the department." The president stood behind his choice and defied general opinion.

Women scientists in the universities found themselves unwelcome even at campus scientific meetings, because the meetings frequently took place at all-male faculty clubs. One nutritionist reported that she was forbidden to eat dinner at the Michigan faculty club when she was the after-dinner speaker, and elsewhere she was refused admission when she was an invited honored guest (p. 215). Despite the difficulties and the prejudice against them, women scientists retained a place for themselves in colleges and universities and made considerable progress in increasing their numbers before 1940.

As in academe, women scientists employed in local, state, or federal governmental agencies increased in number in the 20th century but remained clustered at lower levels or in specific areas of "women's work," where they were underpaid and underpromoted. One manifestation of the government's attitudes occurred after the 1923 Reclassification Act, the intent of which was to institute the policy of equal pay for equal work. In response to the directive, agencies downgraded some job titles to fit women's already low salaries rather than increased their salaries (p. 222). Sex-typing within government, as within the academy, relegated women predominantly to those agencies, in this case related to public health and social welfare, in which low-paying and low-status jobs abounded. The exceptions were those agencies headed by men who were personally willing to risk hiring women.

In industry, the third place of employment for women scientists, women fared considerably worse than in the university or in government. Women employed in the private sector faced overt hostility and found themselves relegated not just to a women's place within science but to science-related work on the periphery. Women who held advanced degrees in scientific fields became chemical librarians or scientific secretaries, and most of them paid a high psychological price for trying to do "men's work." The only exceptions to this bleak outlook were in food and home products industries, which, as in the case of Betty Crocker Kitchens, hired and promoted numerous women scientists.

Rossiter provides abundant evidence to substantiate her view that most of the women who tried to pursue scientific careers before 1940 received fewer honors, had lower status, maintained themselves on lower salaries, and endured greater restrictions on their employment than similarly educated men. Some individual women won recognition and had successful careers in science, but in general women scientists struggled within a cultural context in which they were believed inferior and in a world in which they were judged on factors other than merit. The book chronicles the careers of generations of women, who like their brothers were intellectually stimulated by scientific questions but who had a higher personal and professional price to pay to follow their interests and to reach their goals. Beginning from a stance that is sympathetic to the plight of women, Rossiter has done comprehensive research and will convince many who do not approach the subject from the same point of view. Excellent photographs and informative tables fill out the text. This book will be necessary reading for all who seek to understand the sexual politics of science today. It illuminates how gender has influenced the development of science in this country and how and why our cultural values have followed us into the laboratory. I look forward to Rossiter's volume bringing the analysis into the 1980's.

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Inference in Practice

Judgment under Uncertainty. Heuristics and Biases. DANIEL KAHNEMAN, PAUL SLOVIC, and AMOS TVERSKY, Eds. Cambridge University Press, New York, 1982. xiv, 556 pp., illus. Cloth, $44.50; paper, $14.95.

This important and generally accessible book contains 35 papers (mostly reprints or revisions of previously published papers) all of which explore some aspect of human judgment in circumstances with incomplete information. During the last ten years or so the editors and their co-workers have produced a body of research that has changed profoundly the way we view and study human judgmental processes. It has become apparent that in many instances human judgments are quite at odds with "good practice" or with predictions based upon statistical theories of inference. Were the conclusions from these studies simply that people do not have very good judgment or that their judgments deviate willy-nilly from some predicted reference points, the conclusions would certainly deserve attention. But what has been found is far more interesting and challenging.

In making inferences where uncertainty is present many people adopt a set of identified heuristics or rules of thumb as aids or shortcuts. These heuristics generally lead to systematic, predictable biases in judgments. The judgments referred to are intuitive reactions as opposed to trained responses. It appears that with appropriate training individuals can produce more accurate judgments. For example, generally people express overconfidence relating to skill-based tasks (part 6, chapters 20 through 23). I may be 80 percent sure I can hit a certain target with a dart, even though experience shows I only hit it about half the time. Weather forecasters who routinely provide estimates of the likelihood of various meteorological phenomena are quite well "calibrated." For example, of the days for which they predict a 40 percent chance of rain, on roughly 40 percent there will indeed be some rain. It would, however, be a mistake to infer that it is only the untutored whose judgmental procedures lead to systematically distorted opinions. In fact, much of the work reported has involved the opinions of experts: clinicians, advanced graduate students, other researchers. The book begins with a survey of the heuristics, which appeared in *Science* (**185**, 1124 [1974]).

The following section of the book (chapters 2 through 6) is devoted to the "representativeness heuristic," that is, judging the likelihood that an object belongs to a certain population by noting the extent to which it "represents" or appears typical of the population. The trouble with such judgments is that they ignore or downplay base rate information and sample size. For example, you estimate that it is highly likely that someone is an architect because the description "just sounds like an architect" in spite of the fact that there were virtually no architects in the population being considered.

Availability is the term the authors give to rules by which likelihood is assessed by relative ease of recall or imagining similar events. For example, it is generally easier to think of a word beginning with *r* than a word whose third letter is *r*, and in fact most people seem to feel the former case is the more likely of the two. In fact, in English *r* occurs more often in the third position (as does *k*) than in the first. This heuristic and its implications are examined in part 4 (chapters 11 through 14).

Part 3 (chapters 7 through 10) of the book discusses the role of heuristics in

attribution theory; that is, the "attempts of ordinary people to understand the causes and implications of events they witness" (p. 129). Here both availability or salience and the representativeness heuristic affect one's judgment of cause and effect. Base rate or consensus information tends to be ignored. Information tends to be used or not depending upon whether it fits well with some a priori causal structure; for example, people seem to feel more confident in using the father's height in predicting the height of the son than vice versa.

As mentioned previously, many people tend to be overconfident in assessment of their own skills, providing one possible explanation why banks have credit officers. Another version of this same phenomenon arises in studying the past and raises serious questions of our ability to learn from experience (chapter 23). In studying the past people tend to construct or perceive patterns where none may exist. Knowing how it all came out affects our judgment—there is a tendency to assume that had we been there we would have had the foresight or cleverness to predict what did in fact occur or to deal with problems whose solutions hindsight has made apparent.

Under the heading Covariation and Control, the papers in part 5 (chapters 15 through 19) consider among other things the following: How do people assess correlations in bivariate distribution? Evidence suggests that one's prior opinions and general beliefs about the world influence one's beliefs about the strength of relationships, for example, between personality traits. The role of availability and representativeness in these judgments is striking. How does the belief that one is to some extent in control of a situation affect behavior? In gambling situations, such as dice or other games where the skill of the opponent is not a factor, people still make larger bets when their "opponent" appears to be incompetent. People will pay more for lottery tickets if they choose which ticket their name is placed on than when the choice is made by someone else.

Multistage evaluations, as in sequences of judgments, and correction procedures, such as debiasing techniques, and suggestions regarding improving inductive reasoning are covered in parts 7 and 8 (chapters 24 through 32). Part 9, on risk perception, consists of a single paper that nicely illustrates how heuristics, especially availability, quite naturally lead to persistent biases in beliefs about the risks we all face in life. For example, people frequently overestimate the chances of dying from botulism, flood, tornadoes, and venomous bites and systematically underestimate the likelihood of less newsworthy deaths, for example those due to smallpox vaccinations, diabetes, or asthma.

The discussion here is hardly a summary or digest of the contents of the book. Most of the papers contain experimental evidence concerning the nature, persistence, scope, or incidence of the various heuristics discussed. The prevalence of the heuristics and the biases induced by them can have important implications for preparing for natural disasters, providing for consumer product labeling, making clinical judgments, assessing the risks of suspected carcinogens, and so on. Also, there are evident implications for studying insurance-buying behavior and risk taking. The work summarized in this book has been and will continue to be influential both for studies of human behavior and for those concerned with public policy. It should be of interest to psychologists, economists, and political scientists and in several fields in business schools. The essays collected here provide access to important recent work and give excellent selective reviews of previous research in this area.

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Plate Tectonics

Continental and Oceanic Rifts. G. PÁLMASON, Ed. American Geophysical Union, Washington, D.C., and Geological Society of America, Boulder, Colo., 1982. viii, 310 pp., illus. $20. Geodynamics Series, vol. 8.

In this collection of papers on continental and oceanic rifts, I did not run across a definition of "rift" until the final paper, by P. Mohr, whimsically entitled "Musings on continental rifts." Mohr defines "rift" as "a parallel-sided, downfaulted valley, tens of kilometers in width and at least a few hundred kilometers in length" and then goes on to remark that "mid-oceanic 'rifts' are not correctly so named, as their floors are generated in situ rather than by subsidence of pre-existing rocks." Quibbling aside, I was slightly disappointed that the scope of the book is limited to long, linear rift systems and does not encompass broader areas of continental rifting, such as the Basin and Range province. Nevertheless, the book provides a very good overview of current knowledge about many aspects of rift zones.

The stated intention of the book is to provide a topic-oriented approach to the subject, with sufficient discussion of individual rifts and presentation of hard data to make it of value to researchers in the field. In many respects the book succeeds admirably in achieving this goal, yet it manages to retain enough of a basic approach to the subject to be enlightening to nonspecialists or geological dilettantes. In both regards the book should be well received, for advances in understanding of extensional basins over the last few years have created an explosion of interest in rifting processes, both in academia and in the oil industry. Readers will not find much discussion of some of the newest advances (such as the quantitative evaluation of subsidence and heat flow in continental rift zones as a result of the rifting process), presumably because many of them postdate the planning of this volume. However, the material presented in the book has been in no way outdated by more recent work.

The book is biased rather heavily toward geophysical studies (approximately ten of the 17 contributions fall into this category); several papers deal with various aspects of rift magmatism. I had hoped for some discussion of the structural evolution of some of the continental rift zones and perhaps an analysis of upper crustal deformation during rifting. Along these lines, there is a thought-provoking summary by E. Tryggvason of recent ground deformation determined from geodetic observations of several rift zones. Data on the structural evolution of rift zones are sprinkled throughout some of the other papers in the volume, but there is no satisfactory discussion of the topic. A paper on the role of shear in rifting, by R. Freund, looks promising in the table of contents but lacks sufficient detailed discussion of specific regions and examples.

I especially enjoyed the two summary papers included in the volume: a much-needed history of rift studies to date (largely confined to oceanic rifts) by C. L. Drake and R. W. Girdler and the somewhat flippant analysis of recent controversies and questions about the nature of continental rift zones by Mohr. The latter is written in an engaging style, and, if the reader has any preconceived notions of how or why these rifts form, he or she may delight in booing or cheering the various ideas and arguments as they are put forth.

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