the attitude topic (comprehensive exams). Orthogonally to the expertise information, we manipulated participants' involvement in the issue. As shown in Figure 1, we found that only the involved but not the uninvolved participants were persuaded more by the expert vs. the inexpert source. It appears then that it is not the content or type of information that matters but rather its processing difficulty. At any rate, the motivational factor of issue-involvement seems to have a similar effect on ("heuristic") information about the source as it was shown to have on message argument information in prior research.

Figure 1 here

In subsequent research, (Kruglanski & Thompson, 1999, Study 3) we found that long expertise information had a persuasive effect only in the absence of distraction, mimicking message argument effects in prior research (Petty, Brock & Wells, 1976). By contrast, short expertise information had an effect only in the presence of distraction, consistent with the dual-mode prediction for peripheral or heuristic information in general. In yet another study (Erb, Pierro, Mannetti, Spiegel & Kruglanski, 2002, Study 1), we manipulated the length of the expertise information orthogonally to the degree of involvement.We found that the short expertise information had greater impact under low involvement replicating the expertise effects of prior research, whereas the long expertise information had greater impact under high involvement mimicking the message argument effects of prior research (see Figure 2).

Figure 2 here

Kruglanski & Thompson (1999, Study 4) obtained the same effects for brief (and upfront) versus lengthy (and later appearing) message argument information. Specifically, the brief initial arguments had greater impact under low involvement, mimicking the typical findings with "peripheral" or "heuristic" information, whereas the subsequent lengthy arguments had greater impact under high involvement replicating the typical message argument effects.

(2) Need for closure augments the impact of early source or message information. In a typical persuasion study, the heuristic or peripheral information comes before the message information. Thus, a confounding exists between order of presentation (and thus the processing sequence parameter) and information type (message argument or heuristic/peripheral information). It is possible that part of the reason why the peripheral/heuristic source information exerted its effect primarily under low processing motivation is that the processing sequence matters and under low magnitude of processing motivation participants were motivated to stop soon, and hence to base their judgments on the early information. Consistent with this analysis, we (Erb et al. (2002) found that the need for closure, a variable known to effect the "seizing" and "freezing" on early information (Kruglanski and Webster, 1996; Webster & Kruglanski, 1998) enhanced the impact of the source, or the message information where it appeared early in the informational sequence, i.e. prior to the alternative information type (i.e. message and source information respectively). These data are summarized in Figure 3.

Figure 3 here

3. Biased processing of persuasive information. Both the ELM and the HSM hold that central-route or systematic-processing can occasionally be biased by heuristic or peripheral cues (Chaiken & Maheswaran, 1994; Bohner, Chaiken & Hunyadi, 1994; Bohner, Ruder and Erb (in press), Darke, Chaiken, Bohner, Einwiller, Erb, & Hazelwood, 1998; Mackie, 1987; Petty, Schuman, Richman & Strathman, 1993). Significantly, within the dual-process models, the biasing hypothesis is asymmetrical: It is the heuristic or peripheral cues that are presumed capable of biasing subsequent systematic or central processing, but not vice versa. The reason for the asymmetry is obvious: Because in prior persuasion studies "cues" typically appeared before the message arguments, it does not make much sense to ask whether their processing might be biased by the ("central" or "systematic") processing of message arguments. But the unimodel removes the constraint on processing sequence, hence it affords the question whether any information-type might be capable of biasing the processing of subsequent information provided one was sufficiently motivated to consider the latter. How might that occur?

Simply, the early information could make accessible certain conclusions serving as evidence for further inference rules in whose light the subsequent information might be interpreted (Higgins, Rholes and Jones, 1977). We conducted two experiments to test this idea (Erb et al., 2002, Studies 4 and 5). In the first, we looked at the biasing effects of early message arguments on processing subsequent message arguments and in the second, at biasing effects of early message arguments on processing subsequent source information.

Thus, in the first study participants were given information consisting entirely of message arguments. The initial argument was either of high or of low quality. The subsequent five arguments, were constant for all the participants and were all of moderate quality. Orthogonally to the quality of initial arguments, we manipulated processing-motivation (high versus low) via accountability instructions. We found that attitude toward the aspects highlighted in the subsequent arguments (those constant for all the participants) was biased by the initial message argument, but this occurred only under high processing motivation. Specifically, in the high motivation condition attitude to those aspects of the issue mentioned in the subsequent arguments was significantly more positive when the initial argument was of high versus low quality. In the low motivation condition this difference disappeared (see Figure4).

Figure 4 here

We also found that the thought listings generated in response to the subsequent (constant) arguments were affected by initial argument quality, but only under high processing motivation. In that condition, thoughts generated in response to those arguments were more positive when the initial argument quality was high versus low (see Figure 5).

Figure 5 here

Path analyses additionally demonstrated that under high (but not under low) processing motivation persuasion was mediated by the biased processing of the subsequent-arguments in light of the earlier arguments. In the high motivation condition, the effect of the initial argument on attitude judgments was fully mediated by biased processing of the subsequent arguments.

Under low motivation the valence of the initial argument determined the thoughts about this particular argument which in turn determined attitude judgments. There was no mediation here by thoughts about the subsequent arguments; hence, no evidence for biased processing (see Figure 6 a, b).

Figure 6 here

Our second study reversed the typical order of presentation by placing in one condition message-arguments (of high or low quality) before (rather than after) the source information (of moderate expertise, constant for all participants). In the second condition, source information came first, followed by the (high or low quality) message argument. All participants were placed under high processing motivation. The results revealed that the perceived expertise of the communicator was appropriately biased by initial argument's quality but only when the argument preceded, and not when it succeeded the source information. In turn, biased processing of the source information determined the attitude judgments (see Figures 7 and 8).

Figures 7 and 8 here

Taken as a body, research reviewed above suggests that the contents of persuasive information do not matter. What matters are the parameter values (e.g., on the processing difficulty or order of presentation parameters). When these are controlled for, prior pervasive differences between the peripheral or heuristic processing of "cues" and the central or systematic processing of issue- or message-related information disappear.

Remaining Questions About the Dual Mode Models of Persuasion

The place of "cues" and "arguments" on the elaboration continuum . As noted above, in ELM-inspired research the distinction between "cues" and "message arguments" has been confounded with difficulty of information processing. It is of interest to ask, however, whether such confounding is limited merely to the operational level, or whether it represents a more fundamental feature of the theoretical formulation. In a recent statement, Petty, Wheeler and Bizer (1999, p. 157) denied the latter. As they put it, "In the ELM, content (e.g. source variables, message variables) and process…are orthogonal. That is, one can engage in effortful scrutiny of source factors, message factors and other factors..". Nonetheless, note that in the major statement of the model by Petty and Cacioppo (1986, p. 129) the low end of the elaboration continuum is associated with the use of "cues" as well as with low processing motivation or capacity, while the high end is associated with processing message arguments as well as with high motivation and capacity. Thus, a theoretical confounding does seem to be implied here between what is processed (i.e. "cues" or "message arguments") and how extensively it is processed. At any rate, the way it was originally defined, the notion of the elaboration continuum has no place for the extensive elaboration of "cues"; and whereas it does allow, in principle, for "brief and shallow" elaboration of message arguments, in practice, such possibility is accorded little attention in the model.

Multiple functions of variables in persuasion. An important assumption of the ELM is that the same variables can serve different persuasive functions. Thus, a source variable can

serve in the function of a message argument (e.g. source attractiveness can be an argument in favor of a cosmetic product) and a message can serve in a cue function (Petty and Caciopo, 1986; Petty, 1994). But the essential question is how exactly do the "cue" and "message" functions differ? Clearly, if something was considered to serve a cue function simply because it was processed briefly, and an argument function simply because it were processed extensively, the distinction between cue and argument functions would reduce, simply, to the extent of processing dimension, replacing a qualitative dichotomy by a quantitative continuum, and hence removing the basis for a dual-mode formulation.

Nor does there seem to be any alternative way that works, of conceptually distinguishing between "cue" and "argument" functions. As noted earlier, Petty et al. (1999) exemplified the "cue function" by the counting of arguments and the argument function as processing the substance of the message. But, while the notions of "many" versus "few" arguments (the product of counting), and the substance of some message (e.g. "graduates of prestigious colleges get better jobs") are clearly different in their informational contents, they fulfill the very same evidential function in accordance with the appropriate prior if-then rules as Petty et al. (1999, p. 161) themselves acknowledged.

How are heuristics to be defined? In reference to the HSM, it might be argued that "heuristics" are by definition, brief and simple (cf. Chaiken, Lieberman and Eagly, 1989), hence our creation of lengthy "heuristics" information in research described above is an oxymoron. However, note that if brevity (or simplicity) alone were the sole yardstick for a "heuristic" status,

then the pervasive juxtaposition of “heuristics” and “message arguments” would be unwarranted. After all, message arguments too can be brief and simple. Moreover, if brevity is the hallmark of “heuristics” the distinction between “heuristic” and “systematic” processing begins to look like a quantitative continuum of length, rather than a qualitative dichotomy. All things considered then, the dual mode portrayals of persuasion seem vulnerable on both theoretical and empirical grounds.

Dispositional Attributions

But let us move on to consider in unimodel terms the classic problem of dispositional attributions. In this domain, Trope and his colleagues (Trope, 1986; Trope and Lieberman, 1996;Trope and Alfieri, 1997) proposed an influential dual-process model wherein the contextual constraint information impacts behavior identification and dispositional inference in qualitatively different ways. At the identification stage, the incorporation of contextual constraints is said to be relatively effortless, automatic and independent of cognitive resources. By contrast, at the dispositional-inference stage the influence of context is said to be controlled, deliberative and capacity-demanding (Trope and Alfieri (1997, p. 663).

Trope and Alfieri (1997) tested their dual-process model in two experiments. In their first study, participants were either submitted or not submitted to cognitive load. They then received information about a target person who had given either an unambiguously or an ambiguously positive evaluation of a fellow employee, and had done so under situational constraints prompting either a positive or a negative evaluation of the target. All participants then indicated

(1) how positive was the target person's evaluation of the employee (behavior identification), and (2) how positively the target person really felt toward the employee (dispositional inference). The authors predicted and found that irrespective of load participants rated the unambiguously positive evaluation as very positive, and the ambiguous evaluation as more positive when the situational constrains prompted a positive rather than a negative evaluation (presumably because of an assimilation of the ambiguous evaluation to the constraints). These data were interpreted as supportive of the notion that assimilating a behavior to the context constitutes a resource independent, effortless task that anyone can carry out, irrespective of cognitive capacity.

The results also indicated that only participants in the no-load condition, but not those under load were able to subsequently discount the situational constraints from their behavioral identification ratings in inferring how much the evaluator really liked the employee. This finding was interpreted as indicating that, unlike behavior identification, dispositional-inference is effortful and resource-dependent, and that people can perform it only if endowed with adequate cognitive capacity.

Trope and Alfieri (1997) also postulated that the effortless and resource-independent way in which the context affects behavior identifications renders this process relatively irreversible and inflexible, compared to the effortful and resource-dependent manner in which it affects dispositional inference. In contrast, because incorporating the context information into dispositional inferences is considered resource-dependent the influence of such information should be reversible or revisable on the basis of subsequent relevant evidence. Trope and Alfieri

(1997, Experiment 2) reported data consistent with these predictions. Specifically, even after it was invalidated (!), situational information continued to affect the identification of a target's behavior, but it no longer affected the dispositional inferences made from the behavior.

A Unimodel-Based Analysis of Assimilative Behavior Identifications and Dispositional Inferences

"Phenotypically", dispositional inference phenomena seem starkly different from instances of persuasion. They contain neither a message nor a communicator, and their major interpretations (e.g. by Trope, 1986 or Gilbert and Osborne, 1989) do not distinguish between distinct routes or modes of reaching judgments. Moreover, unlike the dual-process models of persuasion, in which the modes represent different ways (or paths) of forming an attitude or an opinion, Trope's (1986) dual process model of dispositional inferences is dual in the sense of distinguishing between two sequential phases whereby inferences are reached. These apparent differences notwithstanding, each of these phases revolves about a judgment, and hence each is explicable in terms of the very same process identified by the unimodel.

From this perspective, each of the phases addresses a different, content-specific, question. The first is the identification question, "what is it?" The second is the causal inference question, "what caused it?". According to the unimodel both (and in fact, all) questions are answered on the basis of relevant evidence. In these terms, contextual information may constitute evidence relevant both to the behavioral identification and the dispositional attribution questions. For instance, a person's ambiguous facial expression, interpretable alternatively as

"happy" or "sad", might be construed as "happy" if the context of the observation was a party because of the prior assumption that "people generally try to appear happy at parties" and hence, the inference rule, "if party-- then happy-appearing". Similarly, if the context consisted of a funeral one may interpret the expression as "sad" because of the relevance assumption (or, an inference rule) whereby "if funeral then sad-appearing". Note that only subjectively relevant aspects of the context will be used to disambiguate the behavior. Irrelevant aspects (i.e., ones that the individual does not tie strongly to the requisite judgment) should not impact identification. For instance, the individual may rather doubt the statement "if in Amsterdam then happy/sad". An information that an individual was spotted on the Leidseplaain, should not appreciably influence the way in which her Mona-Lisa-like smile was demystified, because that particular knowledge would be considered irrelevant to the smile-identification problem.

In exactly the same way that (for some individuals, subscribing to the appropriate lay theories, or inference rules) certain contextual information may constitute relevant evidence for a given identification, it may constitute relevant evidence against a dispositional attribution. Again, the individual's belief in an "if then" connection between the contextual information and the situational attribution is crucial. Thus, departing from the premise that "Everybody smiles at parties", an individual may reason that "if X smiles at a party she behaves like everyone else, i.e. non uniquely", which is inconsistent with a dispositional attribution of the smiling, defined in terms of its uniqueness.

In short, the role of contextual information in behavioral identification and dispositional

inference is the same. In both cases it serves as relevant evidence for reaching a given, albeit a different, conclusion. Just like with behavioral identification, irrelevant contextual information, e.g. that the smiling occurred in Amsterdam should have no impact on dispositional attributions because of a lack of a prior subjective "if then" belief linking Amsterdam to smiling.

The perceived difficulty of processing parameter also applies alike to behavior-identification and dispositional attribution judgments. For instance, the contextual constraint information may be presented in a salient manner, and/or the rule linking it to the behavioral identification may be highly accessible. This would render the information relatively easy to process. Alternatively, the information may be presented in a pallid fashion and the inference rule that lends it relevance may be relatively inaccessible; this would render it relatively difficult to process. Other factors affecting the difficulty of processing might be the informational "signal to noise ratio" in the stimulus material, or the degree to which the pertinent evidence is imbedded in diluting information. All such factors are assumed to function identically with respect to behavior identification and dispositional attribution judgments.

According to the unimodel, the more difficult the judgmental task, the more processing motivation and/or cognitive capacity should be required to properly carry it out. From that perspective, it is quite possible that Trope and Alfieri's (1997) findings pertain to a situation wherein, for some reason, using the contextual information to answer the identification question was relatively easy, demanded little cognitive capacity, and, consequently, was unaffected by cognitive load, whereas using that same information to answer the dispositional-inference

question was for some reason relatively difficult, demanding and hence sensitive to load.

That the dispositional inference question can be independent of load in some circumstances was, in fact, already demonstrated in a series of studies by Trope and Gaunt (2000). Each of their three experiments varied a different knowledge-activation factor. One experiment varied the saliency of the contextual information, another varied its accessibility, and the third varied its specificity. As Trope and Gaunt (2000, p. 344) summarized it, this research found "...that cognitive load eliminated discounting when situational information was low in salience, accessibility, or specificity. However, when situational information was more salient, accessible, or specific, it produced strong discounting effects even when perceivers were under cognitive load...". We view these interesting results as at odds with a dual process model that portrays dispositional inferences (in counterdistinction to behavioral identifications) as inherently exigent of resources and hence, sensitive to load. But is it the case that assimilative behavior identifications can be sensitive to load in some circumstances?

We (Chun, Spiegel & Kruglanski, in press) conducted three separate experiments addressed at that question, all varying the difficulty of information-processing in reference to the behavior identification judgment. Consistent with the unimodel, participants' perception of the ambiguous behavior was independent of cognitive load where the behavior identification task was made easy (by increasing the saliency of the behavioral or the contextual information), but was significantly dependent on load where this task was difficult. (See Figure 9)

Figure 9 here

Furthermore, where the task was easy, invalidating the contextual information did not affect prior behavioral identifications, replicating Trope & Alfieri (1997). However, where the task was difficult, apparently making the participants self-conscious about the way they reached their judgments, invalidating the contextual constraint information eradicated its effects on behavioral identification (see Figure 10).

Figure 10 here

In short, research reviewed above suggests that it isn't necessary to posit qualitatively distinct judgmental processes for the phases of behavior identification and dispositional inference. The available evidence suggests that when the parameter of processing difficulty is controlled for (as well it should be)--the putative processing differences between these phases are eliminated.

Impression Formation

Impression formation has constituted a central domain of dual-process theorizing. Two influential models in this area have been those of Fiske and Neuberg (1990: Fiske, Lin & Neuberg, 1999) and of Brewer (1988). Though these conceptualizations differ in some important regards, they nonetheless share striking features, crucial from the unimodel's perspective: Perhaps most important among these is that they both distinguish between category-based and attribute-based processing and view them as qualitatively different. Category-based processing is assumed to be "top-down" and attribute-based processing, "bottom up" (Brewer ,1988, p. 4; Fiske & Neuberg, 1990; p. 60).

Both models also assume that impression-formation follows a fixed order whereby it commences with an automatic identification of the target in terms of some general categories. According to Fiske & Neuberg (1990, p. 10) "the category label is more likely to be a social grouping (demographic category, role, job) than a single personality trait". Subsequently, if the incoming information and the knower's self-involvement warrant it, she or he may continue processing information and at the end he/she might process individuating or personal-attribute information as well. In Brewer's (1988, p. 23) model, for example personalization requires a sufficient degree of self-involvement, which allows "…attributes and behaviors ...inconsistent with previously established expectancies (to) be processed extensively and incorporated into the person representation...". In Fiske and Neuberg's (1990, pp. 5-6) model, if the target is "minimally interesting or personally relevant…then the perceiver will attend to...information necessary to form an impression beyond the essentially perceptual, rapid initial categorization...".

We readily accept the notion of a continuum common to Fiske and Neuberg's (1990) and Brewer's (1988) models. In fact, all our parameters represent quantitative continua on which judgmental situations could vary. We differ from these dual-process models of impression-formation, however, with regard to the assumptions that (1) particular contents of information (related, e.g. to social-categories) invariably will be processed first, or are assigned greater weight in the overall judgment under some motivational/cognitive capacity conditions than do other contents, and that (2) that judgment based on some types of information (e.g. on social

categories) is mediated by a qualitatively different process than judgment based on other types of information (e.g. on attribute information).

Primacy. According to the unimodel, the sequence in which information is processed and impacts judgment is generally independent of contents per se. Instead, primacy depends on whether the information is seen as relevant to the judgment and on the readiness with which such relevance is recognized by the knower (determined by such factors as the information's saliency and accessibility and/or accessibility of the rules that lend the information its relevance). The role of subjective relevance was noted by Medin (1988, p. 122). As he put it "The response should depend on what information is needed and how well that information can be predicted from knowledge about who the person is, what groups they can be classified into, or what situation is instantiated..." (emphasis ours). Exactly the same point was implied earlier by Bruner (1957) namely that… "a primary determinant of category activation is the search requirements imposed by the perceiver's needs, objectives and task goals..." (cited in Brewer, 1988, p. 18).

Categories versus attributes? Furthermore, it is doubtful that a "social category" and a "personal attribute" can be meaningfully distinguished from each other as far as the judgmental process is concerned. In the statement "Judy is a nurse", the term "nurse" (i.e. a social category) can be readily considered one of Judy's attributes, as may the category "friendly person" in the statement "Judy is friendly". As Klatzky & Andersen (1988, p. 98) noted "Even individualized person concepts have associated attributes and…these attributes are themselves social categories...". Medin (1988, p. 122) expanded on this point to say "if every person were treated

as absolutely unique, than there would be no basis at all for generating expectations. This would be analogous to the situation of a physician being confronted with a totally new disease unlike any other…".

To summarize then, the information utilized upon an encounter with a social stimulus may indeed represent a "social" category or a "trait/attribute" category, all depending on their subjective relevance ("search requirements", "task goals", or "informational needs") to the judgment at hand. As far as the judgmental process is concerned, "social categories" and "traits" or "attributes" are functionally equivalent in constituting evidence for the requisite judgment.

It seems, furthermore, that impression formation models conceived of a social category in the singular (i.e. the category within which the stimulus person is placed during the identification phase) whereas, of the personal attributes in the plural (i.e. the various attributes that need to be pieced together, in the "piecemeal" process). However, there is no reason to think of a person as fitting a single category necessarily, or being characterized by multiple attributes necessarily. To reiterate, the distinction between "categories" and "attributes" is essentially one of informational contents and is unrelated to the number of categories or attributes that may fit a given individual.

Automaticity. The notion that the identification stage (referred to as "categorization") is necessarily "automatic" and resource-independent was already questioned in connection with the dispositional attribution research described above (Chun, Spiegel & Kruglanski, in press). Any information-processing task may be made easy, hence relatively "automatic", or difficult, and hence controlled depending on the circumstances, its degree of routinization or the individual's

learning history. An identical point was made by Smith (1988, p. 167) who stated: "…the specific dimensions that are classified automatically will depend on people's learning history as well as on context. Practice making particular categorizations or other types of social judgment can lead to automaticity of processing. Thus, there can be no fixed line between dimensions that are processed automatically and those that are not. A new-car salesman who (because of occupational demands) classifies hundreds of people daily as potential customers versus mere "lookers" may eventually make distinctions along that dimension automatically. In our society race, gender, age and (I would add) socioeconomic status are highly salient determinants of many significant social roles, so they are probably processed automatically by most adults. But this might not hold true in other cultures, while other dimensions (e.g. clan membership) might attain automatic status…".

Bottom-up versus top-down processing? Both Brewer's (1988) and Fiske & Neuberg's (1990) models assume that category-based processing is top-down whereas the processing of attribute information is bottom-up. But let us take a closer look. Note first that both types of processing involve jointly (1) contextual information, or data and (2) background knowledge or memory schemata (cf. Bobrow & Norman, 1975). The distinction between bottom-up and top-down processing refers to the instigation-provenance of processing attempts. In the former case the process is instigated by the data (is "data-driven") while in the latter, it is instigated by the schema (is "theory-driven"). Several authors point out that bottom-up and top-down processing co-occur and are inextricably intertwined with each other. Thus, Bobrow and Norman (1975, p.

148) who originally introduced the "bottom-up-top-down" partition note that "Both… processes must go on together; each requires the other". A similar point was made by Ned Jones' (1988, p. 86) in his commentary on Brewer's (1988) model. In his words: "There is a suggestion that order of recall will help us maintain the dual process distinction, but I find it hard to believe that this is going to be anything like a truly reliable discrimination since perceivers inevitably go back and forth between the data and its conceptualization...".

Thus, it may be rather difficult to separate in any given instance the occurrence of "bottom-up" from "top-down" processing. Moreover, it should be at least as difficult to substantiate the claim that one type of processing occurs with one type of information (namely with "social categories") and another type of processing—with another type of information (namely, "personal attribute" categories).

In summary, careful analysis suggests that, consistent with the unimodel, (1) "social category" information does not need to be generally utilized prior to "personal attribute" information. Rather, each type of information is utilized as function of its (subjective) relevance to the judgmental problem at hand. More generally, (2) contextually given "category" and "attribute" information types are functionally equivalent as far as the judgmental process is concerned, both serving as "evidence" for requisite judgments. (3) The degree to which given information is processed "automatically" or effortlessly versus effortfully or deliberately is related to its subjective "ease" (determined e.g. by its degree of routinization) rather than to its contents (i.e., it constituting "social category" or "personal attribute" information). (4) The

distinction between “bottom-up” and “top down” processing may hardly distinguish the differential use of “category” versus “attribute” information in so far as these two types of process seem inextricably intertwined.

Reassessing the Empirical Evidence for a Dual Process Model of Impression Formation

Though the foregoing considerations are consistent with the unimodel, we still need to contend with empirical evidence seemingly corroborating the dual-process models of impression formation. To that end, we consider now two major studies cited in support of Fiske and Neuberg’s (1990) dual process model, namely the Pavelchak (1989) experiment claimed to provide the “...clearest evidence to date for 2 distinct person evaluation processes: 1 based on liking for person attributes and 1 based on social categorization” (Pavelchak, 1989, p. 354), and the, equally important, Neuberg and Fiske (1987) study.

The Pavelchak (1989) study. In the first session of Pavelchak=s experiment, participants rated the likability of 35 academic majors and 50 personality traits. In the second session participants were presented with six stimulus persons, each portrayed via four traits. There were two conditions: category and piecemeal. In the category condition, participants (1) guessed the targets’ academic majors, and (2) rated their likability. In the piecemeal condition, they rated targets’ likability after exposure to their traits, but before guessing their majors. Pavelchak (1989) hypothesized and found that participants in the category condition who categorized the targets prior to rating their likeability—rendered likeability ratings that were more congruent with the categories’ likeability than with likeability of the traits. Participants in the piecemeal

condition, by contrast, made likeability ratings that were more congruent with likeability of the traits than that of the categories. Pavelchak (1989, p. 361) interpreted these results as offering "clear evidence that there are two distinct modes of person evaluation: one computed from attribute evaluations and one based on category evaluations".

From the unimodel's perspective, however, these results are alternatively explicable in terms of a differential accessibility of the "category" information in Pavelchak's (1989) two experimental conditions. Recall that in the category condition participants received the information about the target's traits, then guessed her or his major (the category in question) and then rated her/his likeability. Because the category information was generated (guessed at) just prior to rendition of the likability judgments, it probably was highly accessible to participants due to its recency of activation (cf. Higgins, Rholes & Jones, 1977; Srull & Wyer, 1979). As a consequence, it may have readily figured as a basis for participants' likeability judgments rendered immediately afterward. By contrast, in the piecemeal condition, participants rated the target's likeability immediately following their exposure to the target trait-descriptions, these were then highly accessible at the moment of rating, hence constituted a ready basis for likeability judgments. The "category" (i.e., the participant's major) must have been quite inaccessible at that moment; it may have been even unavailable in participants' memory (c.f. Higgins, King & Mavin, 1982) as they did not have any particular reason to infer those categories unless specifically instructed to do so by the experimenter (which in the piecemeal condition occurred only after participants had made the likeability ratings). Thus, it is not

surprising that the category in the piecemeal condition exercised limited influence on likeability judgments. Should one reverse the order and activate the trait information closer to the moment of judgment (hence rendering it more accessible) than the category information, the trait information might well then exert the stronger influence upon judgments. These notions could be profitably probed in subsequent research.

The Neuberg and Fiske (1987) study. In the procedure employed by Neuberg and Fiske (1987) participants believed they would interact with a former schizophrenic named Frank. Participants expected to work with Frank in an outcome-dependent or independent fashion. They then read a personal profile (the individuating information) allegedly provided by Frank. Half the participants received a stereotypically and affectively neutral profile, the other half, a profile inconsistent with the schizophrenic label. The main dependent variable was participants' liking for Frank. Neuberg and Fiske (1987) predicted that in the absence of outcome dependency (Experiment 1) or accuracy motivation (Experiment 2) and where the individuating information was neutral, participants should not be particularly motivated to process the information and hence should rely on the category label and evaluate Frank negatively. However, where the individuating information was inconsistent with the category, or where participants were outcome dependent on Frank, they should be motivated to process the individuating information and hence base their liking judgments on such information, that is, render relatively neutral judgments where the individuating information was neutral and relatively positive judgments where the individuating information was positive.

Results of the Neuberg and Fiske (1987) experiments yielded the predicted pattern, which the authors interpreted as support for the dual-process model and especially, for the notion that processing motivation (induced either via outcome dependency, informational inconsistency or accuracy motivation) encourages attribute-based processing or individuation whereas the absence (or relatively low level) of processing motivation encourages category-based processing.

But a close look at the Neuberg and Fiske (1987) procedure suggests an alternative interpretation. Specifically, the category-information that Frank is a former schizophrenic was presented very briefly (via a single line of text stating that "Frank, …entered St. Mary's around a year ago as a schizophrenic" (Neuberg and Fiske, 1987, p. 435)) and up-front. By contrast, the individuating information was presented subsequently and rather extensively (namely, via a "one page personal profile ostensibly written by Frank about himself" (ibid.)). It is thus possible that the reason why the category information had greater influence on likeability judgments under low processing motivation is that it was easier to process than the lengthier, more complex and subsequent, individuating information. By the same token, the latter information may have been processed more extensively, and hence exerted greater influence on judgments where the participants' motivation was heightened by the outcome dependency or, by a glaring inconsistency between the category and the individuating information.

To explore these notions we (Chun & Kruglanski, 2002a) created two experimental conditions: one in which, much as in the Neuberg and Fiske (1987) studies, the category-information that Frank had been hospitalized as a schizophrenic was presented briefly and

upfront, whereas the (positive) individuating information came subsequently and was relatively lengthy. In the second, novel, condition, the individuating information came first and was relatively brief (albeit equated for positivity with that of the lengthy individuating information). It was followed by a relatively lengthy description of a routine life of Frank in a hospital where he had been hospitalized, at the end of which participants learned that the reason for the hospitalization was schizophrenia (the category information). Orthogonally, we manipulated cognitive load. The results yielded the predicted two-way interaction between informational-sequence and load. Where the category-information was presented upfront, its relative effect on likeability judgments was enhanced under cognitive load (versus the absence of load). In this condition, likeability ratings of Frank were lower under load (versus no-load) reflecting the fact that the category "schizophrenic" had negative connotations for our participants. However, where the category information was presented last, its effect on likeability judgments was undermined by load, in that the likeability ratings of Frank were higher under load (versus no load) reflecting the reduced relative effect under load of the category versus the individuating information. These results are shown in Figure 12.

Figure 12 here

Thus, it appears that just as with any other type of information, category-information need not be relied on more where the knower's processing resources are low. Rather, the degree to which any information (including category information) is relied upon depends, among others, on the relation of its processing difficulty (determined, e.g. by its length, complexity and

sequential position) to the individual's processing resources.

Biases and Heuristics

A vastly influential research program in the psychology of judgment has been the "biases and heuristics" approach launched by a seminal series of papers by Amos Tversky and Daniel Kahneman (e.g., Kahneman & Tversky, 1973; Tversky & Kahneman, 1974; Tversky & Kahneman, 1983). According to their view, shared by many researchers to date, people often do not follow the laws of probability calculus but instead apply rules of thumb or heuristics that often lead to judgmental errors, sometimes labeled as cognitive biases or illusions. This "heuristics-and-biases" view implies that there is something qualitatively distinct about the way people use heuristics versus statistics; reflecting a qualitative difference between what Tversky and Kahneman (1982) referred to as "extensional" versus "intuitive" reasoning. Although no elaborate theory was put forth in support of this distinction, the heuristics and biases view suggested that, much like visual illusions, cognitive illusions too cannot be overridden by conscious effort or formal training (for a thorough discussion see Sedlmeier, 1999).

A very different perspective on the heuristics and biases work is offered by the unimodel. According to this view, "heuristics" and "statistics" represent two content-categories of inferential rules whereby judgments may be reached. Other than that, their use and impact is governed by the very same process embodied in the judgmental parameters elaborated earlier.

Subjective relevance of "representativeness" versus "base-rate" rules. Consider the famous "lawyer and engineer" problem used to demonstrate the putatively ubiquitous base rate

neglect by lay knowers. In a typical experiment claiming this effect, participants are provided with individuating (or "indicative") information about a target as well as with information about the base rates of engineers and lawyers in the sample. In judging whether the target is an engineer, for example, the participant might use a "representativeness" rule whereby "if target has characteristic a, b, and c, he/she likely/unlikely to be an engineer". Alternatively, she might use a "base rate" rule whereby "if the base rate in the sample is X, the target is likely/unlikely to be an engineer". In the original demonstrations by Tversky and Kahneman, participants were much more likely to base their likelihood judgment on the representativeness rule rather than on the base rates, evidencing considerable base-rate neglect. The question is why?

From the unimodel's perspective, a straightforward possibility is that the constellation of parametric values in original 'base-rate neglect' studies may have favored for some reason the "representativeness" over the base-rate rule. For instance, it could be that participants perceived the "representativeness" rule as more relevant to the judgment at hand than the "base rate" rule. Research has established indeed that framing the lawyer-engineer problem as "statistical" or "scientific" appreciably reduced the base-rate neglect (Schwarz et al., 1991; Zukier & Pepitone, 1984). In present terms, framing might have increased the momentary perceived relevance of the statistical information to the judgment at hand. Another way of accomplishing the same effect would be to alter the "chronic" relevance of the statistical information. This might be accomplished by teaching statistical rules to individuals, hence increasing their belief in an "if then" statement linking the base rates, for example, to the likelihood judgments. Indeed, research

(by Nisbett et al, 1987, and Sedlmeier, 1999) has established that statistical reasoning can be taught and that it can result in the increased use of statistical information. As Sedlmeier recently put it (1999, p. 190): “The pessimistic outlook of the heuristics and biases approach cannot be maintained… Training about statistical reasoning can be effective... ”.

The notion that the use of the base-rates depends on their perceived relevance to the knower isn’t exactly new (cf. Borgida & Brekke, 1980). As Bar-Hillel (1990, p. 201) aptly remarked “…base-rates are by and large neglected if and when they are considered to be irrelevant to the prediction at hand… (furthermore) in the… tasks that dominate laboratory studies of base-rate neglect—base rates provide only a general informational background on which other information, which typically pertains more directly or specifically to the target case, is added… Such information…tends to render the arbitrary base rates subjectively irrelevant...”. Also, “different people may differ in the extent to which they judge base rates as irrelevant and hence in the extent to which they are inclined to ignore them...” (ibid., p. 202).

According to Bar-Hillel (1983), in some cases the subjective-relevance of base-rates to the prediction-task may be indeterminate <u>even for the statistically sophisticated</u> (!) In her words, (Bar-Hillel, 1983, pp. 58-59) “It would seem...that any use of base-rates could be justified, provided one can come up with the proper scenario... (hence) we may need to relax out concept of a “normative solution”… (as) intuition is often sensitive to considerations that are not captured by simplistic formal models...”. Thus, even to the statistically enlightened, base-rates need not appear more relevant than alternative (“intuitive”) inference-rules.

In other words, the parameter of subjective relevance applies equally to statistical and "heuristic" information. Whichever one of these two appears the more relevant to the judgment at hand, is likely to be used as the evidence for the judgment. Ginosar & Trope (1980) found, for example, that when the individuating sketch was nondiagnostic with regard to the engineer/lawyer problem (and hence was considered irrelevant) participants did utilize the base-rates. As Ginosar & Trope (1980, p. 240) noted, "when the individuating information is useless as a guide to prediction "attention is shifted… to the base-rate frequencies...". Of course, the perceived relevance of any information type, i.e. statistical or "heuristic", to a given judgment is a matter of degree. In one of our studies, we included a condition in which the "representativeness" information was mixed, some was consistent with the engineer stereotype and some, with the lawyer stereotype, lowering the subjective relevance of such information to judgment of the target's profession. As compared with the "pure" "representativeness" information, consistent with the engineer stereotype, the "mixed" condition reduced participants' tendency to view the target as an engineer, while enhancing the effect of base-rates (see Figure 13).

Figure 13 here

Difficulty of information utilization: (1) accessibility effects. According to the unimodel, subjective-relevance is hardly the sole parameter affecting the use of information. Another such parameter is processing difficulty, related, inter alia , to accessibility of the judgmental rule that lends the information-given its relevance. Consider the children's riddle "why more grass is

consumed by white sheep than by black sheep?" While many respondents are perplexed by this question, the answer is extremely simple: because there are more white sheep than black sheep (!). As Bar-Hillel noted (1983, p. 206): "...the sheep riddle works not because people are unaware that a large population eats more than a smaller one but because they do not think of the population when asked the riddle." (emphasis ours). In other words, although the inference-rule "if a population is large, it eats more" may be available in the knower's mental repertory it may be quite inaccessible to an individual at the moment of judgment (Higgins, King & Mavin, 1982). Somewhat analogously, the "psychological" context of most early base-rate neglect studies might have rendered the statistical rules not only less subjectively relevant to participants but also less accessible. This should render their use more difficult, and hence unlikely.

In a study we performed to address this issue, prior to exposure to the lawyer/engineer problem participants were first primed with words that called to mind statistical information such as "random", "percentage" and "ratio". We varied base-rate information at two levels, either 2% of the sample were engineers and 98%, lawyers, or the figures were 50% for each category. As shown in Figure 13, in the no-priming control condition, the base rate neglect found in the original demonstrations was robustly replicated. However, in our statistical priming condition, sensitivity to base rates was much increased in that participants significantly distinguished now between the two percentages (see Fig 14).

Figure 14 here

Difficulty of information processing: (2) informational length and complexity. Just as the processing of message and cue information in persuasive contexts, the processing of statistical and representativeness information may be affected by their length and complexity. In the original demonstrations of base-rate neglect--the base rates were presented briefly, via a single sentence, and upfront. The case information followed and was conveyed via a relatively lengthy vignette. If we assume that participants in those studies had sufficiently high degrees of processing-motivation and cognitive capacity, it is plausible that they were inclined to process the lengthier, more difficult to digest, information and, hence, may have given it considerable weight just as in persuasion studies the lengthier, later appearing information was given considerable weight under high motivation or cognitive capacity conditions.

But if processing difficulty matters, we should be able to increase or decrease the use of statistical information, for example, by varying its processing difficulty orthogonally to participants' capacity or motivation. In a recent study designed to do so (Chun and Kruglanski, 2002(b), Study 1) we presented participants in one condition with the usual sequence of brief base-rate information followed by extensive case information. In another condition, we presented brief case-information followed by extensive statistical base rate information. Thus, in the short base-line long case information condition, replicating the prototypical "base-rate neglect" study, participants read the following statement:

"We collected data regarding a group of people. 30% of the group members are engineers, and the rest are lawyers. One member of the group is Dan. He was drawn randomly

from that group of people. He is 45 years old. He is married and has four children. He is generally conservative, careful, and ambitious. He shows no interest in political and social issues and spends most of his free time on his many hobbies, which include home carpentry, sailing and mathematical puzzles. ”

In our novel, short case-information long base-rate condition, the statement read instead:

“We collected data regarding a group of people. One member of the group is Dan. His hobbies are home carpentry, sailing and mathematical puzzles. He was drawn randomly from that group of people. The group included 14% criminal lawyers, 6% trade lawyers, 9% mechanical engineers, 4% patent lawyers, 10% human rights lawyers, 11% electrical engineers, 12% public defense lawyers, 8% divorce lawyers, 10% nuclear engineers, 16% tax lawyers. ”

Additionally, we manipulated cognitive load. Finally, the base rates too were varied, consisting of 30% engineers in one condition, and 70% in the other condition. As shown in Figure 15, when the base-rate information was presented briefly and upfront, its use actually increased under cognitive load (!). But when it came later and was lengthy and more difficult to process, it was utilized only in the absence of load.

Figure 15 here

Finally, if difficulty of processing matters, we should be able to reproduce the foregoing results juxtaposing two types of representativeness information, one brief and up-front (i.e. easy to process), the other lengthy and late appearing (hence, more difficult to process), rather than pitting (as has been typically the case) base-rate against representativeness information. To test

this idea we (Chun & Kruglanski, 2002 (b), Study2) created two informational sequences: One in which brief information representative of the lawyer stereotype was followed by lengthier information representative of an engineer stereotype, the other in which brief information representative of the engineer stereotype was followed by lengthier information representative of the lawyer stereotype. Orthogonally, we manipulated cognitive load. The results shown in Figure 16, indicate that where the engineer information was presented briefly and upfront, participants' likelihood-judgments that the target was an engineer was enhanced by cognitive load. However, where the engineer information was lengthy and came late, the judged likelihood that the target is an engineer was lower under load. In short, the processing of statistical and heuristic (in this case "representativeness") information seems to be affected identically by values of the parameters of processing difficulty and processing capacity.

Figure 16 here

Motivational biases. If judgments based on statistical and heuristic information are governed by the same process--they should be affected similarly by the parameter of motivational bias (known also to affect attributions (for a review see Kunda, 1990), and the elaboration of persuasive information (Kruglanski &Thompson, 1999a). Cumulative research evidence supports this prediction. Thus, work by Sanitioso and Kunda (1991) demonstrated that the use of the statistical rule, whereby predictability increases sharply with sample size, was greater where it allowed the participants to conclude what they wished to conclude, namely that their sample of observations was large enough for their predictions. A similar conclusion was

reached by Ginosar and Trope (1987) where the use of base-rate information increased in condition where the conclusion it yielded was motivationally desirable to participants. In a different line of work Sanitioso, Freud and Lee (1996) found that the use of stereotypic or "representativeness" information, too, was affected by participants' directional motivation. Specifically, where the gender stereotype implied that the participant's partner is competent,she/he used the stereotype more, and where it implied that the partner is incompetent she/he used it less.

In summary, it appears that the use of "heuristics" and of statistics is affected identically by the judgmental parameters identified earlier. These are the same parameters that govern the use of message-arguments and peripheral/ heuristic cues in persuasion settings, or the use of contextual constraint information in behavioral identification or dispositional inference judgments. Note, furthermore, that in the early "biases and heuristics" research the parameter values on which the statistical and heuristic information-types might have differed were not controlled for. Thus, the statistical information might have been less accessible, less subjectively relevant and/or earlier appearing, and hence less likely to be processed under high processing motivation or capacity than the heuristic information. The findings reviewed above suggest, however, that when those parameter values are controlled for the previously claimed differences between the use of "heuristic" and statistical information disappear.

Recapitulation and Conclusion

People form judgments on a plethora of topics, and use to that end a plethora of evidence-

types. Nonetheless, all instances of judgment share critical features in common. It is these common features, furthermore, that afford an answer to the fundamental question about the kind of information that may impact judgments, and, about the circumstances under which it may do so. Specifically, we have argued that all human judgment is determined by an intersection of several dimensional parameters, present at some of their values in the judgmental context. The empirical data reviewed above, support the notion that such parametric intersections explain large bodies of prior findings in diverse domains of human judgment. Moreover, our parametric framework affords new predictions that receive consistent support in empirical research.

The Essence of the Unimodel.

The gist of our conception holds that judgments are based on information serving as evidence in accordance with its fit within pre-existing rules of the "if then" variety. The parameter of subjective-relevance represents the individual's degree of belief in a given such rule, so that the greater the degree of subjective relevance the greater the information's impact on judgment. That on condition, of course, that the individual realize the degree of subjective relevance a given information affords. Which depends, in turn, on difficulty of the judgmental task at hand and on the individual's (cognitive and motivational) readiness to cope with the difficulty.

A major assumption of the unimodel is that informational contents, though necessarily present in every instance of judgment, do not ultimately matter as far as the information's judgmental impact is concerned. What matters instead are the parametric intersections to which

given judgmental contents may be attached. Diverse judgmental contents may be attached to the same parametric intersections and it is the latter rather than the former that ultimately determine the information's impact upon judgment.

We applied our unimodel to four major domains of social judgment, namely to: (1) persuasion, (2) attribution, (3) impression formation, and (4) biases and heuristics. In all these areas the unimodel's predictions were corroborated when pitted against the implications of pertinent dual mode frameworks. It appears that various dual process models have typically confounded informational contents with parametric intersections (e.g., the contents of information with its processing difficulty in a given instance). Once the two had been "unconfounded", however, it became apparent that the informational contents per se do not matter, contrary to implications of the dual-process models.

Associationistic Versus Rule-Following Conceptions of Human Judgment.

However pervasive, differentiation between processing-modes in content-related terms is not the exclusive manner in which such distinctions have been made. A particularly well known alternative is Sloman's (1996) distinction between two "reasoning systems" one "associative", the other "rule-based" (see also Smith & DeCoster, 2000). It may be well to consider this distinction closely in light of the present analysis. First, note that Sloman (1996, p. 11) himself admits that "any apparently associative process can be described as rule based because of the representational power of rules" (p. 11). Yet based on a subjective feeling, Sloman is led to suspect that there is a distinction. As he put it (ibid., p. 3) "Associative thought feels like it arises

from a different cognitive mechanism than does deliberate, analytical reasoning. Sometimes conclusions simply appear at some level of awareness, as if the mind goes off, does some work, and then comes back with a result, and sometimes coming to a conclusion requires doing the work oneself, making an effort to construct a chain of reasoning...".

Obviously a subjective feeling of some difference—is not a conclusive argument for a fundamental difference in process. Hence, Sloman (1996) proceeded to analyze several examples of phenomenally experienced variation in an attempt to identify a more substantial criterion for building a case for the process-distinctiveness argument.

Rapidity of judgment. His initial example is that of figuring out change at the cash register. Sometimes "the answer springs to mind associatively" (perhaps in figuring out that the change for a ten dollar bill, for a purchase of $9.00 is one dollar), and sometimes "a person has to do mental arithmetic" (perhaps in figuring out that the change for a fifty dollar bill after a purchase totaling $27.35 is $22.65). But the quickness with which the answer comes to mind, is hardly compelling evidence for a qualitative difference in mode. Instead, it could reflect the difficulty of the arithmetic task in the two instances (related to our difficulty of processing parameter). This may depend in part on the task itself, and in part on the degree to which it was routinized for a given individual (Shiffrin & Schneider, 1977). Thus, for a young child who is just learning to count, figuring out that 10-9=1 may be quite arduous and deliberative, whereas for a cashier who routinely sells a certain product for $27.35, figuring out the change for a $50.00 bill might be extremely rapid, etc.

Conscious awareness. Sloman (1996, p. 6) explored another heuristic (beyond rapidity of judgment) to tell the "two systems" apart, this time having to do with "the contents of awareness". When a response is produced solely by the associative system, a person is conscious only of the result of the computation, not the process. In contrast, a person is aware of both the result and the process in a rule-based computation…". Nonetheless, Sloman (1996, p. 6) quickly discarded process-awareness as a demarcation criterion. In his words "Awareness provides only a fallible heuristic for identifying systems not a necessary or sufficient condition..." (ibid.). For instance, "some reasoning is not obviously associative and yet apparently occurs without conscious awareness (Nisbett & Wilson, 1977)" (ibid.).

Does Criterion S do the job? Sloman (1996) finally settles on one demarcation criterion that he views as crucial in warranting a qualitative distinction in process. This is his Criterion S described as follows (ibid., p. 11) "A reasoning problem satisfies Criterion S if it causes people to simultaneously believe two contradictory responses". Because of the key importance that Sloman attaches to this particular criterion, it may be well to consider it carefully. Take Sloman's own example, the statement that a "whale is a mammal" (see discussion on p. 11). Whales are commonly perceived to resemble fish more than typical mammals like a cow or a horse. Thus, a knower may need to deal in this case with two contradictory beliefs, one derived from the whale's outward similarity to fish and one derived from the "academic" knowledge that classifies whales as mammals. But from the unimodal perspective, all we have here are two distinct rules yielding opposite conclusions. One rule is based on similarity, or the

"representativeness" heuristic (and heuristics, after all, constitute rules by definition) e.g. "if X looks like a fish, swims like a fish, and lives like a fish, X is a fish". The other rule may be based on other criteria for classification in the mammal category, e.g. "breast feeding of offspring", or, indeed the source heuristic "If a biology text claims X (e.g., that whales are mammals) then X is the case.

A telling example of a confusion between rule contents and qualitatively distinct processes is Sloman's discussion of Kahneman, Slovic, and Tversky's (1983) Linda problem whereby the probability that Linda is both a bank teller and a feminist (after being provided evidence that she is likely to be a feminist) is judged more likely than the probability of her being a bank teller only, in apparent violation of the conjunction rule in probability calculus. In Sloman's terms "Apparently, two mechanisms exist that lead to divergent conclusions. On the one hand, the intuitive heuristic leads to the conclusion that the T & F (bank teller and feminist) is more probable. On the other hand, a probabilistic argument leads to the conclusion that T (bank teller alone) is more probable" (Sloman, 1996, p. 12). However, intuitive heuristics by all accounts (cf. Chaiken, Lieberman and Eagly, 1989) constitute "rules" as do "statistical calculations". Hence, the contradictory implications of these two rules hardly constitute evidence for a qualitative duality of the reasoning process, in which only one process is rule-based.

Perhaps the most striking of Sloman's (1996) examples concerns the Muller-Lyer illusion. Here, perception provides the answer that the lines are of unequal length, and a ruler furnishes an incompatible answer, is that they are equally long. Once again, however, it is easy

to understand this phenomenon in terms of two rules in which the individual happens to strongly believe, and that happen to yield disparate conclusions. One of these rules is that one's visual perceptions are valid ("if my eyes inform me that X then X it is"); the other, that application of a ruler yields valid answers.

Note that not every single person necessarily upholds both these rules. For instance, individuals hampered by a limited eyesight may probably harbor considerable doubt about the veracity of their perceptual experiences. Similarly, members of primitive cultures devoid of length measuring instruments may not trust the ruler much. Suppose, finally, that on two different occasions an individual measured the same line with different rulers, one of which was biased (e.g. having an inch represented by 3cm, rather than the normal 2.3cm). In one instance, the conclusion might be that the line's length is less than some X and in the other instance, that it is more than X. Clearly then the use of the very same rule-based "reasoning system" (here application of a ruler) may lead to two contradictory conclusions, satisfying Sloman's Criterion S for systems distinctiveness.

In summary then, Sloman's (1996) criteria for a duality of the judgmental process seem readily explicable in terms of the present unimodel. Rapidity, lack of awareness, or automaticity more generally (cf. Bargh, 1996) may reflect degrees of routinization (hence processing difficulty) rather than a qualitative duality (as Sloman himself recognizes). And the Criterion S (of incompatible, strongly held beliefs) is highly compatible, in fact, with the unimodel notion whereby different rules (major premises) applied to the same evidence (minor premises) may

yield completely different conclusions. None of this seems to warrant the assumption of a qualitative difference in reasoning processes.

This is not to deny the pervasive occurrence of associationistic phenomena but rather to adopt a different perspective on their role in judgment. According to the unimodel, semantic associations refer to knowledge activation, but not all activated knowledge is relevant to the judgment at hand. Imagine that you observed John smile. This may evoke the associations "friendly", and also the memory of a teeth bleaching ad claiming to improve the brilliance of one's smile. Only the former but not the latter association, of course, would affect the judgment that John is friendly because of the subjective relevance of "smiling" to "friendliness". The moral of the story is that associations would affect judgments only if they activated (subjectively) relevant "if then" rules and not otherwise. According to this argument, associationistic processes do not constitute a qualitative alternative to a rule-following process assumed by the unimodel. Associations may activate certain constructs, but only those among the activated constructs that are also subjectively relevant would be used in judgment-formation.

The Human Judgment According to the Unimodel

Beyond its ability to explain prior data and concepts, the unimodel offers a number of advantages for conceptualizing human judgment processes. Two are particularly important. They are the unimodel's (1) integrative power, and (2) generative potential. We consider them in turn.

Integrative power. The unimodel affords three types of integration: (1) A within-models integration of the dual modes, based on the notion that judgmental phenomena addressed by

these models are better explicable in terms of parametric intersections of several quantitative continua rather than in terms of qualitative dichotomies. (2) A between-models integration, based on the notion that different content domains of judgment, for which disparate conceptual models have been proposed, are actually governed by the same set of principles, related to workings of the parametric intersections. (3) A between-parameters integration, based on the notion that they all work interactively and that the impact of information upon human judgment is determined jointly by an intersection of parametric values at a given instance of judgments. By contrast, prior judgmental models typically (if implicitly) focused upon a single parameter, or a subset of parameters, be it processing capacity and motivation (implicit, e.g. in Petty and Cacioppo's (1986) Elaboration Likelihood continuum), be it subjective-relevance of evidence for the typical knower (implicit, e.g. in Tversky and Kahneman's (1974) notions of reliance on (subjectively relevant) heuristics rather than statistics), and McGuire's (1960), and Wyer's (1970, 1974) classic analyses of probabilogical judgment, or be it motivational bias (addressed, e.g. in models of motivated reasoning (Dunning, 1999; Kunda, 1990; Kunda and Sinclair, 1999).

Generative potential. The unimodel has considerable potential for generating further research on judgmental phenomena across domains. The present paper reviewed some initial efforts in this vein, but ample further unimodel-based research could (and should) be carried out. Novel experimental studies, meta-analyses of prior research and conceptual reviews should be possible wherein previous notions and findings are examined and re-interpreted from the present theoretic perspective. Last but not least important, the unimodel offers a more flexible portrayal

of human judgments (cf. Strack, 1999) than did its predecessors. According to that view, no judgmental content (such as social categories or stereotypes) necessarily defines the departure point of judgmental deliberations, no judgmental content (e.g. various statistical notions) is necessarily doomed for misuse or neglect. According to that view, any informational content can either have or lack judgmental impact depending on the constellation of parameters it happens to be attached to. Liberation from contents has important implications for further inquiry and theory development on the topic of human judgment. It suggests, specifically, that we should re-focus our modeling efforts on a more precise elaboration of the judgmental parameters, their interrelations and their conjoint impact on people's impressions, opinions or estimates.

A Post Script on the Dual-Process Models.

Though in the present paper we have elaborated a general alternative to the dual-process models we hardly think they should not have happened, nor that they did not make fundamentally important contributions. Quite to the contrary, we feel they were extremely important, that they moved the science of human judgment a long way, and that they solved important problems and identified important phenomena. The present unimodel has benefited immensely from concepts, findings, and methodological paradigms developed by the dual-process theorists and its formulation would not have been possible otherwise. In an important sense, the unimodel articulated what was increasingly implicit in the dual process literature, if considered carefully, or to borrow a Kuhnian term, it addressed the anomalies that accumulated within the dual-process paradigm itself. In that sense, the unimodel simply was a "theory waiting

to happen" and we merely assisted in its birth thus serving as theoretical "midwives" rather than as its genuine progenitors.

References

Anderson, N. H. (1971). Integration theory and attitude change. Psychological Review, 78, 171-206.

Ajzen, I. (1977). Intuitive theories of events and the effects of base rate information on prediction. Journal of Personality and Social Psychology, 35, 303-314.

Bargh, J. A. (1996). Automacity in Social Psychology. In E. T. Higgins, & A. W. Kruglanski (Eds.), Social Psychology: Handbook of basic principles, (pp. 169-183). New York: Guilford.

Bar-Hillel, M. (1983). The base-rate fallacy controversy. In R.W. Scholz (Ed.) Decision making under uncertainty. Amsterdam: Elsevier.

Bar-Hillel, M. (1990). Back to base-rates. In. R.M. Hogarth (Ed.) Insights in Decision Making. Chicago: University of Chicago Press, pp. 27-56.

Bobrow, D. G., & Norman, D. A. (1975). Some principles of memory schemata. In D. G. Bobrow, & A. Collins (Eds.), Representation and understanding: Studies in cognitive science (pp. 131-149). New York: Academic Press.

Bohner, G., Chaiken, S., & Hunyadi, P. (1994). The role of mood and message ambiguity in the interplay of heuristic and systematic processing. European Journal of Social Psychology, 24, 207-221.

Bohner, G., Ruder, M, & Erb, H.-P. (in press). When expertise backfires: Contrast and assimilation in persuasion. British Journal of Social Psychology.

Borgida, E. & Brekke, N. (1980). The base rate fallacy in attribution and prediction. In J. H. Harvey, W.J. Ickes & R.F. Kidd (Eds.) New directions in attribution research, Vol. 3, Hillsdale, N.J.: Erlbaum.

Borgida, E., & Brekke, N. (1981). The base rate fallacy in attribution and prediction. In J. H. Harvey, W. Ickes, & R. F. Kidd (Eds.), New directions in attribution research (Vol. 3, pp. 63-95). Hillsdale, NJ: Lawrence Erlbaum.

Brewer M.B. (1988) A dual process model of impression formation. In T.K. Srull and R.S. Wyer (Eds.). Advances in social cognition (vol. 1) (pp. 1-36), Hillsdale, New Jersey Lawrence Erlbaum Associates.

Bruner, J. S. (1957a). Going beyond the information given. In H. Gruber et al. (Eds.), Contemporary approaches to cognition. Cambridge, MA: Harvard University Press.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. Journal of Personality and Social Psychology, 42, 116-131.

Chaiken, S. (1980). Heuristic versus systematic information and the use of source versus message cues in persuasion. Journal of Personality and Social Psychology, 39, 752-756.

Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic processing within an beyond the persuasion context. In J. S. Uleman, & J. A. Bargh (Eds.), Unintended thought (pp. 212-252). New York: Guilford.

Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: Effects of source credibility, argument ambiguity, and task importance on attitude

judgments. Journal of Personality and Social Psychology, 66, 460-473.

Chaiken, S., & Trope (1999). Dual-process theories in social psychology (edited volume). New York: Guilford.

Chaiken, S., & Trope (1999). Dual-process theories in social psychology (edited volume). New York: Guilford.

Chun, W. Y., Spiegel, S., & Kruglanski, A. W. (in press). Assimilative behavior identification can also be resource-dependent: A unimodal perspective on personal-attribution phases. Journal of Personality and Social Psychology.

Chun, W. Y. & Kruglanski, A. W. (2002a). When increasing cognitive load reduces stereotypical judgments. Unpublished data. University of Maryland, College Park.

Chun, W. Y. & Kruglanski, A. W. (2002b). Distraction from biased reasoning: The case of judgment from base rates. Unpublished data. University of Maryland, College Park.

Cosmides, L., & Tooby, J. (1996). Are humans good intuitive statisticians after all? Rethinking some conclusions from the literature on judgment under uncertainty. Cognition, 58, 1-73.

Darke, P. R., Chaiken, S., Bohner, G., Einwiller, S., Erb, H.-P., & Hazelwood, D. (1998). Accuracy motivation, consensus information, and the law of large numbers: Effects on attitude judgments in the absence of argumentation. Personality and Social Psychology Bulletin, 24, 1205-1215.

Ditto, P. H., & Lopez, D. F. (1992). Motivated skepticism: Use of differential decision

criteria for preferred and nonpreferred conclusions. Journal of Personality and Social Psychology, 63, 568-584.

Duncan, B. L. (1976). Differential social perception and attribution of intergroup violence: Testing the lower limits of stereotyping of blacks. Journal of Personality and Social Psychology, 34, 590-598.

Dunning, D. (1999). A newer look: Motivated social cognition and the schematic representation of social concepts. Psychological Inquiry, 10, 1-11.

Eagly, A. H., & Chaiken, S. (1993). The psychology of attitudes. Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.

Epstein, S., & Pacini, R. (1999). Some basic issues regarding dual-process theories from the perspective of cognitive-experiential self-theory. In S. Chaiken, & Y. Trope (Eds.), Dual process theories in social psychology (pp. 462-482). New York: Guilford.

Erb, H.P., Pierro, A., Mannetti, L., Spiegel, S. & Kruglanski, A.W. (2002). Persuasion according to the unimodel. Unpublished data. University of Maryland.

Evans, J. St. B.T. (1989). Bias in human reasoning: Causes and consequences. Hove, OK: Lawrence Erbaum Associates. (4).

Evans, Sr. B. T., Handley, S.J., Perham, N., Over, D.E., & Thompson, V.A. (2000). Frequency versus probability formats in statistical word problems. Cognition, 77, 197-213.

Festinger, L. (1957). A theory of cognitive dissonance. Evanston, Ill.: Row, Peterson.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior: An

introduction to theory and research. Reading, MA: Addison-Wesley.

Fiske, S. T., Lin, M., & Neuberg, S. L. (1999). The continuum model: Ten years later. In S. Chaiken, & Y. Trope (Eds.), Dual process theories in social psychology (pp. 231-254). New York: Guilford.

Fiske, S. T., & Neuberg, S. L. (1990). A continuum model of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. In M. P. Zanna (Ed.), Advances in experimental social psychology (Vol. 23, pp. 1-74). New York: Academic Press.

Gigerenzer, G., & Hoffrage, U. (1995). How to improve Bayesian reasoning without instruction: Frequency formats. Psychological Review, 102, 684-704.

Gilbert, D. T., & Osborne, R. E. (1989). Thinking backward: The curable and incurable consequences of cognitive busyness. Journal of Personality and Social Psychology, 57, 940-949.

Ginosar, Z., & Trope, Y. (1980). The effects of base rates and individuating information on judgments about another person. Journal of Experimental Social Psychology, 16, 228-242.

Ginosar, Z., & Trope, Y. (1987). Problem solving in judgment under uncertainty. Journal of Personality and Social Psychology, 52, 464-474.

Greenwald, A. G. (1968). Cognitive learning, cognitive response to persuasion, and attitude change. In A. G. Greenwald, T. C. Brock, & T. M. Ostrom (Eds.), Psychological foundations of attitudes (pp. 147-170). San Diego, CA: Academic.

Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), Syntax

and semantics 3: Speech acts (pp. 41-58). San Diego, CA: Academic Press.

Hamilton, D. L., & Gifford, R. K. (1976). Illusory correlation in interpersonal perception: A cognitive basis of stereotypic judgments. Journal of Experimental Social Psychology, 12, 392-407.

Hamilton, D. L., & Sherman, S. J. (1999). Dualities and continua: Implications for understanding perceptions of persons and groups. In S. Chaiken, & Y. Trope (Ed.), Dual-process theories in social psychology. (pp. 606-626). New York, NY, US: The Guilford Press.

Higgins, E. T. (1997). Beyond pleasure and pain. American Psychologist, 52, 1280-1300.

Higgins, E. T., King, G. A., & Mavin, G. H. (1982). Individual construct accessibility and subjective impressions and recall. Journal of Personality and Social Psychology, 43, 35-47.

Higgins, E. T., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. Journal of Experimental Social Psychology, 13, 141-154.

Jacoby, L.L., Kelley, C.M., Brown, J. & Jasechko, J. (1989). Becoming famous overnight: Limits on the ability to avoid unconscious influences of the past. Journal of Personality and Social Psychology, 56, 326-338.

Jarvis, W. B. G., & Petty, E. E. (1996). The need to evaluate. Journal of Personality and Social Psychology, 70, 172-194.

Jones, E.E. (1988). Impression formation: What do people think about? In T.K. Srull and R.S. Wyer (Eds.). Advances in social cognition (vol. 1). Hillsdale, New Jersey. Lawrence Erlbaum Associates., pp. 83-90.

Jones, E.E. & Davis, K.E. (1965). From acts to dispositions: The attribution process in person perception. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 2, pp. 219-266). San Diego, CA: Academic Press.

Kahneman, D. & Tversky, A. (1973). On the psychology of prediction. Psychological Review, 80, 237-251.

Kahneman, D., Slovic, P, & Tversky, A. (1982). Judgment under uncertainty: Heuristics and biases. Cambridge, England: Cambridge University Press.

Kahneman, D., & Tversky, A. (1982). On the study of statistical intuitions. Cognition, 11, 123-141.

Kelley, H. H. (1967). Attribution theory in social psychology. In. D. Levine (Ed.), Nebraska Symposium on Motivation (Vol. 15, pp. 192-240). Lincoln: University of Nebraska Press.

Klatzky, R. L. & Andersen, S. M. (1988). Category-specificity effects in social typing and personalization. In T. K. Srull & R. S., Jr. Wyer (Ed), A dual process model of impression formation. Advances in social cognition, Vol. 1. (pp. 91-101). Hillsdale, NJ, US: Lawrence Erlbaum Associates.

Kruglanski, A.W. (1989a). Lay epistemics and human knowledge: Cognitive and motivational bases. New York: Plenum Press.

Kruglanski, A.W. (1990). Lay epistemic theory in social cognitive psychology. (target article for peer commentary) Psychological Inquiry, 1, 181-197.

Kruglanski, A. W. (1999). Motivation, cognition, and reality: Three memos for the next generation of research. Psychological Inquiry, 10, 54-58.

Kruglanski, A. W., & Thompson, E. P. (1999a). Persuasion by a single route: A view from the unimodel. Psychological Inquiry, 10, 83-109.

Kruglanski, A. W., & Thompson, E. P. (1999b).The illusory second mode or, the cue is the message. Psychological Inquiry, 10, 182-193.

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "Seizing" and "freezing". Psychological Review, 103, 263-283.

Kunda, Z. (1990). The case of motivated reasoning. Psychological Bulletin, 108, 480-498.

Kunda, Z., & Sinclair, L. (1999). Motivated reasoning with stereotypes: Activation, application, and inhibition. Psychological Inquiry, 10, 12-22.

Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. Journal of Personality and Social Psychology, 37, 2098-2109.

Mackie, D. M. (1987). Systematic and nonsystematic processing of majority and minority persuasive communications. Journal of Personality and Social Psychology, 53, 41-52.

Medin, D. L. (1988). Social categorization: Structures, processes, and purposes. In T. K. Srull & R. S., Jr. Wyer (Ed), A dual process model of impression formation. Advances in social cognition, Vol. 1. (pp. 119-126). Hillsdale, NJ, US: Lawrence Erlbaum Associates.

McGuire, W. J. (1960). A syllogistic analysis of cognitive relationships. In C.I. Hovland & M.J. Rosenberg (Eds.), Attitude organization and change: An analysis of consistency among attitude components (pp. 65-111). New Haven, CT: Yale University Press.

McGuire, W. J. (1968). Personality and attitude change: An information processing theory. In A. G. Greenwald, T. C. Brock, & T. M. Ostrom (Eds.), Psychological foundations of attitudes (pp. 171-196). San Diego, CA: Academic.

Mischel, W. & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics and invariance in personality structure. Psychological Review, 102, 246-268.

Mussweiler, T., & Strack, F. (1999). Comparing is believing: A selective accessibility model of judgmental anchoring. In: W. Stroebe, & M. Hewstone (Eds.), European review of social psychology (Vol. 10, pp. 135-168). Chichester, UK: Wiley.

Neuberg, S. L. & Fiske, S. T. (1987). Motivational influences on impression formation: Outcome dependency, accuracy-driven attention, and individuating processes. Journal of Personality and Social Psychology, 53, 431-444.

Newell, A., & Simon, H. A. (1972). Human problem solving. Englewood Cliffs, NJ: Prentice-Hall.

Nisbett, R. E. & Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. Psychological Review, 84, 231-259.

Nisbett, R.E., Cheng, P. W., Fong, G.T. & Lehman, D. (1987). Teaching reasoning.

Unpublished manuscript. University of Michigan.

Pavelchak, M. A (1989). Piecemeal and category-based evaluation: An idiographic analysis. Journal of Personality and Social Psychology, 56, 354-363.

Petty, R.E. & Cacioppo, J. T. (1983). Central and peripheral routes to persuasion: Applications to advertising. In L. Percy & A. Woodside (Eds). Advertising and consumer psychology (pp. 3-23). Lexington, MA: Heath.

Petty, R. E. (1994). Two routes to persuasion: State of the art. In: G. d'Ydewalle, P. Eelen, & P. Berteleson (Eds.), International perspectives on psychological science (Vol. 2, pp. 229-247). Hillsdale, NJ: Erlbaum.

Petty, R. E., Wells, G. L., & Brock, T. C. (1976). Distraction can enhance or reduce yielding to propaganda: Thought disruption versus effort justification. Journal of Personality and Social Psychology, 34, 874-884.

Petty, R.E. & Cacioppo, J.T. (1984). The effects of involvement on response to argument quantity and quality: Central and peripheral routes to persuasion. Journal of Personality and Social Psychology, 46, 69-81.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), Advances of experimental social psychology (Vol. 19, pp. 123-205). San Diego, CA: Academic Press.

Petty, R. E., Ostrom, T. M., & Brock, T. C. (Eds.) (1981). Cognitive responses in persuasion. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Petty, R. E., Schumann, D. W., Richman, S. A., & Strathman, A. J. (1993). Positive mood and persuasion: Different roles for affect under high- and low-elaboration conditions. Journal of Personality and Social Psychology, 64, 5-20.

Petty, R. E., Wheeler, S. C., & Bizer, G. Y. (1999). Is there one persuasion process or more? Lumping versus splitting in attitude change theories. Psychological Inquiry, 10, 156-163.

Ryan, R.M., Sheldon, K.M., Kasser, T. & Deci, E.L. (1996). All goals are not created equal: An organismic perspective on the nature of goals and their regulation. In P.M. Gollwitzer & J.A. Bargh (Eds.). The psychology of action. New York: Guilford.

Sanitioso, R., Freud, K., & Lee, J. (1996). The influence of self-related goals on the use of stereotypical and individuating information. European Journal of Social Psychology, 26, 751-761.

Sanitioso, R. & Kunda, Z. (1991). Ducking the collection of costly evidence: Motivated use of statistical heuristics. Journal of Behavioral Decision Making, 4, 161-176.

Schneider, W. & Shiffrin, R.M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. Psychological Review, 84, 1-66.

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. Journal of Personality and Social Psychology, 61, 195-202.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. Journal of Personality and Social

Psychology, 45, 513-523.

Schwarz, N. & Clore, G.L. (1996). Feelings and phenomenal experiences. In E.T. Higgins & A.W. Kruglanski (Eds.). Social Psychology: A Handbook of Basic Principles. New York: Guilford, pp. 433-465.

Sedlmeier, P. (1999). Improving statistical reasoning: Theoretical models and practical implications. Lawrence Erlbaum Associates: Mahvah, New Jersey.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. Psychological Bulletin, 119, 3-22.

Smith, E.R. (1988). Impression formation in a general framework of social and nonsocial cognition. In T.K. Srull and R.S. Wyer (Eds.). Advances in social cognition (vol. 1). (pp. 165-176). Hillsdale, New Jersey. Lawrence Erlbaum Associates.

Smith, E. R., & DeCoster (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. Personality and Social Psychology Review, 4, 108-131.

Srull, T. K., & Wyer, R. S., Jr. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. Journal of Personality and Social Psychology, 37, 1660-1672.

Tetlock, P. E. (1985). Accountability: A social check on the fundamental attribution error. Social Psychology Quarterly, 48, 227-236.

Trope, Y. (1986). Identification and inferential processes in dispositional attribution.

Psychological Review, 93, 239-257.

Trope, Y., & Alfieri, T. (1997). Effortfulness and flexibility of dispositional judgment processes. Journal of Personality and Social Psychology, 73, 662-674.

Trope, Y., & Gaunt, R. (1999). A dual-process model of overconfident attributional inferences. In S. Chaiken, & Y. Trope (Eds.), Dual process theories in social psychology (pp. 161-179). New York: Guilford.

Trope, Y., & Liberman, A. (1996). Social hypothesis testing: Cognitive and motivational mechanisms. In E. T. Higgins & A. W. Kruglanski (Eds.), Social psychology: Handbook of basic principles (pp. 239-270). New York: Guilford Press.

Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. Science, 185, 1124-1130.

Tversky, A. & Kahneman, D. (1980). Causal schemas in judgment under uncertainty. In M. Fishbein (Ed.), Progress in social psychology. (pp. 13-34). Hillsdale, NJ: Erlbaum.

Tversky, A., & Kahneman, D. (1983). Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. Psychological Review, 91, 293-315.

Uleman, J. S. (1987). Consciousness and control: The case of spontaneous trait inferences. Personality and Social Psychology Bulletin, 13, 337-354.

Wason, P. C. (1966). Reasoning. In B.M. Foss (Ed.). New horizons in psychology. (pp. 113-135) Harmondsworth, Middx.: Penguin.

Webster, D. M., & Kruglanski, A. W. (1998). Cognitive and social consequences of the

need for cognitive closure. In W. Stroebe, & M. Hewstone (Eds.), European review of social psychology (Vol. 8, pp. 133-141). Chichester, UK: Wiley.

Webster, D. M., Richter, L., & Kruglanski, A. W. (1998). On leaping to conclusions when feeling tired: Mental fatigue effects on impression formation. Journal of Experimental Social Psychology, 32, 181-195.

Wyer, R. S., Jr. (1970). Quantitative prediction of belief and opinion change: A further test of a subjective probability model. Personality and Social Psychology, 16, 559-570.

Wyer, R. S., Jr. (1974). Cognitive organization and change: An information processing approach. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Zukier, H., & Pepitone, A. (1984). Social roles and strategies in prediction: Some determinants of the use of base rate information. Journal of Personality and Social Psychology, 47, 349-360.

Figure Captions

1. Attitudes toward comprehensive exams as function of outcome-relevant involvement and source expertise.

2. Attitudes toward comprehensive exams as function of outcome-relevant involvement and length of expertise information.

3 (a). Attitudes toward comprehensive exams as function of early-appearing source information and need for closure.

3 (b). Attitudes toward comprehensive exams as function of early-appearing message argument information and need for closure.

4. Attitudes toward subsequent message aspects as function of initial argument quality and magnitude of processing motivation.

5. Valence of cognitive responses to subsequent arguments as function of initial argument quality and magnitude of processing motivation.

6. Mediation of initial argument's effect on attitudes by biased thoughts about subsequent arguments and high (b) but not under low (a) magnitude of processing motivation.

7. Perceived expertise of the communicator as function of processing sequence and initial argument quality.

8. Valence of cognitive responses to communicator information as function of processing sequence and initial argument quality.

9. Mediation of initial argument's effect on attitudes by biased thoughts about the communicator in the “before” (b) but not in the “after” (a) condition.

10a. Behavior identification ratings as function of situational information, salience of situational constraint information, and cognitive load.

10b. Behavior identification ratings as function of situational constraint information, behavior saliency, and cognitive load.

11. Behavior identification ratings as function of situational information, salience of situational and behavioral information, and cognitive load

12. Effects of individuating and categorical information as function of its length/complexity and cognitive load.

13. Rated likelihood that Tom is an engineer as function of the representativeness (subjective relevance) of the individuating information and base rate information.

14. Rated likelihood that Tom is an engineer as function of priming statistical concepts and base rate information.

15. Rated likelihood that Dan is a lawyer as function of base rate presentation, cognitive load, and base rate information.

16. Rated likelihood that Dan is a lawyer as function of the relative length/ordinal position of the engineer versus lawyer representativeness information and cognitive load.