RESEARCH APPLIED TO FIREFIGHTING, HOSPITAL CARE, PROCESS CONTROL

Berndt Brehmer, Uppsala University

1. The experimental work with our *fire fighting simulation* continues. The current focus is upon the problem of what strategy the subjects are using, that is, whether they are using a feedforward strategy, relying upon some model to predict the state of the system, or applying a feedback strategy, using only current information. This is an important question, for the mental models will be different for the two cases. A feedback strategy uses only a model of the effects of one's actions upon the system, while a feedforward strategy requires a more elaborate model. To investigate these problems we study the effects of delays, for delays require a feedforward strategy. Our results so far suggest that the subjects follow a feedback strategy unless the system is transparent, that is, unless the delays can be seen to happen. In the latter case, subjects seem to be able to develop models for feedforward control.

2. Applied work is being conducted in the context of *process control in modern industry* and *intensive care in hospitals*. These studies aim at improving the information systems in these contexts (and, of course, at validating our laboratory results).

3. Work on *distributed decision making in dynamic contexts* is still in a start-up phase, but some theoretical work has been done, especially in the context of emergency management.

4. *New versions of the basic DESSY* paradigm suited to the investigation of process control skills are being developed. The main focus of interest here is upon questions of how a human operator will be able to control the system. We are concerned both with system architecture and with system representation.

FOURTH ANNUAL INTERNATIONAL INVITATIONAL MEETING OF THE BRUNSWIK SOCIETY

Friday, November 11, 1988
Jenney Room, Midland Hotel, Chicago, IL

7:45 - 8:30	**Continental Breakfast**
8:30 -10:00	**Medicine** Mark Chaput de Saintonge, Anthony LaDuca, Roy Poses, Marilyn Rothert, Robert Wigton
10:00 -10:30	**Break**
10:30 -12:00	**Intuition and Analysis** Michael Doherty, David Funder, Stephen Hoch
12:00 -1:30	**LUNCH** (on your own)
1:30 - 3:00	**Public Policy/Conflict Negotiation** Kenneth Hammond, Jeryl Mumpower, John Rohrbaugh
3:00 - 3:30	**Break**
3:30 - 5:00	**Forecasting/Dynamic Tasks** Berndt Brehmer, Cynthia Lusk, Tom Stewart
5:00 -	**Adjourn**

MEDICAL NEWS

EFFECT OF TEACHING PROGRAM ON PHYSICIANS' JUDGMENTS ANALYZED

Roy Poses,
Medical College of Virginia

Bob Wigton, Randy Cebul, Bob Centor, and I have continued to analyze data from our project on the *effect of a teaching program including cognitive and outcome feedback on physicians' judgments for actual patients.* As will be reported by Dr. Wigton, we were able to improve the quality of judgments with this approach.

OMAHA PHYSICIANS EVALUATE EFFECT OF COGNITIVE FEEDBACK

Robert Wigton, University
of Nebraska Medical Center

Tom Tape and I have been *testing whether cognitive feedback will improve medical students' learning of a multivariable logistic function for predicting the risk of death from coronary heart disease.* Using our program FEEDBACK, medical students are given both cognitive and outcome feedback in making predictions about both real and simulated patients. The outcome feedback consists of the likelihood of death from heart disease predicted by the logistic rule. Since Roy Poses and I had previously found the program improved the calibration of physicians' estimates of the likelihood of streptococcal pharyngitis, we are attempting to determine in this study whether the improvement in calibration results more from outcome feedback or more from feedback of weighting. Also, we gave a course in conjunction with the annual meeting of the Society for Medical Decision Making which focused on cognitive feedback as well as Ken Hammond's work on the cognitive continuum.

However, this improvement in accuracy did not influence the physicians' decisions, casting doubt on the idea that physicians make decisions using decision thresholds. We also noticed a large discrepancy between initial rates of antibiotic use at our two research sites. We have therefore begun a (?Brunswikian) multiple logistic analysis of the relationship between clinical cues and treatment decisions at the two sites.

I have continued to investigate whether multivariate analyses can identify physicians' use of cognitive heuristics and biases affecting judgments for actual patients. Preliminary results suggest that the value-induced bias influences judgments of the likelihood of streptococcal pharyngitis for patients with sore throats; and that the availability heuristic influences judgments of the likelihood of bacteremia for patients with suspected bacteremia.

DICK JOYCE, a founder-member of the invitational international Brunswikians, greatly regrets missing yet another meeting, but will be attending a meeting on medical ethics in the Chicago of the south: Athens (Greece, not Georgia or Ohio).

Joyce's current interests in applications of JA are now entirely medical, and concern introducing Wigton and Smith's work on *ethical issues* to a European audience, and experimenting (in England, Eire, and Denmark) with using the judgments of patients to examine their quality of life.

PROJECT ASSESSES CLINICAL DECISIONS

Anthony LaDuca, National
Board of Medical Examiners

The main objective of the Clinical Judgment Analysis (CJA) project has been the development of an *assessment of physicians' clinical competence*, intended for use in the projected computer-based examination that completes the NBME's certification sequence for licensure. During the past four years, we have pursued (a) a program of research in analysis of physicians' clinical judgment in management of ambulatory patients with chronic illness, and, (b) a formal collaboration with the Department of Family Medicine, Jefferson Medical College on developing computer-based instructional materials intended for use with their students and residents. During 1988, progress has been made along these fronts:

1. Publication of "An Exploratory Study of Physicians' Clinical Judgment: An Application of Social Judgment Theory" by A. LaDuca, J. D. Engel, & J. D. Chovan in *Evaluation & the Health Professions, 11*(2), 178-200.

2. Completion of a small study, and NBME report, on "Problem Specificity, Reliability and Functional Equivalence of Physicians' Clinical Judgments" by A. LaDuca, J. D. Engel, & E. R. Julian.

3. With the Jefferson faculty, design of two clinical judgment tasks in management of hypertensive patients, development of a consensus criterion policy for one of these, and pilot trials of a prototype instructional version with medical students (scheduled for October).

MORE MEDICAL NEWS _____

UK STUDY MODELS DETERMINANTS OF EXPECTED REWARDS

D. Mark Chaput de Saintonge,
London Hospital Medical College
and
John Kirwan,
Bristol Royal Infirmary

It is, at present, considered unethical in the UK to reward volunteers for taking risks. Nevertheless we felt that is what most subjects for experimental procedures expect. A study of 30 clinical and 30 preclinical medical students aimed to *model determinants of expected rewards*. Using a representative design we examined the contribution of six factors relating to the test drug, the experimental procedures, and general logistics. Not only was it clear that volunteers expected financial reward for taking risks, but systematic differences appeared in the consensus models between the clinical and preclinical students. Clinical students' most important determinant of reward was the duration of leave required from their clinical studies whereas the preclinicals were most concerned with uncertainty about drug safety.

Although we have regularly used paper patients as validated probes of clinical decision taking, we have no information about probes of decisions taken on clinical trial reports. It seemed possible that the more scientific frame of a trial report might induce not only a more analytical mode of judgment, but also the use of scientifically "harder" cue variables. To *investigate framing effects*, identical but representative data were presented either in the form of a "paper patient" or as a clinical trial abstract. A few doctors appeared to be sensitive to these effects either in their use of variables or the size of effect they regarded as important in that context. Aggregate models weighted for consistency were similar (although criterion for judging similarity remained a matter of judgment!) As usual aggregate models concealed variance between individual policies, and we hope other Brunswikians will show us how policy model feedback has actually been used to reach a working consensus in medical contexts.

MICHIGAN GROUP COMPLETING STUDY OF WOMEN'S JUDGMENTS ON ERT

Marilyn Rothert,
Michigan State University

The decision making group at Michigan State University is currently completing a policy capturing study of *women's judgments regarding estrogen replacement therapy*. The sample consisted of 265 women. A cluster analysis was done using the D index of similarity of the subjects' standardized regression weights suggested by Nunnally. Individuals were assigned to clusters based on their loadings on the various factors. The cluster analysis identified four groups. Group 1 (N=120) placed most importance on relief of hot flashes. Group 2 (N=83) had a more complex pattern, attending to both the level of hot flashes and risk of fracture due to osteoporosis; the women were concerned about cancer with the estrogen only therapy, but not with the estrogen therapy combined with progestogen. Group 3 (N=40) was influenced by hot flashes, and somewhat by osteoporosis; this group was not concerned with cancer, and did not want the combined therapy causing resumption of cyclic bleeding. Group 4 was very small (N=9) and of the groups was most concerned about cancer and least concerned with hot flashes. Of the 25 variables hypothesized to predict group membership in a stepwise discriminant function analysis, six variables were significant at the .05 level. We selected a sample from the groupings and did guided interviews asking the women to talk aloud while completing the task. We are currently completing this analysis. These data will provide the basis for design of an educational intervention. We are looking at the risk communication literature and at the potential use of policy capturing and decision analysis as educational strategies to inform women regarding ERT.

SJT APPLIED TO NEGOTIATIONS, BARGAINING

Jeryl Mumpower, SUNY-Albany

My research activities during the past year have focussed primarily on *applying SJT notions to the study of negotiations and bargaining*. I have been working recently on developing a typology of negotiation situations as they are determined by the judgment policies of the negotiators. I might characterize this as a "theory of the (negotiation) task." I have found that apparently slight changes in negotiators' policies significantly alter the underlying structure of the negotiation situation in some rather nonintuitive manners.

PREDICTIONS OF INTERPERSONAL RELATIONSHIPS STUDIED

Stephen J. Hoch,
University of Chicago

Currently I am working on two interrelated streams of research related to the Brunswik tradition. First, I have used a lens model type of analysis to study *interpersonal prediction*, concentrating on issues surrounding predictive accuracy. Previously, I have studied *spousal prediction* using an anchoring and adjustment modeling methodology. I have also studied the *heuristic role of projection* (the tendency to assume others are similar to oneself) in interpersonal prediction, offering an analytic model for understanding the conditions under which projection is a reasonable prediction strategy and when projection can get one into trouble.

More recently, I have examined *how marketing professionals make predictions about the attitudes, interests, and opinions of the American consumer*. I found that experts (experienced marketing managers and researchers) were no more accurate than two groups of everyday consumers (novices). And although both novices and experts had difficulty predicting the attitudes of American consumers, the reasons for their poor performance were very different. Everyday consumers had difficulty because they assumed that they were different from the American consumer even though they actually were quite similar; these subjects could have been more accurate if they had simply stuck with their own positions on the issues rather than making predictions at all. On the other hand, marketing experts had difficulty because they were dissimilar to the American consumer target and thus could not rely on their own position as a diagnostic cue. The conventional wisdom might have been that marketing experts did badly because they erroneously assumed that consumers would think and behave much like themselves, in other words they projected indiscriminantly. How-

ever, the analyses showed that experts knew that they were not similar to the consumer target and projected quite appropriately. Their problem was that they could not recruit and utilize enough other target relevant knowledge to overcome their structural dissimilarity with the target.

Finally, I have been working with Bob Blattberg on understanding how to *combine database (statistical) models with managerial intuition*. We have analyzed five different real-world, online forecasting situations in business

COGNITIVE FEEDBACK

Work continues at Bowling Green on an intensive review of *cognitive feedback literature*. In addition to the chapter by Doherty and Balzer in *Human Judgment: The SJT View*, the *Psychological Bulletin* will publish an article on cognitive feedback.

and found that a combination of models and intuition results in a significant increase in predictive accuracy (an R^2 increase of .09) over either decision input in isolation. An interesting part of our results emerges in cross-validation analyses, where we found that the inclusion of intuition reduces model shrinkage by over 50%. The model and manager appear to provide mutually stabilizing influences on each other. The model provides consistency while the manager appears able to identify other nonquantifiable factors (possibly broken leg cues) and nonstationary aspects of the data generating process that the model cannot effectively detect. We show that a 50:50 heuristic weighting of model and manager is quite effective; we also show in simulations that the improvement in predictive accuracy is relatively insensitive to the exact weighting of the two decision inputs.

PROBLEMS OF HYPOTHESIS TESTING EXPLORED

Joshua Klayman,
University of Chicago

I am continuing work on problems of hypothesis testing and learning from outcome feedback, working in particular on several projects dealing with *cue discovery and cue use in diagnostic (rather than predictive) judgment*. Concerns include:

1. *What are the differences between predictive and diagnostic judgment tasks* (in terms of task characteristics and the way they are processed)? [Preliminary findings: causal direction doesn't matter, categorical nature of judgments probably does.]

2. *Are some types of cues easier to learn than others?* [Categorical cues seem easier to learn than continuous ones.]

3. *What information acquisition strategies do people use in attempting to learn to diagnose accurately, and*

which are most effective for them? [People organize information by disease; various systematic approaches can be effective.]

4. *What is the effect of prior knowledge and hypotheses on learning of diagnostic cues?* [Prior expectations direct attention, but unexpected relations can be learned if attended to.]

5. *Can information be presented to subjects in a format that facilitates diagnostic thinking?* [A format that stresses differences between competing alternatives seems to help, even if no extra information is provided.]

Projects are at various stages of completion; Some results (e.g., those discussed in my talk at JDM last year) are pretty well signed, sealed, and soon to be delivered. Others are just in the pilot stage, and I hope to be ready to talk about them next year.

RESEARCH EVALUATES ACCURACY OF SOCIAL JUDGMENT PROCESS

David C. Funder, University of Illinois at Urbana-Champaign

My current research concerns the *accuracy of judgments of personality* that people make of each other in daily life. I believe that the vast amount of research on "errors" in interpersonal judgment, which dominates this literature, is actually and utterly uninformative about accuracy for Brunswikian reasons: The errors are demonstrated in artificial, hypothetical, and limited contexts—the representativeness of which is undetermined, and in fact doubtful. In contrast to this research, my efforts examine the judgments of personality made by people who actually know each other in daily life, and the ability of these judgments to predict criteria including overt behaviors. Results of this research, to date, appear to establish (a) interpersonal judgments made by college students have a perhaps surprising degree of accuracy, (b) this accuracy varies as a function of degree of acquaintanceship and (c) the inherent observability of the trait that is judged. For more information see:

Funder, D. C. (1987). Errors and mistakes: Evaluating the accuracy of social judgment. *Psychological Bulletin, 101*, 75-90.

AUSTRALIANS MODEL MAGISTRATE SENTENCING

Alex Wearing, University of Melbourne

During Australia's Bi-Centennial year I have been mainly working on *developing a simulation of magistrate sentencing* based upon protocols obtained from magistrates as they processed actual cases. We (Jeanette Lawrence, Heather Payne, and I) have a mostly working program that models a theory of how magistrates arrive at a sentence.

SJT BOOK IN PRINT

The SJT book is out! Human Judgment: The SJT View, edited by *Berndt Brehmer* and *Dick Joyce* and published by North-Holland is intended as a Festschrift to *Ken Hammond* and reviews progress in SJT since 1973 (the year the Rappoport & Summers book was published). It contains chapters on the development of SJT (*Berndt Brehmer*); procedures (*Tom Stewart*); policy capturing (*Annica and Berndt Brehmer*); learning from experience (*Josh Klayman*); cognitive feedback (*Mike Doherty & William Balzer*); cognitive conflict (*John Rohrbaugh*); medical judgment (*Bob Wigton*); accounting (*William Waller*); educational applications (*Ray Cooksey*); social work with a comparison between SJT and SDT methods (*Lenard Dalgleish*); risk judgment (*Tim Earle & George Cvetkovich*); medical ethics (David Smith & *Robert Wigton*); the separation between facts and values (*Len Adelman*); and negotiations and mediation (*Jeryl Mumpower*).

RESULTS OF J/DM RESEARCH APPLIED TO WEATHER FORECASTING

Thomas Stewart, SUNY-Albany

Work on *expert judgment in weather forecasting* continues to show that weather forecasters are similar to other experts and that the results of judgment and decision research can be applied to weather forecasting. In addition, we have found that psychologists can make a substantial contribution to what meteorologists call the "evaluation problem," that is, how do we measure the skill of weather forecasters? Using the lens model equation, we can decompose skill in a way that is new to meteorology.

I plan to continue the work on weather forecasting in my new position at the Center for Policy Research at the State University of New York at Albany. In addition, I will be conducting a variety of studies of environmental policy.

SJT CONCEPTS UTILIZED IN PAPERS

Len Adelman, George Mason University

I have applied Brunswikian and Social Judgment Theory concepts in three papers written this past year. First, in a paper entitled, "Behavioral Concerns in Support System Design," which will be published in the Concise *Encyclopedia of Information Processing in Systems and Organizations*, I utilized (a) the triple-system case to represent the support system designer, user, a task for which the system is being developed, and (b) the concepts represented in the lens model equation to illustrate why system design is so difficult. Second, a paper entitled, "Measurement Issues in Knowledge Engineering," which will be published in IEEE *Transactions in Systems, Man, and Cybernetics*, util-

izes the concept of "object sampling" to argue that the development of high quality knowledge bases requires sampling over five potential sources of measurement error: domain experts, knowledge engineers, knowledge elicitation methods, knowledge representation schemes, and problem domains. And, third, in a recent paper entitled, "Attitudinal, Normative, and Affective Components of Decision Making: Further Research on Multicomponent Decision Models," Stuart Rakoff (of Decision Sciences Consortium, Inc.) and I used a multimethod approach and a convergent and discriminant validity analysis to empirically show that the above three concepts represent distinct constructs that affect people's judgments of intent.

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