The Rhetoric of Irrationality

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ABSTRACT. The popularity of the 'biases and heuristics' literature is examined critically in terms of the rhetorical factors that have mediated widely published claims that human judgment abilities are poor and even irrational. The logic of the original experiments is examined as well as the factors that cause that logic to be ambiguous and the implications of the experiments to be misrepresented. Questionable use of evaluative language in scientific articles and secondary gains to outside authors who spread the bias message are also examined.

Not long ago, *Newsweek* ran a feature article describing how researchers at a major midwestern business school are exploring the process of choice in hopes of helping business executives and business students improve their 'often rudimentary decision-making skills' (McCormick, 1987). Ah, you may say, and not a moment too soon, all the while rehearsing names that have become punch-lines in the history of business failures: Edsel, New Coke, PCjr. . .the list goes on.

You should not, however, enjoy yourselves too thoroughly in all this because the rudimentary skills at issue are not solely the property of business folk. Instead, the researchers have, in the author's words, 'sadly' concluded that 'most people' are 'woefully muddled information processors who often stumble along ill-chosen shortcuts to reach bad conclusions'. Poor 'saps' and 'suckers' that we are, a list of our typical decision flaws would be so lengthy as to 'demoralize Solomon'.

If you are distrustful of *Newsweek's* reporting on these matters, you should not be. The language in the article and the conclusions that are drawn are only modestly more apocalyptic than those appearing in scholarly journals both inside and outside psychology. Moreover, the gloomy sentiments are not peculiar to researchers at a single institution. From coast to coast, researchers seem to agree that people of all stripes are seriously deficient in their decision-making abilities.

This is a powerful message, sweeping in its generality and heavy in its social and political implications. It is also a strange message, for it concerns

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something that we might suppose could not be meaningfully studied in the laboratory, that being the fundamental adequacy or inadequacy of people's capacity to choose and plan wisely in everyday life. Nonetheless, the message did originate in the laboratory, in studies that have no greater claim to relevance than hundreds of others that are published yearly in scholarly journals. My goal in this article is to trace how this message of irrationality has been selected out of the literature and how it has been changed and amplified in passing through the logical and expository layers that exist between experimental conception and popularization.

The Message Has Been Chosen

Prior to 1970 or so, most researchers in judgment and decision-making believed that people are pretty good decision-makers. In fact, the most frequently cited summary paper of that era was titled 'Man as an intuitive statistician' (Peterson & Beach, 1967). Since then, however, opinion has taken a decided turn for the worse, though the decline was not in any sense demanded by experimental results. Subjects did not suddenly become any less adept at experimental tasks nor did experimentalists begin to grade their performance against a tougher standard. Instead, researchers began selectively to emphasize some results at the expense of others.

Christensen-Szalanski and Beach (1984) provided a particularly clear picture of this selection process in a study of citations to experimental papers in the span 1972–81. They surveyed all the summaries appearing in *Psychological Abstracts* for those years using the keywords *decision-making, judgment* and *problem-solving.* Articles were included in their sample if they were empirical papers written in English involving the study of individual, adult subjects on a task for which some comparison was provided to an explicit normative model. This yielded 84 articles of which 37 reported good performance and 47 reported poor performance. Citations of each of these articles were then counted using the *Social Science Citation Index* and a measure of journal visibility was determined for each.

The results were very clear. Although articles reporting good performance and articles reporting poor performance were published in comparable numbers and in journals of comparable visibility, reports of poor performance were cited an average of 27.8 times in the sampled period, whereas reports of good performance were cited only 4.7 times. Moreover, both the bias in citations and the overall rate of citations to articles on decision-making increased markedly over the years studied, even though the ratio of good to poor results in the literature remained about the same.

As the citation data make clear, something happened in the early 1970s that increased the visibility of research in judgment and decision-making while simultaneously shifting the focus of attention toward poor performance. What this something was was the publication between 1971 and 1973 of four empirical articles by Daniel Kahneman and Amos Tversky in mainstream psychology journals (Kahneman & Tversky, 1972, 1973; Tversky & Kahneman, 1971, 1973) followed by a summary article in *Science* (Tversky & Kahneman, 1974). These articles constitute the cornerstone of what today is called the *biases and heuristics literature*. They are the points of departure for several additional bias papers by Kahneman and Tversky and their associates, as well as for dozens of follow-up studies by other authors.

The *Science* article is the primary conduit through which the laboratory results made their way out of psychology and into other branches of the social sciences. According to a study by Berkeley and Humphreys (1982), it was cited a total of 227 times in 127 different journals between the years 1975 and 1980. About 20 percent of the citations were in sources outside psychology. Of these, all used the citation to support the unqualified claim that people are poor decision-makers.

Acceptance of this sort is not the norm for psychological research. Scholars from other fields in the social sciences such as sociology, political science, law, economics, business and anthropology ordinarily look with suspicion on the tightly controlled experimental tasks that psychologists study in their laboratories, particularly when the studies are carried out using student volunteers. In the case of the biases and heuristics literature, however, the issue of generalizability is seldom raised and it is rarely so much as mentioned that the cited conclusions are based on laboratory research. Human incompetence is presented as a fact, like gravity.

If you think of it, this is a great trick, for the studies in question have managed to shed their experimental details without sacrificing scientific authority. Somehow the message of irrationality has been sprung free of its factual supports, allowing it to be seen entire, unobstructed by the hopeful assumptions and tedious methodologies that brace up all laboratory research. How this happened is very complex, but we can get an inkling of the process by focusing on three related points: first, how the logic of the original experiments is ambiguous; second, how this ambiguity allows conclusions that are unwarranted to be drawn from the experiments; and third, how the unwarranted conclusions get amplified and extended by authors outside psychology.

The Experimental Logic Has Been Changed

The biases and heuristics literature hangs on three fundamental ideas.

(a) Probabilistic thinking is important if people are to understand and cope successfully with real-world uncertainty.

(b) People's intuitions about probabilities are based on heuristic processes or rules of thumb rather than formal computations.
(c) Heuristic processes are fallible and lead in some circumstances to systematic errors.

The first of these ideas has been a staple of judgment and decision research. For the most part, it is accepted uncritically by practitioners, although Gigerenzer and Murray (1987) have argued that the apparent importance of probabilistic thought reflects mostly the central methodological role that probability theory plays in psychological research and not anything more basic about the way the world works. The latter two ideas are the unique inventions of Kahneman and Tversky and constitute the central insights of the biases and heuristics movement.

Before 1970, psychologists studied probabilistic thought by asking subjects to give intuitive estimates of statistical indices such as the variance of a set of scores or the correlation between the variables. Never mind the oddity of expecting statistically naive subjects to have intuitions about the average squared deviation of scores about a mean or the average cross-product of pairs of *z*-scores: all in all, people did quite well. But little thought was given to how they got their answers. It was not so much that anyone assumed that people have statistical equations inside their heads as that the analysis bypassed the head altogether.

Kahneman and Tversky radically changed all that by focusing attention on the process of judgment. They hypothesized that people estimate probabilities by means of a collection of cognitive short-cuts termed *heuristics*, a concept borrowed from computer science. In broad terms, heuristic methods are quick-and-not-too-dirty procedural tricks that usually yield acceptable solutions to problems at noticeably less cost than is required by alternative methods (called algorithms) that guarantee optimal solutions. In other words, heuristics are methods that achieve efficiency by risking failure.

The heuristics originally proposed by Kahneman and Tversky are three in number:

1. *Representativeness* refers to people's tendency to judge the probability of a sample by the degree to which it either resembles the parent distribution or displays the characteristics of the generating process.
2. *Availability* refers to the tendency to estimate the probability of an event by the ease with which instances of the event can be remembered or constructed in the imagination.
3. *Anchoring and adjustment* refers to the process of generating estimates by taking a value suggested by the statement of the problem or some partial computation and then adjusting it upward or downward to account for other relevant information.

Kahneman and Tversky's experimental approach was also radical. Virtually all previous studies of probabilistic thinking had relied on within-subject designs in which individual subjects respond to dozens or even hundreds of abstract stimuli generated by systematic variation of the parameters believed to affect the measure under study. This is a dull kind of research to participate in as a subject and, some would say, a dull kind of research to specialize in as a scientist. Although it has the virtue of studying the behavior in question across a reasonably wide range of stimulus values, it rarely yields simple answers to experimental questions. One has, instead, to assess the patterns of subjects' responses over the whole range and come up with quantitative statements about the degree to which people do or do not respond to critical variables.

Kahneman and Tversky replaced the parametric study with the 'problem' study in which a statistical or logical principle is translated into a concrete frame and then posed as a question to different groups of subjects. Sometimes the question is embedded with others as on a college admissions test. Other times the question stands alone. Sometimes the question requires a choice between two alternatives. Other times it requires a numerical estimate. But in any case, the subject spends little time in the experiment and is given little information, explicit or implicit, about the domain being studied.

For illustration, here are six problems taken from the original set of studies:

Problem 1 (Kahneman & Tversky, 1973, p. 241)

> A panel of psychologists have interviewed and administered personality tests to 30 engineers and 70 lawyers, all successful in their respective fields. On the basis of this information, thumbnail descriptions of the 30 engineers and 70 lawyers have been written. The description below has been chosen at random from the 100 available descriptions.
>
> Jack is a 45-year-old man. He is married and has four children. He is generally conservative, careful, and ambitious. He shows no interest in political or social issues and spends most of his free time on his many hobbies which include home carpentry, sailing, and mathematical puzzles.
>
> Please indicate your probability that Jack is an engineer, on a scale from 0 to 100.

Problem 2 (Kahneman & Tversky, 1972, p. 433)

> There are two programs in a high school. Boys are a majority (65%) in Program A, and a minority (45%) in Program B. There is an equal number of classes in each of the two programs. You enter a class at random, and observe that 55% of the students are boys. What is your best guess—does the class belong to Program A or to Program B?

Problem	Probability Prediction	Heuristic Prediction	Data
Jack problem	Probability differs depending on base rate, 30/70 vs. 70/30	Probability reflects only similarity of description to prototype	Probabilities for base rate groups don't differ: supports representativeness
Classroom problem	Probability of B higher due to larger variance when $p = .45$	Probability of A higher due to similarity in sample and population male majority	Most subjects choose A: supports representativeness
Letter R problem	Actual frequency is higher for R in third position	It is easier to generate words starting with R	Most subjects choose first position: supports availability
Committee problem	There are more combinations of 6 than of 2	It is easier to think clearly about small, non-overlapping committees	Large committees are judged to be less numerous: supports availability
Multiplication problem	1x2x3x4x5x6x7x8 and 8x7x6x5x4x3x2x1 receive same estimate	1x2x3x4x5x6x7x8 is anchored at smaller value and gets smaller estimate	Ascending estimate is smaller: supports anchoring
Urn problem	Disjunctive event is more likely than conjunctive event	Insufficient adjustment to high and low anchors will cause over-estimation of conjunctive event	Most subjects bet on conjunctive event: supports anchoring

FIGURE 1. Six classic problems used to diagnose whether subjects are reasoning according to probability theory or according to heuristic processes. Column 1 gives the name of the problem (see the text for the full wording); column 2 gives the probability theory prediction; and column 3 gives the heuristic prediction. Experimental results are given in column 4. Note that in all cases, the results support heuristic processing.

Problem 3 (Tversky & Kahneman, 1973, p. 211)

Consider the letter R. Is R more likely to appear in the first position of a word or the third position of a word?

Problem 4 (Tversky & Kahneman, 1973, p. 213)

Consider a group of ten people who have to form committees.
How many different committees of 2 members each could they form?
How many different committees of 6 members each could they form?

Problem 5 (Tversky & Kahneman, 1974, p. 1128)

You will have exactly five seconds. Please estimate the value of the following expression:

$$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

Problem 6 (Tversky & Kahneman, 1974, p. 1129; taken from Bar-Hillel, 1973)

Consider two urns. Urn A contains 90 red marbles and 10 white marbles. Urn B contains 10 red marbles and 90 white marbles. You will draw 7 times from either urn, each time replacing the marble you have just drawn before drawing the next. Which event would you rather bet on:
Event 1: you draw 7 red marbles in succession from Urn A.
Event 2: you draw at least 1 red marble in 7 tries from Urn B.

Now, let us examine the various problems with an eye to understanding their experimental logic (see Figure 1). *Problem 1* involves representativeness. The content of the personality sketch makes Jack seem more like an engineer than like a lawyer, but the base rates of engineers and lawyers in the population make it likelier that the sketch belongs to a lawyer than an engineer. A subject judging according to probability theory would use both pieces of information. A subject judging according to representativeness would use only the personality information. By varying the base rates of engineers and lawyers for different groups of subjects we can test between the two possibilities. In this particular case, most subjects judged the probability that Jack is an engineer to be about 0.85 regardless of whether the ratio of engineers to lawyers was 30 to 70 or 70 to 30. The result favors representativeness.

Problem 2 also pits probability theory against representativeness. The sample value of 55 percent lies equally far from each of the population proportions numerically but it has a majority of boys. So does Program A. A subject choosing on the basis of representativeness will note this similarity and pick Program A. A subject reasoning statistically, however, will choose Program B. This is because the variance of a binomial is larger for $p = .45$ than for $p = .65$ which makes it easier for Program B to generate a sample with 55 percent boys. In the experiment, most subjects chose Program A, again supporting representativeness.

Problem 3 involves availability. Most people do not have ready information about relative letter positions. Given sufficient time and interest, they might find the necessary information at the library. In the context of the experiment, however, they must fall back on their own devices. According to the availability hypothesis, people will answer the question by seeing how many words they can generate in each of the two categories. Because it is hard to think of words with R in the third position and easy to think of words beginning with R, subjects should (and did) conclude—erroneously in this particular case—that R is more common in the first position.

Problem 4 also involves availability. In this task, committees of two should be relatively easy to imagine and differentiate mentally. Committees of six, however, will be confusable since they will necessarily have many overlapping members. According to availability, subjects should judge that there are more possible committees of two than of six. This is what happened in the experiment. Statistically, however, the situation is just the opposite: there are actually more committees of six than of two.

Problem 5 demonstrates anchoring and adjustment. The correct answer is 40,320. The median answer to the problem shown was 512. When the problem was turned around, however, so that it read $8\times7\times6\times5\times4\times3\times2\times1$, the median answer was 2250. The difference between the two problem orders comes about because people anchor their estimates by carrying out a few steps of the multiplication and then adjust upwards. This produces a smaller anchor in the ascending series than in the descending series leading to the observed difference in the final results. The gross underestimation in both conditions demonstrates the fact that adjustments are typically insufficient.

Problem 6 shows the role of anchoring in probability judgment. According to probability theory, the probability of drawing seven red marbles in succession from Urn A (a conjunctive event) is simply $.9^7$. This is equal to .48. The probability of drawing at least one red marble in seven tries from Urn B (a disjunctive event) is just 1 minus the probability of drawing seven white marbles. This is equal to $1-.9^7$ or .52, making the disjunctive event more likely than the conjunctive event. But most experimental subjects preferred to bet on the conjunctive event. This is what would be predicted if subjects estimate the conjunctive probability by anchoring at .9 and then adjusting downward and estimate the disjunctive probability by anchoring on 0.1 and then adjusting upward. Since adjustments are typically insufficient, these different anchors should lead subjects to overestimate the likelihood of the conjunctive event and underestimate the likelihood of the disjunctive event.

The New Logic is Ambiguous

Each of these problems is based on the same experimental logic. In all cases, the question is posed so that there are only two possible results. One of these will occur if the subject reasons in accord with probability theory, and the other, if the subject reasons heuristically. This is a classic experimental method that has been called *strong inference* (Platt, 1964) because it guarantees that one or the other hypothesis will be supported by the data. All it requires is for each of the possible results to be unambiguously linked to one and only one of the hypothesized mechanisms and for the experimental manipulation to be strong enough to show up against the unavoidable noise in psychological experiments.

By this logic, the implications of Figure 1 are clear: subjects reason heuristically and not according to probability theory. That is the result, signed, sealed and delivered, courtesy of strong inference. But the main contribution of the research is not this result since few would have supposed that naive people know much about combinations or variances of binomial proportions or how often R appears in the third position of words. Instead, the research commands attention and respect because the various problems function as thought experiments, strengthening our grasp of the task domain by revealing critical psychological variables that do not show up in the normative analysis. As soon as we understand the problems, we recognize the point being made and know what the results will look like. Seeing the data is unnecessary.

There is, however, another way to construe this set of studies and that is by considering the predictions of the two processing modes at a higher level of abstraction (see Figure 2). If we think about performance in terms of correctness, we see that in every case the probability mode predicts correct answers and the heuristic mode predicts errors. Logically, of course, nothing has changed. We are still within our scientific rights to conclude, by virtue of the fact that subjects make errors on every problem, that they have generated their answers heuristically. But the sheer weight of all the wrong answers tends to deform the basic conclusion, bending it away from an evaluatively neutral description of process and toward something more like 'people use heuristics to judge probabilities and they are wrong', or even 'people make mistakes when they judge probabilities because they use heuristics'.

Happily, conclusions like these do not hold up. This is because the tuning that is necessary for constructing problems that allow strong inference on processing questions is systematically misleading when it comes to asking evaluative questions. For example, consider the letter R problem. Why was R chosen for study and not, say, B? Was it simply an arbitrary choice from the set of consonants, any one of which could have been used in the experiment? The answer is no. Of the 20 possible consonants, 12 are more common in the first position and 8 are more common in the third position. All of the consonants that Kahneman and Tversky studied were taken from the third-position group even though there are more consonants in the first-position group.

Problem	Probability Prediction	Heuristic Prediction	Data
Jack problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports representativeness
Classroom problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports representativeness
Letter R problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports availability
Committee problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports availability
Multiplication problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports anchoring
Urn problem	Subject gets right answer	Subject gets wrong answer	Subjects are wrong: supports anchoring

FIGURE 2. The same six problems as in Figure 1 with predictions (columns 2 and 3) and results (column 4) reconstrued in terms of their rightness or wrongness. Although the results are not changed, i.e. they still support heuristic processing, the focus shifts to emphasize the wrongness of subjects' responses.

This selection of consonants was not malicious. Their use is dictated by the strong inference logic since only they yield unambiguous answers to the processing question. In other words, when a subject says that R occurs more frequently in the first position, we know that he or she must be basing the judgment on availability, since actual frequency information would lead to the opposite conclusion. Had we used B, instead, and had the subject also judged it to occur more often in the first position, we would not be able to tell whether the judgment reflects availability or factual knowledge since B is, in fact, more likely to occur in the first position.

In the case of the urn problem, a similar situation holds. The particular values that are assigned to the numbers of red and white marbles are precisely tuned so that the probability of the conjunctive event is just a little less than the probability of the disjunctive event. This is important because it means that if the hypothesized adjustments occur as predicted, the errors they cause will be qualitative or categorical. The subjects will bet on conjunction when they should bet on disjunction. Were we to start, instead, with 91 white marbles and 9 red marbles in Urn A versus 91 red marbles and 9 white marbles in Urn B, the subject's selection of the conjunctive bet would be correct. Likewise, were we to increase the number of draws from 7, say, to 8 or 9, the subjects would probably correctly choose the disjunctive bet.[1] But these results would be useless for strong inference since we would not know why the subject was correct. By setting the parameters of the problem to elicit a qualitative error we eliminate ambiguity.

We see, then, that the experimental logic constrains the interpretation of the data. We can conclude that people use heuristics instead of probability theory but we cannot conclude that their judgments are generally poor. All the same, it is the latter, unwarranted conclusion that is most often conveyed by this literature, particularly in settings outside psychology. To find out how this has come about, we must turn to the summary article by Tversky and Kahneman published in *Science* in 1974.

Ambiguity about the Logic Encourages Irrationality Claims

In the original experimental reports, there is plenty of language to suggest that human judgments are often wrong, but the exposition focuses mostly on the delineation of process. In the *Science* article, however, Tversky and Kahneman (1974) shift their attention from heuristic processing to biased processing. In the introduction they tell us: 'This article shows that people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations' (p. 1124). By the time we get to the discussion, however, the emphasis has changed. Now they say: 'This article has been concerned with cognitive biases that stem from the reliance on judgmental heuristics' (p. 1130).

Examination of the body of the paper shows that the retrospective account is the correct one: the paper is more concerned with biases than with heuristics even though the experiments bear more on heuristics than on biases. The new emphasis shows up in several different ways, most of them implicit.

One source of emphasis is structural. The paper begins with some introductory comments and ends with some theoretical implications. In between, it is divided into sections, one for each of the three heuristics. Figure 3 lists the subheadings that are used within sections. The tone is decidedly negative: there are illusions and misconceptions, there are insensitivities and insufficiencies, and there are biases galore. The entire scheme turns on the ways in which things can go wrong when subjects use heuristics.

Representativeness	**Availability**	**Anchoring and adjustment**
Insensitivity to priors	Bias due to retrievability	Insufficient adjustment
Insensitivity to sample size	Bias due to search process	Biases in conjunction vs. disjunction
Misconceptions of chance	Bias due to imaginability	Biases in probability distributions
Insensitivity to prediction	Illusory correlation	
Illusion of validity		
Misconceptions of regression		

FIGURE 3. Subheadings used by Tversky and Kahneman (1974) in their summary article in *Science.* Although the reported experiments were designed to diagnose process, the subheadings suggest that their function was to assess performance.

There is also emphasis in the strong evaluative language that is used to describe the experimental results. For example, in talking about base-rate problems like the one involving Jack, Tversky and Kahneman (1974) do not just say that people's probability estimates are unaffected by base-rate manipulations. They report instead that even though base rates will enter into 'any reasonable estimate' (p. 1124), naive subjects, 'in sharp violation of Bayes' rule' (p. 1124), display 'little or no regard' (p. 1125) for prior probabilities even when the 'description [is] totally uninformative' (p. 1125). Given the authors' evident exasperation with their subjects' answers, it is hard even to remember that the point of this experiment, like all the others in the biases and heuristics literature, was to diagnose process and not to evaluate performance.

Strong language also suggests that there is uniform agreement that the answers to the problems given by Tversky and Kahneman are correct and not open to debate. This is far from true. It is only in the abstract world of what have been called 'urns and balls' or 'box models' that there are clear-cut answers to probability problems. And even though there are certain numerical relationships in probability theory that are, indeed, uncontroversial for box models, as for example the rule called Bayes' theorem, the application of these relationships in the real world is both theoretically controversial and practically difficult.[2]

In the case of the Jack problem, for example, we are given a cover story about there being 100 descriptions taken from real people and the one for Jack being sampled at random from these. Tversky and Kahneman assume we should set our prior probabilities equal to the provided base rates, though there is nothing in Bayes' theorem to require that we do so. Only if we believe the story should our prior probabilities be set equal to the base rates. But do we believe it? Almost certainly not! To determine whether base rates really affect probability judgments in a situation like this, we have to do more than make up word problems. As Gigerenzer, Hell and Blank (1988) have recently shown, when Jack's description is actually embedded among thumbnail descriptions of real lawyers and engineers and then selected through a process that is rigged to look random, base rates do affect people's judgments just as Bayes' theorem says they should.

Although Tversky and Kahneman do not conclude directly that people are irrational decision-makers, they are sensitive to their role in promulgating this idea. At several places in the text they mention that the heuristics they are studying are 'quite useful' (p. 1124, see also p. 1127) or are 'valuable estimation procedure[s]' (p. 1128) or 'are highly economical and usually effective' (p. 1131). Such praise, however, is followed immediately in every case by warnings that heuristics also 'lead to severe and systematic errors' (p. 1124, see also pp. 1128 and 1131), produce 'predictable biases' (p. 1127) and underlie 'fallacies' (p. 1130) of various sorts. It is also notable that, for all the care that is taken in highlighting errors, not one single instance is cited which illustrates a heuristic working well.

In defending the negative focus, Kahneman and Tversky appeal to an analogy with the study of perception. In their gloss, studies of cognitive biases are like studies of how we perceive distance or size. Both judgments are based on heuristic rules and both use data of limited validity. But the analogy misleads by suggesting that perceptual studies focus on error. They do not. Even in experiments on perceptual illusions, the focus is on how the magnitudes of effects change as the result of experimental manipulations. In perceptual studies, the description of effects is never evaluative and certainly never negative.

Perception researchers, for the most part, are engaged in pure science. Even if their findings lead someday to practical applications that extend human perceptual abilities or correct human perceptual deficits, these researchers have nothing tangible to sell in the marketplace. Decision researchers function in an environment that is much more clearly applied. They do have a product to sell, and that product is expertise in normative decision analysis, so-called at any rate. Their slogan could well be: When better decisions are made, decision researchers will make them.

Irrationality Claims Serve Rhetorical Purposes

The idea that people-are-irrational-and-science-has-proved-it is useful propaganda for anyone who has rationality to sell. This can be seen especially well in papers that have showcased the biases and heuristics literature in applied fields outside psychology. A common structure for such papers (see, e.g., Bazerman & Neale, 1983; Slovic, Fischhoff & Lichtenstein, 1981; Thaler, 1983) is to begin with a selection of the most popular problems and then discuss one or more heuristics and the errors they can cause. Then the discussion shifts to substantive issues in the authors' own fields and advice is offered based on the authors' own insights and experience.

For example, Bazerman and Neale (1983), in a paper on negotiation, tell us that they are going to describe five biases that affect bargaining. They begin by describing two of the results that come from the newer entries in the biases and heuristics literature: framing (Tversky & Kahneman, 1981) and overconfidence (Fischhoff, Slovic & Lichtenstein, 1977). In the framing bias, it is shown that choices among risky options are affected by whether the outcomes are framed as losses or gains. For example, when considering the potential closing of a factory, subjects may prefer a risky option when outcomes are described in terms of jobs lost but choose a conservative option when the same information is described in terms of jobs saved. In the overconfidence bias, it is shown that the confidence ratings people assign to their judgments on various issues are mathematically greater than the proportions of those judgments that turn out to be correct. For example, when subjects give confidence ratings of 100 percent, they may be correct only 85 percent of the time.

After describing the biases and summarizing some research findings, Bazerman and Neale go on to describe three kinds of difficulties in negotiations. On the first, they say

> . . .the biases of framing and overconfidence just presented suggest that individuals are generally affected by systematic deviations from rationality.

> [But] there are some individuals who are more accurate in their interpersonal judgments or less influenced by the frame of the situation. These individual differences may be related to the ability of a negotiator to take the perspective of his or her opponent (p. 317).

They go on then to discuss the notion of perspective taking and to describe a perspective-taking test that they feel may be useful in predicting perspective-taking ability in potential negotiators.

If you are puzzled by how one's ability to adopt the perspective of an opponent is related to overconfidence or to the framing of choices in terms of gains or losses, you are not alone. Neither result bears on perspective taking in any palpable way. Nor do Bazerman and Neale attempt to show that they do. They also fail to indicate how 'lack of perspective taking' (which is their section subtitle) can even be viewed as a cognitive bias, much less one that results from heuristic processing.

The same unpalpability pervades the exposition of their other two points, one of which suggests that sometimes bargaining demands escalate after public commitments are made, and the other of which suggests that sometimes negotiators have a fixed-pie view of the available resources. Perhaps they see the former point as related to overconfidence and the latter to framing, but they never say so explicitly. In any case, the advice they offer, to avoid premature commitment and to consider all the issues in a conflict, while sensible enough, is nowhere meaningfully related to the notion of bias as it appears in the biases and heuristics literature.

In trying to understand how authors use the biases literature to forward personal ends, it is useful to think back to our own reactions when we were first exposed to bias problems. Most educated people, particularly those of us who have a modest professional acquaintance with statistics and probability theory, find the problems to be interesting and fun. The fun is even compounded when our first intuitions on a problem turn out to be wrong since this testifies to the power and cleverness of the problem while simultaneously reassuring us that since we understand the trick involved, retrospectively at least, we are, after all, pretty smart cookies. In this way, bias problems effectively engage interest and attention while massaging professional egos.

The introduction of bias problems also serves to bolster the intellectual qualifications of a paper's authors. In claiming that most people make foolish errors, and in demonstrating that even the reader may do the same, authors suggest that they have superior knowledge or insight into difficult decision situations. Moreover, if the latter message turns out to be obvious or uninteresting, the strategy of beginning with bias problems has the advantage of raising the average quality of a paper that would otherwise be unremarkable.

Not all presentations of the biases literature to outside audiences are empty, though many are. They can also be surprisingly naive. To give one example, Saks and Kidd (1980) have written a well-known paper on legal decision-making in which they argue that legal proceedings would be improved by including formal mathematical procedures. They illustrate by showing the difficulties that ordinary folks have with probability problems. Sometimes, however, they trip themselves up as when they gleefully attempt to rebut a Supreme Court decision which concluded that juries of 6 people are as likely to represent a reasonable cross-section of a community as juries of 12 people. Their argument rests on calculations showing that stratified random samples of size 12 are more likely to contain members of minority groups than samples of size 6. Unfortunately, however, in their haste to find legal illustrations of biased judgment, these legal experts forget the simple fact (which they well know) that juries are neither in practice nor principle intended to be selected at random.

It is only a short step from articles like these to the mass media, where writers like our *Newsweek* author are routinely criticized for sensationalizing material in order to make it interesting and accessible to the public. I do not know how often the criticism is apt, but I know that the *Newsweek* author did not create this particular story from whole cloth. The language he chose was perhaps a little livelier than the language we find in the original articles, but not much. If Tversky and Kahneman (1971) call people's intuitions a 'multitude of sins' (p. 110) and label their judgments with words like 'ludicrous' (p. 109), 'indefensible' (p. 108) and 'self-defeating' (p. 107), why should we expect popular authors to display greater meekness in their choice of words?

Experimental psychologists are used to criticizing one another's work on narrow, technical grounds. In fact, it normally is a put-down to characterize a scientific debate as semantic. Science is supposed to rise above the literary forms in which we express it. In the case of the biases and heuristics literature, however, one cannot criticize the message without criticizing the way it is packaged and presented. The view that people are irrational is real in the sense that people hold it to be true. But the reality is mostly in the rhetoric.

Notes

1. George Wolford (personal communication) of Dartmouth College has recently confirmed these speculations in the laboratory.
2. An astute reviewer of this article has observed, quite correctly, that running parallel to the stream of rhetoric that conveys the irrationality message is another rhetorical stream suggesting that a fairly narrow interpretation of probability theory (typically called 'Bayesian' in the psychological literature) is accepted universally as normatively correct. This parallel stream is a worthy topic in its own right, but one that cannot be pursued here. However, a few related sources are worth noting. Gigerenzer et al. (1989, especially chaps. 3 and

6) surveyed the development of ideas of chance and have shown how they have influenced both theory and method in the social sciences. Of particular interest is the recent canonization of statistical reasoning by psychologists as necessary for human rationality. Gigerenzer (in press) has also critiqued the analogy between probability biases and visual illusions, including the notion that the norms for probabilistic judgment are uncontroversial. Lopes and Oden (in press) have contrasted the negative portrayal of heuristic reasoning underlying the biases and heuristics program with the clearly more positive view of heuristic processes found in the area of artificial intelligence. The argument is advanced that the heuristic processes of representativeness, availability and anchoring may be intrinsic to the sorts of pattern-based reasoning that seem to underlie human intelligence. In earlier work, Lopes (1981, 1982) has argued against the normativeness of simple probability models applied in unique situations or in situations calling for induction, and Lopes and Oden (1987) have shown empirically that expert and non-expert subjects behave similarly in inductive environments and contrary to what has been taken to be normative.

References

Bar-Hillel, M. (1973). On the subjective probability of compound events. *Organizational Behavior and Human Performance, 9*, 396–406.

Bazerman, M.H., & Neale, M.A. (1983). Heuristics in negotiation. In H.R. Arkes & K.R. Hammond (Eds.), *Judgment and decision making: An interdisciplinary reader* (pp. 311–321). London: Cambridge. (Abbreviated from a chapter appearing in M. Bazerman and R. Lewicki (Eds.), *Negotiating in organizations.* Newbury Park, CA: Sage.)

Berkeley, D., & Humphreys, P. (1982). Structuring decision problems and the 'bias heuristic'. *Acta Psychologica, 50*, 201–252.

Christensen-Szalanski, J.J.J., & Beach, L.R. (1984). The citation bias: Fad and fashion in the judgment and decision literature. *American Psychologist, 39*, 75–78.

Fischhoff, B., Slovic, P., & Lichtenstein, S. (1977). Knowing with certainty: The appropriateness of extreme confidence. *Journal of Experimental Psychology: Human Perception and Performance, 3*, 552–564.

Gigerenzer, G. (in press). On cognitive illusions and rationality. In E. Eells & T. Maruszewski (Eds.), *Rationality and reasoning: Essays in honor of L.J. Cohen.* Amsterdam: Rodopi.

Gigerenzer, G., Hell, W., & Blank, H. (1988). Presentation and content: The use of base rates as a continuous variable. *Journal of Experimental Psychology: Human Perception and Performance, 14*, 513–525.

Gigerenzer, G., & Murray, D.J. (1987). *Cognition as intuitive statistics.* Hillsdale, NJ: Erlbaum.

Gigerenzer, G., Swijtink, Z., Porter, T., Daston, L., Beatty, J., & Krüger, L. (1989). *The empire of chance.* New York: Cambridge.

Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology, 3*, 430–454.

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

Lopes, L.L. (1981). Decision making in the short run. *Journal of Experimental Psychology: Human Learning and Memory, 7*, 377–385.

Lopes, L.L. (1982). Doing the impossible: A note on induction and the experience of randomness. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 8*, 626–636.

Lopes, L.L., & Oden, G.C. (1987). Distinguishing between random and nonrandom events. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13*, 392–400.

Lopes, L.L., & Oden, G.C. (in press). The rationality of intelligence. In E. Eells & T. Maruszewski (Eds.), *Rationality and reasoning: Essays in honor of L.J. Cohen*. Amsterdam: Rodopi.

McCormick, J. (1987 August 17). The wisdom of Solomon. *Newsweek*, pp. 62–63.

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

Platt, J.R. (1964). Strong inference. *Science, 164*, 347–353.

Saks, M.J., & Kidd, R.F. (1980). Human information processing and adjudication: Trial by heuristics. *Law and Society Review, 15*, 123–160.

Slovic, P., Fischhoff, B., & Lichtenstein, S. (1981). Informing the public about the risks from ionizing radiation. *Health Physics, 41*, 589–598.

Thaler, R.H. (1983). Illusions and mirages in public policy. *The Public Interest, 73*, 60–74.

Tversky, A., & Kahneman, D. (1971). Belief in the law of small numbers. *Psychological Bulletin, 76*, 105–110.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5*, 207–232.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185*, 1124–1131.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 221*, 453–458.

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