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Like last year some contributions are based on recent PhD work, a good sign for future development and application of Brunswik's psychology. The many contributions represent a wide range of real life situations and subject fields, e.g., rehabilitation consultants' prediction of clients' quality of life, communication breakdown between pilots and controllers, prioritizing in health care, engineers' contaminated land risk assessment. Although different in subject content the presentations illustrate humans' intentional goal-directed behaviour to adapt to an uncertain, probabilistic environment. Some contributions deal mainly with methodological questions, for example increasing our understanding of causality, relating Peircean semiotics to Brunswik's psychology and applying Brunswik's environment-organism approach to some medical, descriptive concepts. We live in an unruly world, where environmental literacy, decision making skill and transcultural values have become necessary prerequisites for our existence. Hopefully psychological research will contribute, in these respects, to increased understanding of humans' adaption to an uncertain, not fully predictable environment.

Many thanks to all authors for their contributions.

Grateful thanks to my wife, Gillian, for language checking and support, and to Esther Kaufmann, for professional help with proofreading, the layout and downloading the contributions.

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Editorial

The Vagueness of Creativity, Reflections on some Brunswik Concepts

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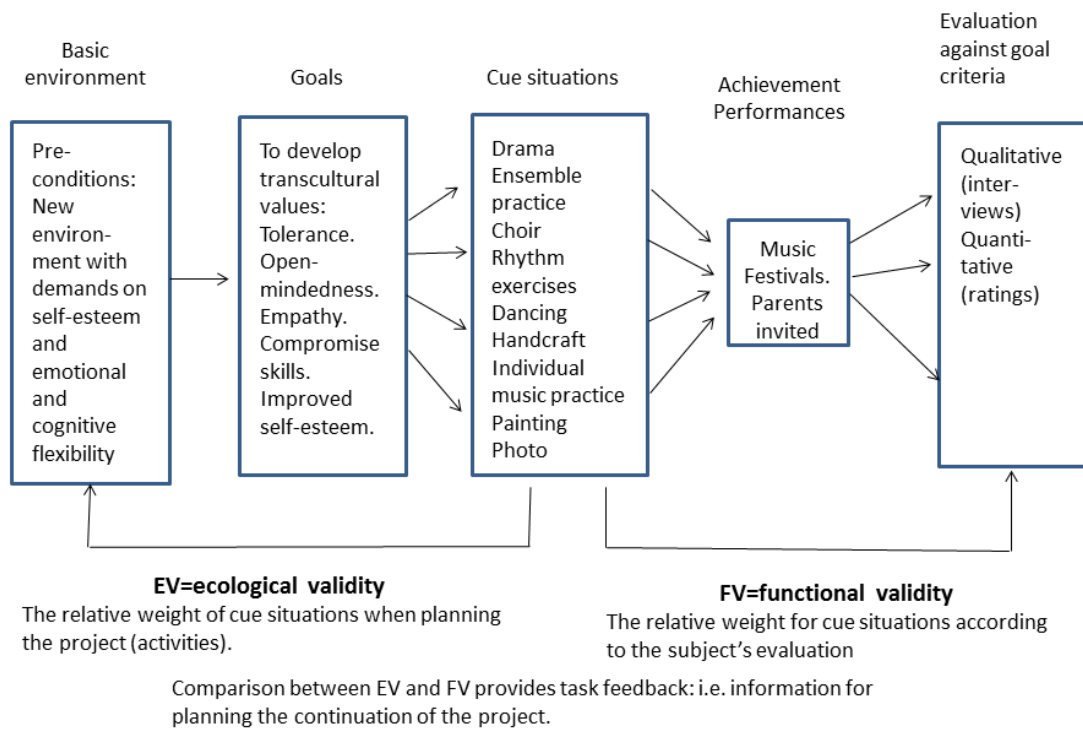
Fundamental shifts in science concerning methods and epistemological outlook are bound to meet with some resistance (Brunswik, 1952). This resistance still persists in psychology, especially with regard to Brunswik's request for representative sampling of situations and social contexts. The problem starts at the domain-level: What is going to be represented? A domain specification can seldom be done in quantitative terms and the whole idea of representative sampling may therefore be dropped right from the beginning. As scientists we are trained to be as exact and clear as possible in our work, which in itself is a good thing. However, it may foster an avoidance attitude to (intolerance) to approximations and qualitative descriptions, two necessary tools for a domain specification. In other words, there may be elements in our own professional identity that oppose Brunswik's idea about representative design. Perhaps we need to be reminded that creative thinking often starts with a qualitative language or pictorial analogies, for example Brunswik's lens model, Darwin's tree sketches and Feynman's doodling on scraps of paper (Hammond, 1996; Kaku & Thomson, 1997). Further, we all have an inborn tendency to perceive constancies, patterns and invariance in our changing world. Therefore it is not natural for us to look at the surroundings in terms of vicarious or probabilistic functioning. This clash between a mundane perception of the world and sophisticated scientific concepts may contribute to resistance towards the idea of representative design. Other obstacles to application of Brunswik's contributions may be the need for interdisciplinary cooperation that follows from his emphasis on environment-organism interaction. Certainly, there are also practical considerations like cost, workload and time-restraints, making it difficult to apply Brunswik's key concepts. However, creative thinking in science is very much like art. The problem or end result cannot be sharply defined from the beginning. Defining the problem is a part of stepwise solving it. The work may start in a mist but end up with a crystal. There is always a moment of vagueness in scientific thinking that results in new theories and concepts.

Machado, Laurence and Silva (2000) have introduced the idea of an epistemic triangle with factual, theoretical and conceptual investigations at its vertices. Scientific progress is assumed to depend on a balance between these types of investigations. In psychology this epistemic triangle is unbalanced, overstretched with factual, descriptive studies. One may wonder: what is the reason for this obsession with facts and descriptive data in psychology? One answer, according to the authors, may be academic students' attitudes and

preference for exactness and practicability in their choice of research topics.

A few years ago, Chris Anderson, a previous editor of Brunswick Society Newsletter, suggested to the Society List that Brunswick's lens model might be hidden in many psychological studies, implicit and unrecognized by the authors. It is quite possible that this is the case. Here is one example. In Malmö, a city in the south of Sweden, more than 30% of the inhabitants are immigrants. In some schools more than 90% of the children have an immigrant background and in one school 36 different languages are represented. In other words, Malmö is a rich city with regard to cultural diversity and pluralism (Becker-Gruvstedt, Olsson & Saether, 2000, p. 59). However, the media often report about ethnic conflicts, youth trouble and racial outrage. The three authors, above, remind us that the educational system has a duty to foster democratic members of the society, individuals who are able to communicate, cooperate, to respect and feel empathy (ibid. p. 59). They maintain that music stands out among the variety of school subjects as an opportunity to develop these transcultural values, openness and mutual understanding in a multi-cultural society such as Malmö city. With this aim, a music project, the World Music School (WMS) was initiated and managed by the Malmö Academy of Music during the years 1996-1999. The project involved thousands of school children aged 6-15 years with immigrant musicians and artists from different cultural backgrounds as well as Swedish music teachers who prepared for their task at the Eo'len Center of West Africa. A wide range of cue-situations at different "stations" was created, see figure below. Once every term a Music Festival was arranged where children performed to show each other and their invited parents what they had achieved during the term. These festivals were followed up by evaluating interviews and written comments from pupils and teachers. During the spring term 1998, 3490 pupils were engaged in the WMS-project, in regular school-time. It is easy to see from the figure below that the whole project implicitly corresponds to Brunswick's lens model paradigm, and we can give an affirmative answer to Chris Anderson's suggestion above. Judged against the qualitative evaluation data the WMS-project was a great success. So what about its future? The three authors complain as follows: "Despite great efforts and continuous invitations to visit us and the schools in order to discuss our activities, the response has been meager. The argument for low activity has repeatedly been lack of financial resources" (ibid. p. 58). Malmö is a multi-cultural city in great need of creative initiative for developing transcultural values like tolerance, mutual understanding, openness, empathy, cooperation skills and self-esteem. The WMS-project initiated and managed by the Malmö Academy of Music is such a creative initiative. It is a sad fact that interests and support from society's macro levels (politicians and civil servants) turned out to be so scant that no continuation of the project was possible.

Brunswik's lens model implicit in the World Music School Project, Malmö Academy of Music, Sweden



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Contributions

Annual Research Update

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My student, Robert (Bob) Holcomb, completed his doctoral research examining the potential value of alternate forms of the Task and Cognitive Continuum Indices (TCI/CCI) for Cognitive Continuum Theory (CCT). The alternate metrics extended the work by Tom Stewart reported in *The Essential Brunswick* (2001). These indices employed the matrix product of the cue inter-correlations matrix with the cue ecological validity weights for task properties and the cue utilization weights for cognitive properties. Bob tested the value of the alternate metrics by having middle-school teachers perform three student-ability prediction tasks varying along the new TCI metric. His results showed support for CCT predictions: (1) a significant relationship between task and cognitive properties and, in turn, (2) improved task performance. In contrast, TCI/CCI metrics based on previous approaches failed to demonstrate support for CCT.

I have continued performing research with Paul Lehner and his colleagues at the MITRE Corporation. The project is testing a method for measuring the forecast accuracy of intelligence-analysis products. The method measures the forecast accuracy of quantitative probabilities that judges infer from a product's text. Although I have no new results to report at this time, we continue to use the Brunswikian principle of task sampling in our research, including the use of open-source National Intelligence Estimates.

Lastly, I completed a manuscript on evaluation for Alex Kirlik's *Oxford Handbook of Cognitive Engineering* (with John Lee). Congratulations to Alex for this handbook.

Professional Judgement of Rehabilitation Counsellors with Complete and Incomplete Information

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There is a view amongst laypersons that professional decisions are objective and by and large trustworthy. On closer inspection, however, there has been substantial evidence of problems in judgements amongst professionals. For instance, clinical problems in doctor-patient relationships (e.g., lack of active listening, overreliance on algorithms) have been documented and evidence for diagnostic error rates has been cited at around 15%.

There is longstanding evidence that professional thinking is influenced by a variety of cognitive heuristics: (a) availability – seeking an acceptable explanation; (b) confirmation bias – a selective search for findings to validate what one expects; (c) attribution errors – typecasting people or relying on stereotypes; or (d) anchoring – decisions that are unduly influenced by initial information. In the counselling context, earlier studies have reported that counsellors were influenced by age, disability status, gender, race, sexual preference and social class of clients.

Kaufmann and Athanasou (2009) concluded that research on judgment achievement should examine judgment tasks within specific occupational domains. They had reviewed judgements across various disciplines (e.g., medicine, business, education, psychology). Overall judgment achievement across different tasks was only moderate ($r = .42$), ranging from .22 for studies in the area of psychology to .58 for those in other professional areas.

In an earlier study of expert professional judgement, Athanasou and Kaufmann (2010) reported that a rehabilitation counsellor was quite reliable in making decisions on the quality of life of accident victim cases. Given seven pieces of information the counsellor was able to make an accurate decision concerning quality of life in 64.8% of cases. This was somewhat better than an automatic decision of just saying that everyone was dissatisfied (54%) without even bothering to examine any case details. It was shown that the counsellor had adopted an overly complex strategy to arrive at a judgement.

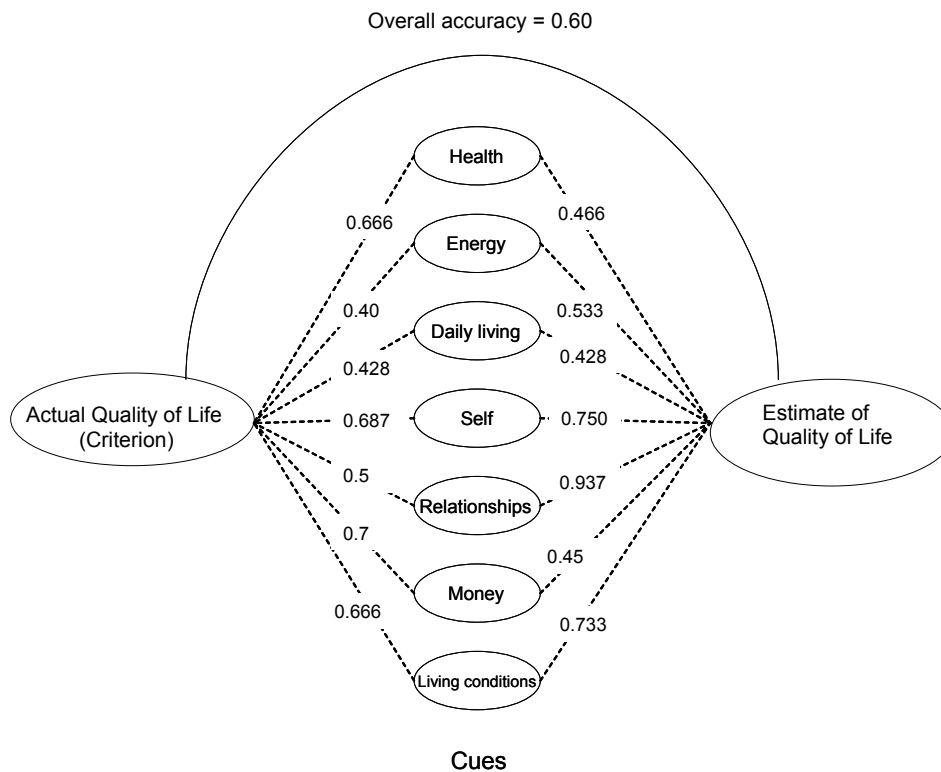
The purpose of this idiographic study is to continue this program of research into professional decision-making. It undertakes an intensive analysis of the client decisions of another rehabilitation professional but on this occasion only partial information is available.

Preliminary Results and Discussion

The rehabilitation consultant in this study was consistent in the decision-making strategy used and was accurate in judging the quality of life of accident victims in 18 out of the 30 cases (60% accuracy). This compared favourably with the

64% accuracy of the rehabilitation counsellor in the earlier study who had the complete profile of information available. Accuracy did not correlate at all (-.16) with the amount of information provided; it did not improve with the number of cues. In retrospect, it made little difference to the counsellor's judgements if a full profile of data was available. This was contrary to expectations and means that accurate judgements can be made in those instances where little information is provided.

Actually, the professional in this study relied on the wrong cues and could have increased accuracy to 70% by relying on just a single cue. This study avoided the use of correlations in the lens model and determined five alternative validity coefficients at the level of the each cue: specificity, sensitivity, misclassification rate, positive predictive value and negative predictive value. The author is still searching for an appropriate equivalent to the multiple regression identity of the lens model equation for dichotomous cues as the present approach does not account for the interaction between cues.



The accuracy of cues for predicting the estimate or actual quality of life ($N = 30$ judgements).

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The Effect of Information on Cue Utilization

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David Watson (Notre Dame University) and I used Brunswik's Lens Model to evaluate personality perception at zero acquaintance. In our study, we operationalized increased acquaintanceship either as escalating exposure or increased trait information. We compared judgments ($N = 471$ judges) made about targets ($N = 50$) based on a still photograph to judgments made about a target based on either (a) approximately one minute of videotaped behavior in addition to the still photograph or (b) one piece of valid trait information in addition to the still photograph. By manipulating the amount of information the judge holds about a target, we could gain insight into how people tend to get to know each other. We found that increasing exposure (i.e., presenting videotaped behavior) increased self-peer agreement correlations for Extraversion and Agreeableness, whereas increasing information (i.e., presenting one sentence about the person's standing on Agreeableness – e.g., "He is the kind of person who typically goes out of his way to help friends") increased self-peer agreement correlations for Agreeableness (obviously), Conscientiousness, and Neuroticism. Furthermore, we found that these judgments were partially mediated by various static cues of the target, such as peer-rated physical attractiveness, hair style, and clothing choice – reliabilities of coded cues ranged from as low as .13 (older-looking face) to as high as .92 (dark hair), with an average intercoder reliability of .58). As the reliabilities indicate, some cues lent themselves to more consensual construal than others, which attenuated some of the cue validity and cue utilization correlations. Nevertheless, some interesting findings emerged. The relations between observer judgments of personality and third-party-coded static visual cues were strongest when observers were presented with a piece of valid trait information, almost as if this statement encouraged ignorance of invalid cues and attendance to valid cues. Hence, introducing a generalized behavioral statement (e.g., "She is the kind of person who frequently goes out of her way to help friends") seems to enhance achievement: column vector correlations between cue validities and cue utilizations averaged .76 in the information condition versus .44 and .46 in the still photograph and video conditions, respectively. This was contrary to our general expectation that additional information would lead to lower cue utilization correlations and diminished achievement.

**Assessing Risk and Prioritising Referral for Self-Harm:
When and Why is My Judgement Different from Yours?**

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This study investigated individual differences in the use of risk factors when making risk assessments for self-harm. Clinical judgement analysis using 35 hypothetical case scenarios was used to determine how case characteristics influence risk assessment for self-harm by mental health professionals. Seven practitioners made four risk/priority assessment judgements for each case, and individual models of judgement for risk and priority were constructed by regressing 10 case variables (cues) onto these sets of judgements. These cues included: the level of social support available, the presence/absence of a recent major life event, the patient's mental state, and the seriousness of the previous self-harm for this case. All but two of the variables (potential risk factors) examined were related to risk and/or priority judgements. Risk assessors applied cues to make assessments consistently – broadly consistent with practice guidelines – although precise cue application varied between professionals. The findings demonstrate the potential for ambiguity in risk assessment (terms such as 'low' or 'high' risk had variable interpretation) and that it can be important to specify whether risk is to be assessed for the initiation, continuation, re-occurrence, or escalation of an event or condition. The study shows the importance of clear practice guidelines (not all risk factors were used as might be anticipated from practice guidelines) and illustrates how clinical judgement analysis, for example by means of Brunswik's lens model paradigm, can be used to understand and enhance the reliability of professional judgement.

Early View (online):

<http://onlinelibrary.wiley.com/doi/10.1002/cpp.754/abstract>

Reference

Cahill, S., & Rakow, T. (in press). Assessing risk and prioritising referral for self-harm: When and why is my judgement different from yours?. *Clinical Psychology and Psychotherapy*. doi: 10.1002/cpp.754

**Expert Decision Making in
Complex Engineering Environments**

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This study investigated the complex decisions made by engineers when conducting contaminated land risk assessments. Experienced assessors ($N = 30$) studied summaries of 27 hypothetical site reports, each containing ten cues that were selected, based on industry guidance, expert interviews and review of contaminated land assessment reports. Models from three theories of decision making were compared. The models were compared quantitatively and then assessed based on the qualitative information collected. From the quantitative analysis applying judgment analysis, according to Brunswik's Lens Model provided the best account of the data, lending support to the Social Judgment Theory (Hammond & Stewart, 2001). A model based on a Fast and Frugal heuristic, the Matching Heuristic (Gigerenzer & Goldstein, 1996), did not fit the data as well; nor did a coherence model based on the Theory of Explanatory Coherence (Thagard, 1989). Comparisons with decisions generated by using industry guidance only showed a moderate fit, suggesting that the standard procedure does not fully represent how experts make assessments in this context. The pros and cons for the three models are discussed in detail.

In each case the participants (experts) were asked to comment on the pollutant linkages of concern. These comments were coded and the frequencies of comments for each cue summed. The frequencies were then correlated with the risk indicator level set for the cue in that case. For most cues, but not all, the level was positively associated with the number of comments, indicating that important cues were referred to more frequently. The frequencies show that a comparatively small number of cues were often identified as important. The four most frequent - soil chemical test data, gas monitoring results, water chemical test data and human pathway were also four of the five cues identified as the most highly weighted within the Lens Model. This result provides further support for the finding that a small number of key cues are particular influential in the decisions made.

Our qualitative analyses of comments made by participants suggest that a combined approach was used that applied key cues, as predicted by social judgement theory, and integrated them into a meaningful, coherent account, according to Theory of Explanatory Coherence. Overall, these findings suggest a

novel process in which a range of information is combined to form a coherent explanation of the data, but in which key cues are more influential than others.

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**Lens Model Methodologies in the Practice of
Industrial-Organizational Psychology**

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In the 2010 Newsletter of The Brunswick Society, Mike Doherty noted a recent academic exchange in *Industrial and Organizational Psychology: Perspectives on Science and Practice* regarding the prospect of industrial-organizational (I-O) psychology taking workplace decisions more seriously. The focal article authors (Dalal, Bonaccio, Highhouse, Ilgen, Mohammed, & Slaughter, 2010) focused on different avenues to increase the exposure of judgment and decision making (JDM) theories, methods, and findings to workplace decisions. The goals of the focal article, as Dalal and colleagues state were “to spark conversation and ultimately engender more cross-fertilization between JDM and IOOB [Industrial-Organizational and Organizational Behavior]” (p. 386).

Although the focal article authors present many avenues to accomplish this cross-fertilization, we (Dev K. Dalal, Dalia L. Diab, William K. Balzer, & Michael E. Doherty) found that a large part of decision making theory and research, namely the Lens Model, was not sufficiently addressed by the focal article. In the spirit of offering further approaches for researching workplace decisions in applied settings, we (Dalal, Diab, Balzer, & Doherty, 2010) presented three different methodologies that can be utilized when researching workplace decisions based on the Lens Model. In particular, we noted how Lens Model studies could be conducted to address applied questions in situations where the researcher is interested in assessing the achievement of judges. We cite examples of actual applied research questions that have used this method, including judging performance as compared to subject matter experts' assessment of success (Roose & Doherty, 1976); applying the Lens Model methods to labor negotiations (Balke, Hammond, & Meyer, 1973); and using the Lens Model methodology to compare judgments of two different individuals (Hogge, 2001).

We continued by exploring the role that policy capturing methodologies can play in IOOB practice. Although policy capturing is known to many academic researchers, we felt that many applied researchers may not be aware of how this approach could be relevant to their work. We provided examples of how policy capturing can be used to investigate claims of gender discrimination in salary decisions (Roose & Doherty, 1978) and graduate school admissions (Maniscalco, Doherty, & Ullman, 1980). We also described a situation where one of the commentary authors (William Balzer) was able to conduct an impromptu policy capturing study to resolve disputes regarding capital planning amongst a group of college deans.

The last methodology we described was the use of cognitive feedback to improve current and future judgments. We described how the Lens Model and policy capturing methodologies could be used to provide judges with an account of how they have weighted cues and how those cue-weights relate to actual weights in the environment. We then described how research has shown that providing cognitive feedback to individuals can improve their future judgments (Balzer, Doherty, & O'Connor, 1989; Balzer et al., 1994).

We concluded by describing some of the challenges a researcher must consider before using these approaches (e.g., number of profiles to be completed, use of stimulus sampling, the use of representative design). Even with these limitations, however, we believe that the Lens Model and related methodologies are powerful tools that applied researchers can use to address real organizational issues by helping individuals in the organization better understand the judgments and decisions they make. Whether the focal article and commentaries lead to further cross-fertilization between JDM and IOOB remains to be seen; however, we believe proper integration of these two fields would be inadequate if Brunswik's work is absent.

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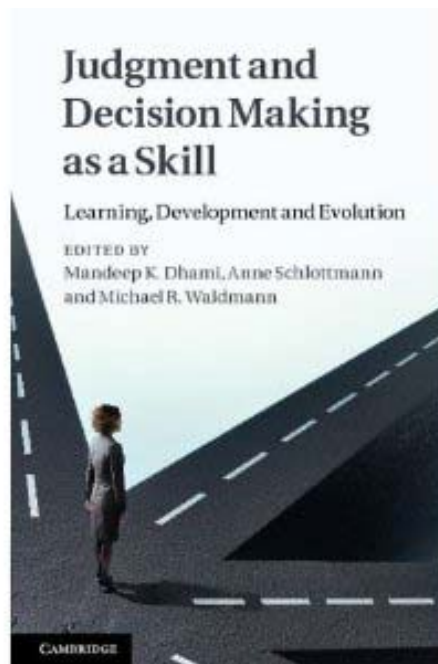
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From Books to Crooks

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I am pleased to announce the publication of my first edited book entitled “*Judgment and decision making as a skill: Learning, development and evolution*” which is published by Cambridge University Press.



Our scientific understanding of human JDM has grown considerably over the past 60 years in terms of the normative benchmarks by which we assess performance, the models we use to describe JDM, and the prescriptive solutions we offer to improve JDM. Nevertheless, the vast majority of theoretical literature and empirical research has discussed human JDM with little reference to its changing or dynamic nature. This is partly due to other theoretical preoccupations such as demonstrations of heuristics and biases and limiting methodological commitments such as studying JDM in cross-sectional, single trials, among cognitive

fully functioning adults. Thus, to date, we know relatively little about how JDM skills are acquired and how they change.

However, there is an emerging field within JDM research which is interested in long-term and short-term changes of JDM skills: Pockets of research have begun to study skill acquisition and decline on a developmental scale in children and the elderly. On an intermediate timeframe there is research on the acquisition of expertise and training. Finally, researchers more interested in short-term changes have begun to study learning (e.g., supervised and unsupervised multiple-cue learning in causal and non-causal domains). Whereas most of the traditional JDM research is conducted using behavioural measures, there is also an increasing body of recent work on the evolution and neuropsychobiology of JDM, which provides fascinating new perspectives on JDM skills. For a coherent and comprehensive picture of the dynamic nature of JDM in humans these perspectives need to inform each other. The proposed book therefore brings together leading researchers in the fields of JDM, cognitive development, human learning, and neuroscience to present emerging perspectives on JDM as a skill.

Beyond the finishing the book, as always, I have been spending a considerable amount of time outside the ivory tower of academia. For instance, I have been working in the defence and security sectors, pinpointing potential applications of decision science (including, Brunswikian theory and method and Hammond's cognitive continuum theory). I have also been working with the Sentencing Council on developing sentencing guidelines, and with Scotland Yard on fingerprint analysis. My research and advice centres on the importance of understanding human-environment relations in order to improve human performance. Beyond the UK, last year, I introduced the notion of adaptive cognition to the Australian police community, and this year I presented it to the South Korean legal and forensic community.

On Sept 1st 2011, I joined the University of Surrey (so new email!), where there are greater prospects for me to expand my links in the criminal justice, defence and security sectors. I am directing the graduate Forensic Psychology programme that collaborates with an internationally renowned secure forensic mental health hospital which accommodates some of the most dangerous offenders in the UK. I have yet to think of Brunswikian-inspired studies in this area – so any ideas are most welcome. In fact, I have missed having the opportunity to share and to learn from you at the annual Brunswik meeting. A fond hello to those I haven't seen for a while, and I hope it is not too much longer before we meet again.

**Essays on Applications of Behavioral Decision Making
in Public Management and Policy**

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I defended my doctoral dissertation in the Public Administration and Policy Program at the University at Albany (SUNY), in April 2011. My three-essay dissertation was titled "Essays on Applications of Behavioral Decision Making in Public Management and Policy" and was supervised by David Andersen (Chair), Tom Stewart, and Erika Martin. My essays included several Brunswikian themes such as learning in multiple cue probability tasks, learning by sampling from the environment, effects of duality of errors on individual learning, and understanding the task characteristics that can increase or decrease disagreement across experts. My studies were connected to natural contexts with public policy implications.

In the first dissertation-essay, I develop a simulation model of threshold learning to analyze the results of a laboratory experiment of airport security screening conducted by Tom Stewart, Jim Holzworth, and Jeryl Mumpower. The essay examines the role of learning in complex, high security environments and uses insights from the study to generate a set of policies to help improve the decision making of airport security staff. The essay resulted in two papers, both co-authored with Tom Stewart: First, in a paper that is accepted for presentation at the Association for Public Policy Analysis & Management conference, Tom and I explain dynamic barriers for learning from feedback in airport security screening through developing and calibrating a threshold learning model of screening. We also discuss how to help calibrate police officers to overcome the problems that are created due to conditionality of feedback (clearer feedback on false positives than false negatives). In the second paper, published in the *Journal of Experimental Psychology: Learning, Memory & Cognition*, Tom and I discuss the limitations of a Brunswikian model, the constructivist coding model, previously developed by Elwin et al. (2007) and Henriksson et al. (2010). The paper argues that the constructivist coding hypothesis imposes an ever-declining selection rate and overestimates base-rate bias for high base rate conditions. We discuss how to extend the model to overcome the limitations. The full citation of the latter paper is: Navid Ghaffarzagdegan, Thomas R. Stewart, 2011. An extension to the constructivist coding hypothesis as a learning model for selective feedback when the base rate is high. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 37(4), 1044-1047.

In my second dissertation-essay, I study normative decision making for warning issuance in the presence of several behavioral reactions from the environment which influence long term conditions of the environment, including the crying wolf effect. The essay has resulted in two papers, both co-authored with David Andersen: First, in a mathematical simulation paper, currently under the third round of review in the *International Public Management Journal*, David and I develop a

signal detection based model with two thresholds and discuss how thresholds for public and private warnings, in a dynamic context with complex behavioral characteristics, should be optimized. In a second paper, presented at the Academy of Management Conference, David and I apply the model to an actual public place setting. In this paper we use data on warning emails sent to students and university staff in order to mitigate the level of crime in a university in 4-year time period. The paper identifies the optimal timing for the dissemination of warning emails.

In the third dissertation-essay, I examine similar issues but in a totally different policy context, public health. In this essay, I examine the problem of healthcare disparities by studying behavioral reasons for practice variation among medical experts; in simple words: why different doctors have different decision models and different styles of practice, and why some costly medical procedures are over-performed in US. The essay focuses on the context of obstetrics, and develops a simulation model of threshold learning that can re-produce the dynamic trend of C-section surgeries and variation of selection rates for C-section across obstetricians in the States of Florida and New York. Further I generalize the analysis and investigate how medical task characteristics, such as feedback frequency and sensitivity of decision outcomes to experience, can mitigate or exacerbate disagreements in the presence of environmental uncertainties. The essay results in two papers: first a simulation paper that is under review for a possible publication, and is the winner of two conference awards: the Lupina Young Researcher Award for Health System Dynamics, and the Dana Meadows Award for the best student paper at the System Dynamics Society Conference (2011). Second, currently, I work with Erika Martin and Andrew Epstein (University of Pennsylvania) to examine the model's ability to replicate C-section decisions of 100 doctors in the state of Florida through their more than 20 years of practice.

Through these essays, I develop insights into the effects of the behavioral reactions of citizens and government employees and organizations on policy performance. I am hopeful to continue this thread of research in collaboration with my previous professors at Albany, and my new colleagues, and other scholars who might be interested in similar topics.

**Seeking Causality vs. Generality:
A Cross-Disciplinary, Theoretical Approach**

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Judgment researchers seeking to increase their understanding of causality and/or generality in the application of scientific knowledge, employ experiments that produce results that are necessarily inversely related; that is, the more the researcher seeks to understand causality, the less s/he will learn about the generality of the results and vice versa. This inverse relation presents a significant problem for scientific psychology and other disciplines. For although both aims are critically important, the experimental designs we most frequently employ produce a situation in which the more vigorously we pursue one the less we achieve of the other. That is a practical problem as well as an academic one.

This problem has been discussed in broad terms in political science, sociology, and economics, but it has largely gone unnoticed in psychology despite having been re-introduced by psychologists Shadish, Cook, and Campbell in 2002.

If this inverse relationship is indeed true, it should be taken into account, for demonstration of causality and/or generality are at the center of the design of experiments. Experiments that enable the pursuit of one goal only at the expense of the other seem less than optimal. Furthermore, the arrangement of independent variables (e.g., orthogonality) in the experiment implicitly determines which goal the experiment will pursue, whether or not the researcher acknowledges it. This article will also claim that ignoring this feature of methodology has strong consequences for the application of science in society.

**Why do Lie-Catchers Fail?
A Lens Model Meta-Analysis of Human Lie Judgments**

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Introduction

A large body of research shows that people are poor at detecting lies. Across hundreds of studies on human lie judgments, people obtain an average accuracy rate of 54%, which is hardly impressive given that chance performance is 50%. There is no evidence of individual differences in lie detection ability (Bond & DePaulo, 2008), nor that presumed lie experts such as police officers perform better than lay people (Bond & DePaulo, 2006). Two explanations for this robust lack of accuracy have been proposed. First, it has been suggested that lie-catchers fail because they rely on invalid cues, that is, behaviors that are unrelated to deception (Vrij, 2008). In support of this idea, which we call *the wrong subjective cue hypothesis*, surveys commonly show that people self-report using cues indicative of nervousness and discomfort, such as gaze aversion, fidgeting and posture shifts, despite the lack of validity of such cues (Global Deception Research Team, 2006). Second, it has been suggested that the lack of valid cues to deception is responsible for lack of accuracy. In support of this explanation, studies mapping cues to deception show that liars and truth tellers barely differ, providing lie-catchers with little useful information to rely on (DePaulo et al., 2003). We call this *the weak objective cue hypothesis*.

Our goal was to test the two hypotheses outlined above. In particular, we wanted to test the notion that incorrect cue use is responsible for lack of accuracy in lie judgments. In contrast to previous research that has largely mapped people's cue use through surveys (for an overview, see Strömwall, Granhag, & Hartwig, 2004), we did not assume that people can accurately self-report on cues involved in their decision-making. Instead, we aimed to measure cue use objectively by correlating behavioral cues with lie-catchers' judgments of deception or truth. We conducted a series of meta-analyses of the deception literature with the aim of answering the following questions: First, what behaviors do people rely on when judging veracity (Meta-analysis 1)? Second, is there a lack of overlap between the cues people use (judgment cues) and those that are actually associated with deception (actual deception cues; Meta-analysis 2 and 3)? Third, is inaccuracy mainly due to incorrect decision-making strategies or lack of valid cues to deception (Meta-analysis 4)?

Meta-analysis 1

Meta-analysis 1 was a synthesis of all the available studies in which people made judgments about the veracity of senders, and in which the behaviors of these senders were coded. The purpose was to establish what behaviors covary with judgments of deception. Our meta-analysis included 4,638 senders and 18,837 lie-catchers. We investigated the correlation between deception judgments and 66 behavioral cues in 153 samples. As can be expected, the results showed that some behaviors are more strongly related to deception judgments than others. Among the strongest cues to deception judgments emerging from our analyses were that communicators who seem incompetent, ($r = -.59$), ambivalent ($r = .49$), and uncertain ($r = .43$) tended to be judged as liars. People appear truthful if they seem cooperative ($r = -.41$), if their faces seem pleasant ($r = -.44$), if they sound immediate ($r = -.44$), and if their stories sound plausible ($r = -.47$) and realistic ($r = -.47$).

We were interested in comparing the cues people self-report using to those that actually correlate with deception judgments. As mentioned above, people claim to rely on lack of eye contact when judging veracity. In actuality, eye contact is a relatively weak judgment cue ($r = -.15$) -- weaker than most of the 66 cues in our meta-analysis. Also in contrast to self-reports, postural shifts ($r = -.08$) is a weak cue to deception judgments, as is fidgeting ($r = .03$) and speech disturbances ($r = .09$). In summary, Meta-analysis 1 shows that people rely on different cues than those they self-report.

Meta-analysis 2

The goal of Meta-analysis 2 was to test the wrong subjective cue hypothesis by comparing cues to perceived deception with cues to actual deception. Recall that the wrong subjective cue hypothesis suggests a lack of overlap between judgment cues and actual deception cues. If we would obtain a strong correlation between these two sets of cues, we would discredit the wrong subjective cue hypothesis. In lens model terms, we were interesting in comparing the strength of utilization coefficients with the strength of validity coefficients. From Meta-analysis 1, we had data on a large number of cues to perceived deception. We compared the strength of these cues with cues to actual deception (the latter data was supplied by DePaulo et al., 2003). We examined 57 cues that had been studied both as a judgment cue and as an actual deception cue. Our results showed that the relation of a cue to deception is positively associated with its relation to perceived deception ($r = .59$). That is, the more strongly a cue is related to deception, the more likely lie-catchers are to rely on it when attempting to detect deception. The correlation is not perfect, but it is positive and substantial in size. The wrong subjective cue hypothesis would not have predicted such a strong overlap between cues to perceived and actual deception.

Further, we compared the relation of each cue to perceived deception with its relation with actual deception. For 22 of the 57 cues, the two correlations were significantly different, meaning that the cue had a different relation to perceived deception than to actual deception. Examining these 22 discrepancies further, we found that 14 of these cues had the same directional relation to perceived deception as to actual deception, but that the cue was a stronger cue to perceived deception than to actual deception. The 8 remaining cues were related to perceived deception but not to actual deception. To summarize, for most behaviors we found that cues to perceived deception and actual deception were matched in terms of strength. For only a minority of the cues, utilization and validity coefficients were different. For

these cues, it was typically the case that the judgment cue matched the actual deception cue in its directional relation to deception, but that the magnitude of the utilization coefficient was larger. For a very small proportion of the cues, judges relied on a cue that was unrelated to deception. In general then, when making judgments, lie-catchers do not seem misguided about the nature of cues to deception. In conclusion, we did not find support for the wrong subjective cue hypothesis.

Meta-analysis 3

Meta-analysis 2 incorporated data from all studies of cues to perceived and actual deception. However, our data on cues to perceived deception came from one set of studies, and the data on cues to actual deception came from another set of studies. The two sets of studies differ in unknown ways, and these differences complicate interpretation of the results. In order to corroborate the results from Meta-analysis 2, we conducted a within-study comparison of cues to perceived and actual deception. We compiled a database of all studies in which researchers had measured both cued to perceived deception and actual deception. We found 25 such samples, including 1,422 senders and judgments of those senders made by 2,250 lie-catchers. The results from this meta-analysis were similar to those obtained in Meta-analysis 2, in that utilization coefficients were strongly correlated with validity coefficients. That is, the more strongly a behavior was related to deception, the more strongly it was associated with perceived deception ($r = .72$). Thus, the results from Meta-analysis 3 were supported, in that the wrong subjective cue hypothesis received little support. Overall, our findings provide evidence that lie-catchers largely rely on valid cues.

Meta-analysis 4

The purpose of Meta-analysis 4 was to investigate whether inaccuracy in lie detection is mainly a function of incorrect decision-making strategies by lie-catchers or due to a lack of valid cues to deception. We also wanted to establish the matching of cue-based predictions of deception with cue-based predictions of deception judgments. We conducted a lens model analysis using the equation proposed by Tucker (1964):

$$r_{acc} = R_{Dec} \times R_{Per} \times G.$$

Thus, the accuracy of lie detection is the product of a) the predictability of a communicator's deceptiveness from behavioral cues, b) the predictability of a communicator's perceived deceptiveness from behavioral cues, and c) the matching of cue-based predictions of deception with cue-based predictions of perceived deception. In order to implement this lens model, we sought studies in which deception had been predicted from two or more cues. We also searched for literature that predicted perceived deception from two or more cues. We found 59 multiple-cue predictions of deception. These represented predictions of deception by 3,428 senders. We also found 30 multiple-cue predictions of perceived deception, representing data from 1,178 senders and 3,497 lie-catchers.

Previous meta-analyses show that the relation between actual deception and perceived deception yields an accuracy of $r = .21$ (Bond & DePaulo, 2006). Our analyses showed that the predictability of deception from multiple cues is $R_{Dec} = .36$. Multiple-cue based predictions of deception judgments yielded $R_{Per} = .63$. We cannot calculate G from individual studies, but by manipulating the lens model equation in

the manner suggested by Stenson (1974), we infer that $G = .93$. Thus, cue-based predictions of deception are very strongly correlated with cue-based predictions of perceived deception. The accuracy of deception judgments can thus be quantitatively decomposed as following:

$$r_{acc} = R_{Dec} \times R_{Per} \times G$$

$$.21 = .36 \times .63 \times .93$$

As this equation demonstrates, the accuracy of lie judgments is most constrained by lack of valid cues to deception, less constrained by judges' unreliability in using those cues, and virtually unconstrained by the matching of cue-based predictions of deception with cue-based predictions of deception judgments. In conclusion, these analyses suggest that the primary source of inaccuracy in lie judgments is not incorrect cue use, as the wrong subjective cue hypothesis holds. Instead, the primary constraint on accuracy lies in the difficulty of predicting deception based on behavioral cues.

General discussion

We believe these results have important implications for the understanding of human lie judgments. Starting with the results from Meta-analysis 1, we found that people rely on different cues than they self-report. That is, while people widely report relying on cues to nervousness and guilt, such as gaze aversion, fidgeting and postural shifts, in reality these cues have limited impact on people's impressions of honesty. That people may not be able to accurately self-report on their decision-making processes is a well-established fact in the psychological literature (e.g., Nisbett & Wilson, 1977). Still, in the deception domain, the self-report method is prevalent. We suggest that if deception scholars wish to map lie-catchers' judgments, they ought to study actual performance, not self-reports about performance.

The discrepancy between self-reported cues to perceived deception and actual cues to perceived deception is important for another reason: It suggests that deception judgments are largely driven by intuitive, implicit processes that may be inaccessible to the conscious mind. Simply put, people do not seem to know what behaviors they rely on when judging veracity. That non-conscious processes are involved in the processing of social information is widely accepted in the domain of social cognition (e.g., Bargh & Chartrand, 1999). Our study adds to this literature by showing that implicit processes play a role when people form judgments about deception and truth.

The results from Meta-analysis 2 and 3 suggest that, contrary to the wrong subjective cue hypothesis, people tend to rely on valid cues to deception. In general, the more strongly a behavior was related to deception, the more likely lie-catchers were to use it when attempting to detect deception. Thus, while the cues people explicitly endorse in survey research tend to be invalid, their actual cue use suggests a fairly good (implicit) understanding of the characteristics of deceptive behavior.

If people in general rely on valid cues to deception, why is deception detection performance so poor? The meta-analytic lens model we compiled suggests an answer to this. As described above, the results indicate that the primary constraint on accuracy is lack of validity of cues to deception, rather than incorrect cue use. This finding has important implication for improving the accuracy of deception judgments, an enterprise that has occupied applied psychologists for decades (see e.g., Frank &

Feeley, 2003). Most attempts to improve deception detection accuracy have been based on the wrong subjective cue hypothesis. That is, these attempts have involved informing lie-catchers of valid cues to deception, with the expectation that this will move them away from their presumed reliance on invalid cues. However, such attempts at cue training have rarely shown substantial positive effects. Our results provide an explanation for why such training tends to be ineffective: Informing lie-catchers of valid cues to deception might be ineffective not because lie-catchers are immune to education, but because their actual cue use already largely overlaps with actual cues to deception.

An approach that is more likely to have a substantial impact on deception detection accuracy is to increase the behavioral differences between liars and truth tellers – that is, to increase the validity of cues to deception through various forms of interactions with senders. A wave of recent deception research has adopted this approach with promising results (see e.g., Hartwig et al., 2005; Levine et al., 2010; Vrij et al., 2008). Our results support these efforts by showing that the key to improving deception detection accuracy is to increase the validity of cues to deception.

Reference to full article: Hartwig, M., & Bond, C. F., Jr. (2011). Why do lie-catchers fail? A lens model meta-analysis of human lie judgments. *Psychological Bulletin*, 137, 643-659.

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**Representative Study Design for the Evaluation of Future Aviation Features
within a Transport Aircraft Cockpit**

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As reported in our last year's newsletter, we aim at realizing study designs, which are representative not only across persons but also across situations, as defined by Brunswick (1947). To realize especially the latter, we typically study the behaviour of air traffic controllers and/or pilots within a variety of situations, which we consider representative of the participants' ecology. For instance, within the scope of one study, which we introduced in last year's newsletter, we tested pilots in a variety of situations in a generic cockpit simulator. To yield situations representative of the ecology of pilots, we systematically manipulated weather conditions and horizontal/vertical flight profiles over the simulation trials. To be further representative across persons - at least to some extent, we tested in total 15 pilots, all of them holding a valid commercial pilot licence. During the various simulation runs, all simulation data were recorded as were the pilots' communication with air traffic control and the gaze behaviour of the pilots flying.

To analyse whether the gaze behaviour of the pilots depended on the state of the aircraft and on the pilots' communication patterns with air traffic control, we used two methodological approaches: First, we identified the points in time at which the state of the aircraft (characterized by its altitude, speed, track, and status of flaps) changed meaningfully (see Jipp, Teegen, Hazama, & Sawaragi, 2011). The identification was based either on a manual segmentation or on the singular spectrum transformation method (Ide & Inoue, 2005). Manual segmentation was executed for those variables, which were not biased by disturbances such as wind. The results were the points in time at which an aircraft parameter revealed a meaningful change (for a visualisation of the time-segmentation's results for altitude and speed, see Figure 1-A). In a subsequent step, we coded the quality of the aircraft state in each time period without changes and calculated the percentages of visual attention on each area of interest within each time period. The areas of interest reflected the various displays in the cockpit. The visual attention on the different areas of interest was, then, inserted in a multivariate analysis of variance as the dependent variables. The independent variables were the coded states of the aircraft.

Second, we split each scenario in constant two-minute intervals (see Jipp & Teegen, 2011). This relatively long interval length was chosen due to the low workload situation currently present in automatic flight mode. For each two-minute interval, we calculated the average state of the aircraft's altitude, speed, track, and state of the flaps in addition to the percentage of visual attention spent on each area of interest. Then, we applied multivariate analyses of variance, again, to relate the visual attention on each area of interest with the states of the aircraft.

The results of both analyses revealed significant relationships especially between the aircraft's altitude and speed with the visual attention (see Figure 1-B): In higher altitudes, pilots tended to visually focus more on the displays required for communicating with air traffic control. In lower altitudes, the pattern changed and the pilots focused more on the displays informing on the status of the aircraft (especially the primary flight display).

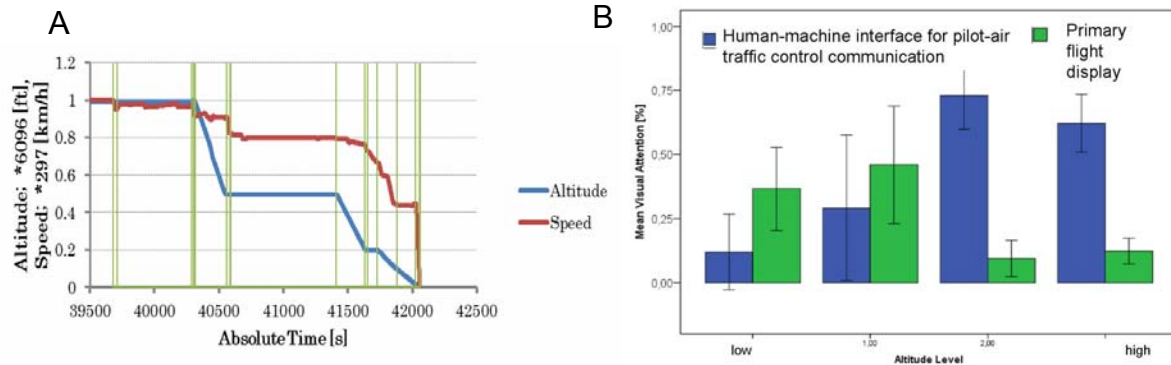


Figure 1. A. Visualisation of a time-based segmentation of the aircraft's altitude and speed (adapted from Jipp, Teegen, Hazama, & Sawaragi, 2011). B. Bar graphs visualising the visual attention on the human-machine interface for pilot-air traffic control communication and the primary flight display in different altitude levels (adapted from Jipp, Teegen, Hazama, & Sawaragi, 2011).

Interestingly, the results did hardly show variance of the visual attention between pilots, which might be related to the extensive training of pilots. Still, with regard to some areas of interest, differences between pilots appeared. This pattern also held for the differences between the scenarios: There were effects, which were constantly apparent across situations, but some seemed to be scenario-specific. However, these results need to be interpreted with care. Although the results did hardly vary between the two chosen methodological approaches, there might be an effect of the manner of segmenting the aircraft's states. We, thus, plan to segment them in one- or three-minute intervals and to analyse whether the already found relationships still hold. In addition, the chosen scenarios are considered representative of highly automated flight situations. Manual flight scenarios have, so far, not been considered, and future work will need to show whether the found effects depend on the level of automation of the aircraft. Further, the available sample size is relatively small such that future research will need to show whether the present interaction effects between the scenarios, the aircraft's states, and the pilots' gaze patterns actually generalize across further pilots and/or situations. Still, we believe that only the application of person- **and** situation-representative study designs will enable us yielding insights into the complex relationship between the cockpit, its automation, and the pilots' behaviour.

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Hoge and Coladarci (1989) through the Psychometric Lens

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The approach of the Hunter-Schmidt meta-analysis traces back to Brunswik's research (see Wittmann, 1988) especially to Tucker's lens model equation (see Tucker, 1964). Within this approach meta-analyzed studies are corrected for artefacts (e.g. measurement error). Due to this historical background of the Hunter and Schmidt approach we labeled our project "through the psychometric lens". In 1982 the Brunswik-based Hunter and Schmidt approach evolved and since then continued to be developed (see Hunter & Schmidt, 2004). Hence, we re-analyzed, in our project, the meta-analysis by Hoge and Coladarci (1989) with an updated Hunter and Schmidt approach (2004). We selected Hoge and Coladarci's meta-analysis as its inclusion criteria are comparable to those of Kaufmann and Wittmann (2010). Hoge and Coladarci's meta-analysis estimated teacher's judgment accuracy across 55 judgment tasks taken from 16 studies. Hence, this study is also suitable for a comparison with our previous analysis base on lens model studies in the educational context.

First we compared the databases of both meta-analyses (Hoge & Coladarci, 1989; Kaufmann & Wittmann, 2010) according to study characteristics such as teaching experience, research approach (idiographic vs. nomothetic). Finally, also the publication year of the included studies is considered.

This first comparison of both meta-analyses reveals that also studies included in Hoge and Coladarci's meta-analysis neglected an idiographic research approach (see also Kaufmann, 2007). Only one study reported individual teacher's judgment accuracy data (see Hoge & Butcher, 1984). Moreover, in Hoge and Coladarci's meta-analysis only judgments made by teachers are considered; in lens model studies also judgments made by students are included; both types of analysis studies mainly published in the 80's. However, as Hoge and Coladarci meta-analysis was published in the late 80's, we recommend that this meta-analysis is updated and that also studies after the 80s are considered.

The number of cues available to teachers could not be considered in our comparison as this information was not available in the studies included in Hoge and Coladarci's meta-analysis.

Our psychometric analysis reveals also that Hoge and Coladarci's meta-analysis underestimated teacher's judgment accuracy without any artifact correction, and overestimated the variation between studies. Moreover, there was still a great variance in judging mathematics compared to language tasks. Teacher education programs should be aware of our results and further studies could lead to training methods aimed at decreasing judgment variability and increasing its accuracy.

Further studies may also reveal if these differences are based on teachers' skills, children characteristics or an interaction of these. Through, idiographic

modeling the value systems of teachers' examination and marking activities can be studied. That will give teachers a better understanding of how their personal preferences influence their professional judgments about students' achievements. Inter-teacher agreement can be decomposed, by the lens model equation, into components, making it possible to analyze if low agreement depends on low cognitive control, differences in applied values or both. Future research may also show if inter-teacher differences in implemented values can be decreased by discussions and practice based on judgments and decisions about the same cases.

To summarize, this project demonstrates the fruitfulness of a Brunswik-based evaluation approach. For more information about the project see Kaufmann (2011). Finally, I would like to thank the University of Teacher Education Central Switzerland for their support with a research grant.

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Dissertation Research

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My current dissertation research investigates the impact of task properties and cognitive strategies on performance of judgment. Using Cognitive Continuum Theory (CCT), this investigation has theoretical implications for researchers in public management, as well as implications for practicing managers and administrators in public sector organizations. The design of the current study is similar to Dunwoody et al. (2000), but is different in manipulation of depth and surface characteristics and examination of components of CCI. First, the current study focuses on variation of environmental predictability when other depth task characteristics are fixed. This manipulation will provide clear result about the relationship between environmental predictability and cognitive strategy. Second, bar graphs are used for the graphical display. This test shows whether bar graph induces intuition as did the iconic display in Dunwoody et al. (2000). Third, examination of components of CCI such as cognitive control (R_s), error distribution (kurtosis), differential confidence, self-insight into policy (differences between subject and objective weights), and response rate will be examined. These differences contribute to the study of CCT in terms of variability of operationalization and analyzing method.

The experiment is conducted with two surface task characteristics (graph and table cue display) and with two different conditions of depth task characteristics ($R_e = .9$ and $R_e = .7$). Subjects are recruited and paid through Amazon Mechanical Turk (<http://mturk.com>), and the experiment is conducted through SurveyMonkey. This study hypothesizes that Transportation Security Administration (TSA) recruits new employees. Participants evaluate candidates for Transportation Security Officer (TSO). In the task, participants are required to play the role of TSA personnel staffs and rate hypothetical applicants. They received 100 learning trials with outcome feedback followed by 50 test trials with no feedback. The data have been collected and analysis is in progress.

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**Brand Personality and Brand Gender
as Means of Improving Employees' On-Brand Behavior**

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Although we have not applied Brunswik's lens model paradigm to our data, our work illustrates the usefulness of his concept 'distal cues and distal responses'. According to Hammond (1965, pp. 21-22) Brunswik advocated:

Distal variables embodied in objects and/or persons should be employed in psychological research; that central states such as motivation set, attitude, or personality characteristics should be valid; and that distal effects such as goal achievement should be observed.

By varying distal, emotional sender cues we have studied their relations to the receivers' distal responses within the marketing field.

Recently marketing researchers have been trying to describe the nature of brands by assigning human personality traits to them. J. Aaker (1997) developed a model similar to the Big-Five classification with five factors (sincerity, excitement, competence, sophistication, and ruggedness) implementing 42 different traits. Primarily, this is based on the theory of animism (Gilmore, 1919/2008); i. e. the description of tangible objects using human character traits as can be seen in expressions like "majestic mountain". Cars like Porsches and BMWs, as examples, are thought to be spirited, ardent, and daring.

Another branch of marketing research focuses on the fit between a brand and the company employee who represents the brand; the employee is said to be on-brand (Chernatony & Cottam, 2009). After decades of optimizing the functionality of products and the setup of clear communication with logo, color and advertising, these "humanics" are now at the center of attention to improve consumers' recognition of the cues that a brand personality is sending via his or her representatives.

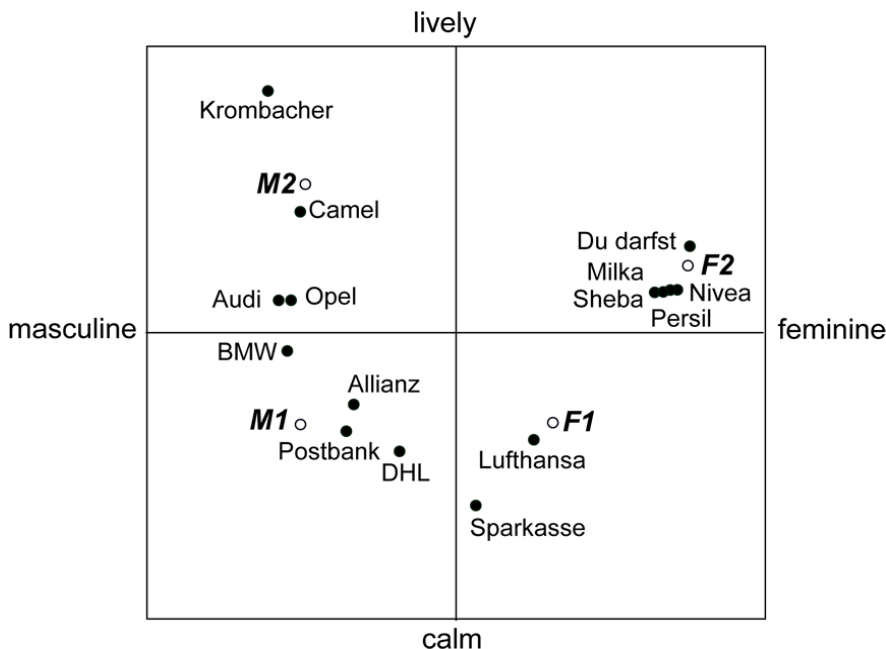
Using the brand personality approach, this goal can be achieved. In an online experiment with several hundred participants, fictitious hotline calls could be identified as being most suitable for a group of brands whereas they did not fit as well to other brands. Two telephone conversations were recorded; one each by a male and a female speaker. One phone call was intended to be vivid and lively; the other more calm and reserved.

To be able to do so, emotions were identified that could evoke or intensify the perception of several personality traits. As an example, excitement and joy increase the perception of a spirited and passionate personality, assertiveness and self-confidence are indications of a successful, honest and reliable person. Findings from conversation analyses showed examples how these emotions could be evoked. Intonation and prosody played key roles. As result, four telephone conversations could be produced; two by lively female/male employees and two by calm female/male employees.

For both brands and employees, a model with ten personality traits in two factors was applied: Spirit & Passion (spirited, imaginative, daring, ardent, and cheerful) and Trust & Security (successful, down-to earth, honest, original, and reliable). In a first step, fifteen brands were selected and the scores for the ten personality traits were assessed. The same was done for the phone calls where the character of the call center employee was described. In another survey, one of the four phone calls was played and the participants had to check those of the fifteen brands where he or she thought that they best fitted to the call. By calculating the Euclidean distance between the employee personality traits and the brand personality traits it could be shown that the smaller these differences are, the more the specific employees are on-brand.

The model could be extended by the most salient personality trait: gender. Marketing literature has shown that brands can also be described as masculine or feminine. After assessing the gender scores for the fifteen brands and the four phone calls on a bipolar scale from very feminine through neutral to very masculine, again the minimum Euclidean distances revealed those pairs of brands and call center employees that fitted best.

The following figure shows both the employees (**F1** and **F2** female, **M1** and **M2** male) together with their respective brand that fit best to them. The lively and vivid female speaker **F2** fitted best to female brands Nivea (cosmetics), Persil (detergent), Sheba (cat food), Milka (chocolate), and Du darfst (margarine). The lively male speaker **M2** fitted best to the male brands Krombacher (beer), Camel (cigarettes), and the three cars BMW, Audi and Opel. Similar to the speakers **F2** and **M2** the product brands also seem to be more exciting. The calmer service brands are represented best by the calm speakers **M1** and **F1**: Allianz (insurance), Postbank and Sparkasse (savings and loans bank), DHL (parcel service) and Lufthansa (airline).



Thus, the application of the personality concept can make a significant improvement of on-brand behavior.

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News from Kathleen Mosier

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I was too late with my Brunswick report last year, so will try to catch up in this report! We've been involved in several projects focusing on decision making in aviation. Much of this work is in collaboration with Ute Fischer at Ga Tech. One thread of our research concerns affect and its place as a cue in judgment and decision making. We looked at Aviation Safety reports concerning communication breakdowns between pilots and controllers, and found that affect played a role in how the breakdowns were resolved.

This research is discussed in

Mosier, K. L., Rettenmaier, P. McDearmid, M., Wilson, J. Mak, S., Raj, L., Orasanu, J. (2010). Pilot/ATC Communication Conflicts: Implications for NextGen. *Proceedings of the 54th Annual Meeting of the Human Factors and Ergonomics Society*, San Francisco, CA.

...and in an article on the role of affect in expert decision making.

Mosier, K. L., & Fischer, U. M. (2010). The role of affect in Naturalistic Decision Making. *Journal of Cognitive Engineering and Decision Making*, 4, 240-255.

We also wrote a review of models of decision making, including the Lens Model, and applications to human Factors issues. In this chapter, we discuss decision making in terms of both *front-end* judgment processes – e.g., attending to and evaluating the significance of cues and information, formulating a diagnosis, or assessing the situation- and *back-end* decision processes e.g., retrieving a course of action, weighing one's options, or mentally simulating a possible response. Two important metatheories – correspondence (empirical accuracy) and coherence (rationality and consistency) – provide ways to assess the goodness of each phase. We discuss models of decision making in terms of their point of focus and their primary strategies and goals. Next, we turn the discussion to the contextual layers in the decision context - individual variables, team decision making, technology, and organizational influences. Lastly, we focus on applications and lessons learned – investigating, enhancing, designing, and training for decision making.

This reference for this chapter is:

Mosier, K. L., & Fischer, U. M. (2010). Judgment and decision making by individuals and teams: Issues, models and applications. In D. Harris (Ed.), *Reviews of Human Factors, Volume 6* (pp. 198-256). Santa Monica, CA: Human Factors and Ergonomics Society.

Coherence and correspondence are also discussed in the aviation context in:

Mosier, K. L., (2010). The Human in Flight: From Kinesthetic Sense to Cognitive Sensibility. In E. Salas & D. Maurino (Eds.), *Human Factors in Aviation* (pp. 147-173). NY: Elsevier.

Our current work is geared toward the FAA NextGen research program. We are looking at decision making and human-automation interaction as a function of planned changes in automation capabilities, flight procedures, and roles and responsibilities of pilots and ATC.

Effects of “Double Rationing” Health Care

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The usefulness of my research rests on the premise that explicit rationing of health care resources may soon become a more palatable option to achieve good health outcomes while containing costs. The focus of my work is on “double rationing” – which occurs when two conditions are met. The first is that only some medical treatments are covered in a publicly funded health care package because of limited financial resources. The second conditions is that only a subset of patients demanding treatment can receive it due to limited medical resources (beds, organs, equipment, etc.). I am currently in the process of writing my dissertation, which will consist of three components:

1. A literature review of the values that are deemed relevant to making prioritization judgments in health care
2. An experiment that tests whether the unique characteristics of a treatment prioritization task and a patient prioritization task lead people to choose different values to make their prioritization decisions, and
3. A model that demonstrates the effects of using different values to prioritize treatments and patients

One common focus of the study of Public Administration is whether the implementation of a program or policy is carried through at the "street level" in accordance with the intentions of the policy makers. Classic works in Public Administration present case studies of instances where programs went horribly wrong at the implementation stage, sometimes because "street level bureaucrats"

have different value systems than policy-makers, which lead them to act in ways that sink the policy. The three components of my dissertation all focus on the values that are used to make decisions to prioritize limited health care resources by different decision makers in the health care system. The literature review will identify the values that have already been identified as important in rationing health care. Using these values as a foundation for my experiment and judgment analysis as my method, I will explore whether the values used to prioritize treatments and patients differ *because of the unique characteristics of the task*.

The two tasks (prioritizing treatments and prioritizing patients to receive a specific treatment) differ in three ways. First, in one task subjects are asked to prioritize treatments while for the other task, subjects prioritize patients. Second, the policy-maker's decision of prioritizing treatments rests on probabilistic information about a treatment (expected health gains, average severity levels, percentage of people who engaged in behaviors that cause disease onset, and percentage of people who contract the illness belonging to a societal group with worse than average health outcomes). In comparison, a health care professional will have access to information that is relatively more certain, such as whether the patient actually did engage in risky behaviors that are associated with disease onset and the severity of the particular patient's condition. Lastly, the health care professional will know particulars about the patients, such as whether he cares for dependents or whether he is a member of a societal group that experiences worse than average health outcomes. These pieces of personal information can also be used to prioritize patients.

The last piece of my research, the model, is built to demonstrate that policy makers can fail to achieve expected goals, not because of deliberate subterfuge by street level bureaucrats, but because policy makers may not consider that health care professionals, making decisions that are well within their domain, can seriously alter the expected benefits of the policy. Using clusters of subjects and their values from the results of the experiment, I can use the different cue weights to examine whether subjects acting as health care professional undermine the policy goals of subjects acting as policy-makers.

News from Jeryl Mumpower

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As reported last year, Tom Stewart, Jim Holzworth, and I continue to investigate how people learn to make decisions when feedback is limited because the decision eliminates the possibility of feedback (e.g., when the decision is not to hire an applicant, the company will not learn how the applicant would have performed if he or she had been hired). This represents conditional feedback because the presence or absence of feedback is conditional on the decision.

Our first paper in this multi-year program of research, "Learning to Make Selection and Detections Decisions: The Role of Base Rate and Feedback" has been accepted for publication in the *Journal of Behavioral Decision Making*. During the upcoming year, we plan an analysis of the role of uncertainty and payoff on learning to make such selection and detection decisions.

Two other papers that I described in last year's report appeared in print this year:

Mumpower, J. L. (2011). Playing Squash against Ralph Keeney: Should Weaker Players Always Prefer Shorter Games? *Decision Analysis*, 8(1), 71-77.

Mumpower, J. L. (2010). Disproportionality at the "Front End" of the Child Welfare Services System: An Analysis of Rates of Referrals, "Hits," "Misses," and "False Alarms." *Journal of Health and Social Services Administration*, 33(3), 364-405.

I am working on several other papers – one on behavioral responses to boil water advisories and the other on risk perceptions of terrorist threats, but neither of these projects are particularly Brunswikian in character.

**The Similarity Heuristic:
The Fast-and-Frugal Side of the Representativeness Heuristic**

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Research into cognitive heuristics has been divided into two camps: the first emphasizing the limitations and biases produced by heuristics (e.g. Kahneman & Tversky, 1973); and the second, focused on the accuracy of heuristics and their ecological validity (e.g. Goldstein & Gigerenzer, 1996). These two approaches come from different research traditions that have asked different questions, and as a result adopted different methods. The question asked by the first camp is “do people use heuristic X?” while those in the second camp, the fast-and-frugal tradition, ask “how good is it?”. In this paper we suggest the second question has not been applied to the “classic” heuristics first described by Kahneman and Tversky (1973). The natural way to answer the first question is by means of what Brunswik (1955) called a systematic design, and second through a representative design. In a systematic design the stimuli are chosen for efficient hypothesis testing, in the representative design the stimuli are a representative sample of an applicable domain. Our work (Read & Grushka-Cockayne, 2011) is the first to test the “classic” heuristics under a representative design.

In our work, we investigate a subset of the representativeness heuristic we call the “similarity” heuristic, whereby decision makers who use it judge the likelihood that an instance is a member of one category rather than another by how much it is similar to others in that category. We provide a mathematical model of the heuristic and test it experimentally, using a representative design, in a trinomial environment. We show that in this environment, the similarity heuristic turns out to be a reliable and accurate choice rule and both choice and response time data suggest it is also how choices are actually made by subjects.

Imagine a decision maker faces two urns, denoted A and B, each containing red and white balls in known proportions, denoted R_A and R_B . The decision maker draws a random sample of five balls from an unseen urn, and must then bet on whether it is from urn A or B. Corresponding to all possible samples, e.g., RRWRW, and both hypotheses (urn A or B), there is a likelihood computable from the binomial distribution. i.e., likelihood (A) and likelihood (B). Consider the simplest decision rule: If $\{\text{likelihood}(A)\} > \{\text{likelihood}(B)\}$ then choose urn A; if $\{\text{likelihood}(B)\} > \{\text{likelihood}(A)\}$ then choose urn B; choose urn B, and if the likelihoods are equal choose at random. The accuracy of this “likelihood heuristic” (a proxy for the similarity heuristic) is obtained by computing the probability of correct choices for each sample, weighting each of these probabilities by the probability of obtaining the sample, and then summing these weighted probabilities. This heuristic is “crippled” in that it ignores all prior probability information.

We examined the incremental accuracy from using Bayes' rule instead of the likelihood heuristic under a wide range of conditions. The heuristics perform well when (a) the likelihoods strongly favor some set of hypotheses; (b) the prior probabilities of these favored hypotheses are approximately equal; and (c) the prior probabilities of other hypotheses never "enormously" exceed the average value in (b). Likewise, when the conditions are not met, the similarity heuristic will do poorly. Figure 1 demonstrates that these conditions hold over a very wide range, and therefore the likelihood ratio will also perform well over a very wide range. On the x-axis is plotted the likelihood ratio of two hypotheses, ranging from 1 (the hypotheses are indistinguishable) to very high or very low (the hypotheses are very different). Each point on the line represents the accuracy of the two decision rules summed over all possible priors for the two hypotheses. As can be seen, over much of the range, the likelihood heuristic (the dashed line) and Bayes' rule (the solid line) yield almost identical results and produce perfect accuracy. The two urns' contents have similar contents, i.e. the likelihood ratio is close to 1, both decision rules suffer from lower accuracy levels, with the likelihood heuristic suffering when the populations are almost identical. Over the entire range, the likelihood heuristic will underform the "optimal rule" in only a small subset of cases. This shows that the similarity heuristic is likely to perform extremely well under most circumstances. It performs poorly primarily when the populations on which it is operating are difficult to distinguish under any circumstances. (This figure and discussion was not included in the published paper).

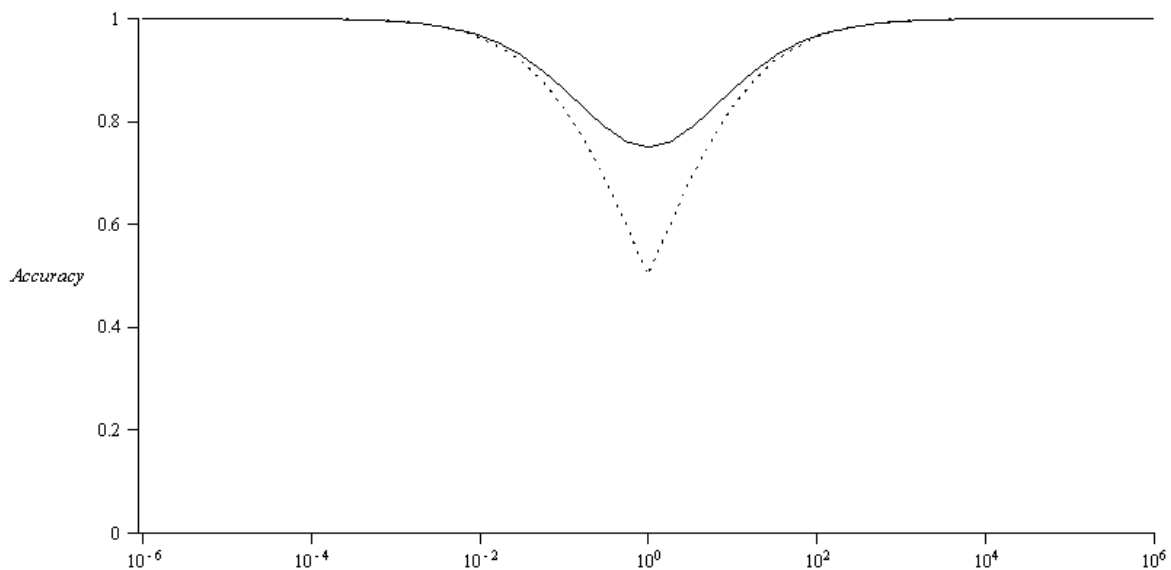


Figure 1. The accuracy of the Bayesian decision rule, solid line and the accuracy of the likelihood heuristic, dashed line. The likelihood heuristic performs well over the majority of the range. The deviations of 1% or more will occur when the likelihood ratio is larger than approximately 0.026 and smaller than approximately 38, both reaching the minimal performance when the likelihood ratio is 1.

We conducted a lab experiment in which two populations and samples were drawn from a trinomial distribution. Two populations were randomly generated, and then a sample drawn from one of the populations with an asymmetric prior. Separate groups assessed the similarity of the sample to the populations or chose the population from which the sample was most likely to have been drawn. Our results

indicate that in the particular context tested, the similarity heuristic achieves a high level of accuracy when making probabilistic choices, with 86% correct choices, significantly greater than chance. Moreover, we find strong evidence that people were using a shared similarity standard to make their choices – the similarity judgments made by one group proved to be an excellent predictor of both the similarity judgments *and* the choices made by other groups.

We also examined the relationship between the similarity heuristic and the use of prior probability (base-rate) information. Since the similarity heuristic disregards prior probabilities, it can be in error when these priors differ. In the experiment we chose the population from which the sample was chosen with priors of 1/6 and 5/6. One choice group knew the priors, while the other did not. Performance was not improved by knowledge of priors, suggesting that subjects were not using the information optimally. While knowing the prior probability did increase the tendency to choose the high prior item, it did so indiscriminately - respondents put equal weight on the prior when similarity was undiagnostic (when knowledge of the prior would be useful) than when it was diagnostic (and the knowledge was relatively useless).

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**A Multiple Cue Threshold Learning Model of Selection and Detection:
Balancing Judgmental Accuracy with Threshold Learning**

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Selection and detection problems represent some of the most challenging decision making tasks, especially in the fields of health and medicine. In a population of pregnant women, who is a candidate for a caesarean delivery? Does this mammogram indicate the presence of cancer? Should antibiotics be prescribed for this illness? We must judge cues, make decisions and evaluate feedback, in an uncertain, high stakes environment. This particular type of problem is relevant and timely, especially in the arena of public policy, yet we have limited understanding about how people make decisions in these circumstances.

In my recently completed dissertation, following on the research on threshold learning with limited feedback conducted by Thomas Stewart, Jeryl Mumpower and Jim Holzworth, the purpose of this investigation is multifold. I examine the literature, identifying principles and modeling rules based on the large volume of prior research. This review covers an analysis of judgment and decision making, explores the relationships between feedback and accuracy, feedback and confidence and feedback and implicit learning, while untangling the results of years of model building on cue judgment and threshold learning.

I identify the key elements of decision maker behavior, based on an analysis of recent experimental data, applying, wherever possible, those elements to a current problem in public policy and model decision making: the significant rise in caesarean deliveries. I present a simple model that combines error correction and hill-climbing principles, which provides a good match to empirical data, as well as demonstrating that it effectively seeks an optimal threshold in an uncertain environment.

I conclude by offering some general conclusions about what we know about this sizable intellectual landscape, and what additional insight has been drawn from this modeling investigation. In particular, I note that this research has shed some light on why the caesarean rate has risen so dramatically, and why it is a direct and very reasonable result of the decision making environment. And I will offer some prescriptions, based on model based exploration, and supported by the literature and empirical testing, about where we are at, and what we still need to uncover, in order to make better decisions.

Additional papers, derived from this dissertation, are forthcoming.

Brunswik's Relational, Environment-Organism Approach Applied to Schizophrenic Symptoms: An Etiological Model

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Due to the lack of theoretical models and causal reasoning, psychiatric classification systems are still confined to descriptive categories. However, some new concepts are "looming on the horizon of psychiatric classification", according to Smolik (1999, p. 188). Much interesting research within neuroscience borders on to psychiatry and the enigma of human consciousness, for example Deisseroth et al., (2003); Kandel (2003).

This recent interest in research about the human consciousness reflects a radical shift in researchers' attitude to make consciousness a proper subject for work. In his book "The Astonishing Hypothesis" (1994) Frances Crick introduces his text with the following words from John Searle:

As recently as a few years ago, if one raised the subject of consciousness in cognitive science discussions, it was generally regarded as a form of bad taste and graduate students, who are always attuned to the social mores of their disciplines, would roll their eyes at the ceiling and assume expressions of mild disgust (Crick, 1994).

The neurologist, Benjamin Libet describes the interrelatedness between our consciousness and its neural correlates as follows: "Our own subjective, inner life, including sensory experiences, feelings, thoughts, volitional choices, is what really matters to us as human beings" (see Crick, 1994, p. 255).

Gerald Edelman (1992) refuses the idea of "qualia-free" research:

...We can take the human beings to be the best canonical referent for the study of consciousness. This is justified by the fact that human subjective reports (including those of qualia) can all be correlated.... It is our ability to report and correlate while individually experiencing qualia, that opens up the possibility of scientific investigation of consciousness." (p. 99, pp. 114-115).

Crick (1994) appeals to fellow researchers to change their former avoidance attitude to consciousness as a research topic with the following words:

Now is the time to take the problem of consciousness seriously. We suspect that it is our general approach that will be useful, rather than our detailed suggestions... I believe that the correct way of conceptualizing consciousness has not yet been discovered and that we are merely groping our way toward it. (p. 255)

John Searle (1992) has defined a number of essential features of conscious states, here briefly mentioned as follows:

- 1) subjectivity,
- 2) unity,

- 3) intentionality,
- 4) centre and periphery,
- 5) gestalt structure,
- 6) familiarity dimension,
- 7) mood-variations,
- 8) boundary conditions.

In this short presentation we regard consciousness as a biological phenomenon and schizophrenia as a disease of consciousness. Consciousness can be studied from two complementary perspectives, a subjective phenomenological aspect and an objective neuro-scientific one. This double perspective does not mean that one or the other of the two approaches can aspire to be the only true method for describing causality behind schizophrenic symptoms. Schizophrenia is a diagnostic label used for a heterogeneity of symptoms. Many schizophrenics do not share any symptoms at all (Eberhard, 2007, p. 43). In clinical practice, schizophrenia has been regarded as the garbage can model for solving the decision problem with a bewildering flora of symptoms (Kirk & Kutchins, 1992, p. 229). Against this background it is understandable that efforts have been made to reduce the haystack of symptoms to one, just one aspect, disturbances in ipseity, i e. Loss of Self (see Sass & Parnas, 2003; Taylor, 2010). In contrast, an etiological model is proposed, that covers restricted, broad aspects on consciousness, aspects we all have experience of, following the advice of William James (1892/2001):

...a student who loves the fullness of human nature will prefer to follow the analytical method and begin with the most concrete facts those with which he has daily acquaintance in his inner life. (pp. 18-19)

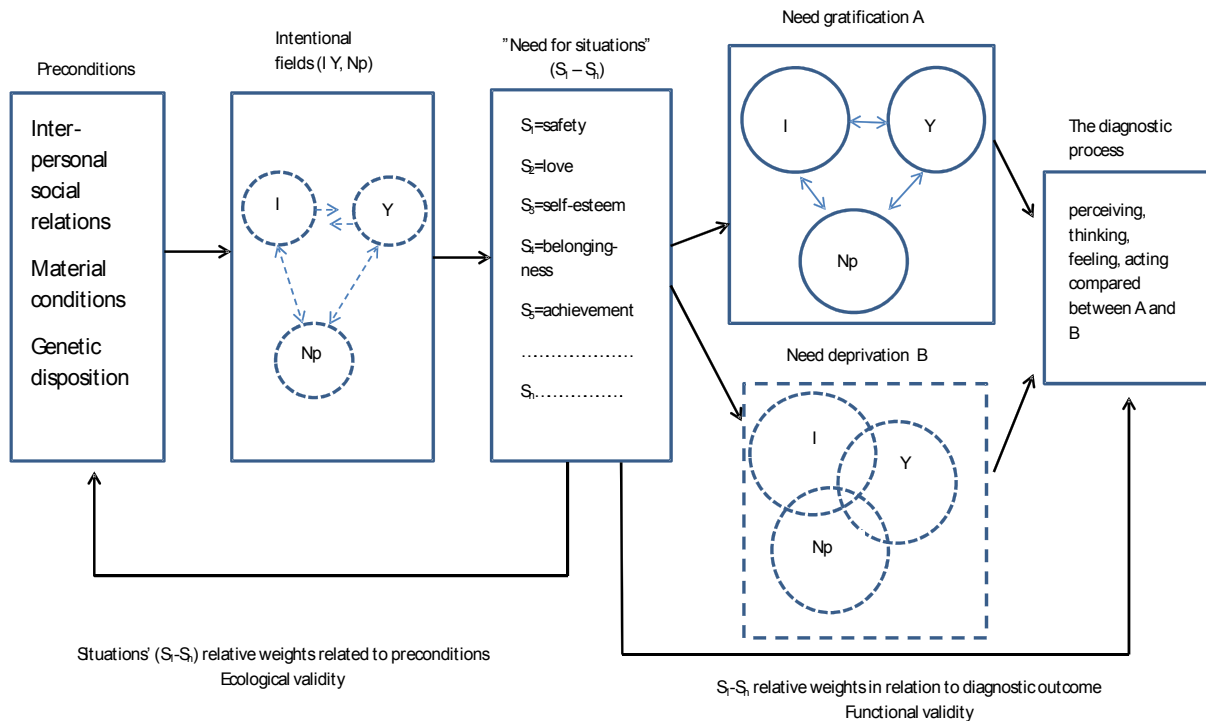
The concept "intentional" as a defining feature of conscious states, of which we all experience, was introduced by Franz Brentano (1874/1997). Since then it has appeared in different versions among many researchers, for example, Sperry (1969), Popper and Eccles (1981). We suggest the following three intentional fields as our main building blocks for an etiological model for schizophrenic symptoms:

- 1) The I-field, the I-concept meaning that we know with our own knowing. Consciousness implies self-reflection, we know we are knowing. In modern diagnostic symptom-manuals like DSM-IV and ICD-10 the concept "I" or "self" is never mentioned.
- 2) The Y-field, the You-concept, meaning that initially the You is represented by another person, for example the child's mother. With time, by self-reflection an internalized You is acquired, not in need of any external person in order to function (Barresi & Moore, 2002).
- 3) The Np-field, the Np-concept meaning the non-personal world, with which the individual interacts (Baron-Cohen, 1991).

The term "field", used in this context, can be seen as an aspect of a problem-complex, where separate fields or aspects do not exist apart from each other. The intentional fields designated I, Y and Np, arise and disintegrate together as mental representations. When we describe a magnetic field we talk about a negative pole, a positive pole and the magnetic field itself. But the three aspects never occur on their own. Their apparent separateness is an illusion due to our rational, analytical concept formation. The subfields within our three main fields are dynamically interdependent in a way that keeps the differentiation between them stable and balanced in normal consciousness (see Brunswik's compromise-and stabilizing concept, 1952; and Tolman's belief-value matrixes, 1951). As the etiological model, (see Figure), includes a time-dimension it is understood that the fields can be defined

in terms of their surroundings during a time-space. Schizophrenic symptoms do not pop up suddenly. They develop gradually with time (Sass & Parnas, 2003; Wykes & Callard, 2010).

Brunswik's environment-organism approach, applied to the plethora of schizophrenic symptoms, an etiological model



Brentano describes mental states always as “being about something” although he insists on calling consciousness “quasi-relational” (Brentano, 1874/1997, p. 374). Our intentional field-concepts imply that they, from their beginning, are non-epistemic and opaque with regard to logical content-references. With time and reciprocal interaction the fields lose their referential opacity and the mind gets structured and stabilized into our three overruling fields, one I, one Y- and one Np- field. Further, we assume, with Searle (1992) that consciousness always includes a “mood”, which we regard as opaque with regard to emotional drive and feelings, and thus difficult to communicate with words. A patient’s first person account may help us to understand this mood state when he describe his mood during a schizophrenic break-down as a constant “longing”, a never-ending imperative to fill an aimless existence with meaning. This mood is a recurrent theme in the Nobel Laureate Karl Axel Karlfeldt’s poem “*Longing is My Heritage, My Castle in Empty Valleys*”.

We assume the three intentional fields to be continually reconstructed as a result of locomotion, i.e. attention shifting. They are supposed to interact with each other in establishing the individual’s belief-value systems, which, in turn, are results of the single individual’s psycho-social “need-for” history (gratification versus deprivation).

These belief-value systems are expected to have a selective and transforming influence on how people structure and interpret their self-perception, their social and their non-personal world (i.e. the three intentional fields). The basic psycho-social needs referred to in this context are mainly taken from Abraham Maslow’s work “*Motivation and Personality*” (1970). To avoid speculation about internal, organic need-states the expression “need-for” is used, indicating a demand on environmental

conditions, a term suggested by Else Brunswik (Brunswik, 1952, p. 76). The hypothesis is that gratification of basic psychosocial needs is a prerequisite for mental health, while their deprivation gives rise to mental dysfunction and illness. The environment's production of gestures, demands, rewards or reproofs, etc., leads normally to a balanced, stable differentiation between the three fields, the I-, the Y- and the Np-field, in accordance with the perspective of others. The output from the field-interaction can cover the whole range of higher-order cognitive, emotional and perceptual responses. Sometimes, however, the individual construes the reciprocal relations between the three fields in a way that does not correspond with reality outside that person's mind. When consciousness loses the overall control over attention, the three intentional fields start to fuse with each other (see Figure, fusion is symbolized by broken outlines and overlapping circles). The following first person accounts will illustrate this fusing-process. A patient losing grip of the I-field complains: "I don't feel myself or I am not myself. I am losing contact with myself or I am becoming a monster." A patient will even say that: "My I-feeling is diminished or my I is disappearing from me" (Taylor, 2011, p. 1239). The loss of control over the Y-field is obvious in persecutory delusions, where the patient, without reason, feels malevolently treated by others. This confusion of the I- and Y- fields is also illustrated by the case concerning a prominent, schizophrenic Swedish artist. Visiting a retrospective exhibition of his own master-pieces the nurse, who accompanied him, walking along the row of pictures, heard him muttering: "this XX must have been a rather good painter". The fusion of the Np-field with the I-field is drastically described, as follows, by a patient, who is suddenly struck down with a mental break-down after two weeks' drug treatment: "soot fell over the world, flowers lost their lustre and all the trees were aching. It was like being blown along a frictionless eternal ice, an empty space without horizon". All these first person accounts indicate a distortion in the feature of unity of consciousness. Also the boundaries conditions, i.e. the situatedness of consciousness, is sometimes distorted in schizophrenia. To illustrate: a young man going abroad is stopped at the passport control and sent to a psychiatric clinic because he insists on presenting himself as pilot from an unknown planet. Sometimes this loss of situatedness may lead to tragic outcomes, as when a newly discharged patient a few weeks later stabs a schoolboy to death, explaining the act by insisting that the boy was an alien invader from a foreign planet. This patient had been discharged from the clinic with a testimony that risks for any violence were non-existent. What kind of drug-treatment or alternative treatment exist today, that can restore the broken boundary conditions of a schizophrenic patient? What do you do as a clinical psychologist or psychiatrist when a patient's tacit world becomes explicit, and focus and periphery of consciousness fuse with each other? Is it barely a question of associative disturbances or an incomprehensible word-salad? Is it likely that one-sided drug treatment, going on year after year, will restore and stabilize the functional relations between the three content fields, the I-, the Y-, and the Np-field. Their firm interdependency is described by Buber (1958) as follows:

Primary words are spoken from the being. If Thou is said, the I of the combination I - Thou is said along with it. If It is said the I of the combination I - It is said along with it. (pp. 15-16)

The American psychiatrist, Allen Frances, chairman of the task force for the descriptive psychiatric symptom manual (DSM-IV), reviewing his earlier work, expresses fears for a new, more inclusive DSM version (DSM-V) with the following words:

DSM-V would create tens of millions of newly misidentified, false-positive 'patients', thus greatly exacerbating the problems caused already by an overly inclusive DSM-IV. There would be massive overtreatment with medications that are unnecessary, expensive, and often quite harmful (2010, p. 1).

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News from Tom R. Stewart

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I have been fortunate to have excellent collaborators and students. Jeryl Mumpower, Jim Holzworth and I completed what we intend to be the first in a series of three papers on learning decision thresholds with conditional feedback.

Stewart, T. R., Mumpower, J. L., & Holzworth, R. J. (2011). Learning to make selection and detection decisions: The roles of base rate and feedback. *Journal of Behavioral Decision Making*. doi: 10.1002/bdm.755.

Online: <http://onlinelibrary.wiley.com/doi/10.1002/bdm.755/abstract>

The second and third papers on the roles of uncertainty and payoffs are in progress.

April Roggio completed her dissertation entitled "A multiple cue threshold learning model of selection and detection: Balancing judgmental accuracy with threshold learning." Hers is the first model that represents both MCPL and threshold learning in the same model. She has described her work elsewhere in this newsletter.

In related work, Navid Ghaffarzadegan and I proposed an extension to the constructivist encoding hypothesis of Elwin, Juslin and their colleagues.

Ghaffarzadegan, N., & Stewart, T. R. (2011). An extension to the constructivist coding hypothesis as a learning model for selective feedback when the base rate is high. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(4), 1044-1047.

Navid finished his dissertation work this year which included a successful model of threshold learning. He has described his work elsewhere in this newsletter.

Elise Weaver and I completed a paper for a special issue of the *Journal of Behavioral Decision Making* on individual differences in decision making competence. We factor analyzed measures of performance on a battery of tasks including both coherence and correspondence based tasks and measures of fluid and crystallized intelligence. The structure indicated that coherence and correspondence tasks do involve different abilities. Surprisingly, the intelligence measures loaded more heavily with correspondence tasks than with coherence tasks.

Weaver, E. A., & Stewart, T. R. (2011). Dimensions of judgment: Factor analysis of individual differences. *Behavioral Decision Making*. doi: 10.1002/bdm.748.

Online: <http://onlinelibrary.wiley.com/doi/10.1002/bdm.748/abstract>

In addition DoSuk Lee and Christine Muller have made progress on their dissertation work. DoSuk has collected the data for his investigation of cognitive continuum theory, building on Dunwoody's earlier work. Chris is looking at the implications for prioritization of treatments in health care policy under a two stage system where policy makers prioritize treatments and then doctors prioritize patients to receive those treatments. She is about to collect data. Their work is described elsewhere in this newsletter.

Brunswick, Peirce and an Integrated Model of Human Cognition

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My current research is on ways to bridge from models of formal, theory based thinking to models of everyday thinking, in order to build an integrated approach to human cognition (Storkerson, 2010a). This work has its origin in research in design and communication, particularly the field's lack of theoretical frameworks that can inform practice, education and research (Storkerson 2004, 2008, 2010b). This lack has been longstanding and vexing in design. Initially, I saw it as a failure of the field. In retrospect, my interpretation was somewhat unfair because designs problems seem to reflect broader problems of knowledge in technological societies which needs to be simultaneously scientific and naturalistic (Nowotny, Scott, & Gibons 2001).

As we know, current thinking estranges formal and naturalistic thinking and deprecates the latter. This bifurcation and concentration on formal thinking persists in in many fields. The model of formal thinking taken as "scientific" despite increasing evidence that it is defective both as a description of human thinking (Evans, 2008) and, as a normative model of how people should think. The view is emerging in psychology that human naturalistic cognition is a set of processes, that are, not available to consciousness, which construct the life world within which formal thinking takes place (MacGilchrist, 2009). Thus, it is not an alternative to formal thinking but the base that formal thinking depends on.

Brunswick's theory of mind is naturalistic. It establishes such a bridge through the primacy of the ecological-pragmatic level as the "objective" level of human functioning. His model is of intentionality that creates order by representation and action, while functionally tied to the environment. The lens model demonstrates how ecological cognition, can be quantitatively investigated without a determinist frame such as behaviorism.

The partnership with Peircian semiotics is natural and beneficial for both semiotics and Brunswick's psychology. Peirce's epistemology and ontology are ecological and pragmatic. Objects are what they do, which is how they affect each

other in interaction. At any time, objects and their qualities are relative to each other, and human knowledge is by definition based in and limited by experience. Knowledge is a subjectivity that is functionally linked to the environment experienced: a subjectivity that is also objective. Peirce's sign based theory of construal that is his semiotics, is congruent with Brunswik's functionalist theory of representation and in particular his "cues", though Peirce's models of sign function are more elaborated. Peirce's notion of abduction provides an ecological psychology framework to account for the origins of creative thinking and model building (Kirlik & Storkerson, 2010). In Peirce, the origin of knowledge is abduction, a creative guess or vision of something that might be the case: a model to give form to something observed. The model is an invention of human subjectivity, which is aimed at identifying the distal environment for purposes of interaction. It is this model that can be formally tested.

Thus, Peirce provides theoretical grounding for positions that are axiomatic in Brunswik and puts them in a coherent and systematic logic. That elaborated system provides for studying multiple aspects of cognitive function: visual rhetoric, embodied cognition, analogical similarity and the nature of resemblance (structural iconicity), mental models and diagrammatic thinking, which has a particularly important place in Peirce as the point of transition from concrete thinking, for example about the triangle drawn on a piece of paper, and abstract thinking: "triangle" as a form, the different types of triangles and mathematics of their geometries (Stjernfelt, 2007, pp. 89–116).

Finally, cognitive psychology seems to be the obvious operational level at which to consider more coherent models of human thinking, but experimental psychology in general is notoriously lacking in theoretical frameworks. Instead, there are often ad hoc interpretations. In naturalistic cognition these are of prejudicial and taken out of context: explorations of human errors and peculiarities. For example findings that given a random list of last names, people overestimate the frequency of a name that belongs to someone famous or that "Positive affect is used to infer familiarity in a heuristic fashion." (Monin, 2003). Gigerenzer, Todd et al. (1999) have demonstrated systematic reinterpretations for such intuitive "heuristic" thinking as reflecting the natural world of probabilistic but pervasive interrelations between variables, as distinct from mathematical models that presume the independence of variables (Gigerenzer & Todd, 1999).

We can recognize the importance of vicarious function in Brunswik's notion of representative design in psychological experiments, but still, for designers as other practical "makers", it is important to study how the cues themselves are constructed so they can deliberately create them. Creating is very different from experiencing. The variety of brunswikian research shows how it is possible to study these building blocks of naturalistic cognition such as perception and judgment within his framework.

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News from Elise A. Weaver

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As Tom Stewart writes elsewhere in the newsletter, we have completed a paper finding two factors of coherence and correspondence for a set of judgment measures in the JDM literature. These are highly correlated, with a latent variable of intelligence underpinning both. Interestingly, our "intelligence" latent variable, made up of crystallized, fluid, and digit span memory correlates more highly with correspondence tasks than with coherence tasks.

Weaver, E. A. & Stewart, T. R. (2011). Dimensions of Judgment: Factor Analysis of Individual Differences. *Journal of Behavioral Decision Making*. doi: 10.1002/bdm.748

In my other work, I am developing Bayesian and system dynamics models. The other day I went to our HumRRO office library that occupies a small room and discovered both Brunswick's Perception and the Representative Design of Psychological Experiments and Forrester's World Dynamics. I guess I'm working in the right place.

News from Bob Wigton

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This Fall, Tom Tape, Esther Kaufmann and I gave an afternoon short course at the annual of the Society for Medical Decision Making in Chicago, entitled "Psychology of Medical Decision Making II: Modeling Judgment, the Brunswikian Approach". We presented both a historical background and a practical approach to doing lens model studies. The presentations were very well received and there was good discussion among the participants.

Brunswik Symmetry and the Nothing Works Challenge

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My friend and classmate Friedrich Lösel, professor of psychology at the University of Erlangen-Nürnberg, Germany and director of the Institute of Criminology. Cambridge, UK retires this year at the University. Friedrich had had the data, where we first could demonstrate how important the symmetry between intervention and outcome assessment is (Lösel & Wittmann, 1989). These principles I coined Brunswik-Symmetry. It can be shown that a lack of this symmetry is related to "nothing works" findings in many areas of psychology, criminology and social sciences broadly understood. In a chapter for the festschrift for him I describe how these violations can be mapped and described via Tucker's lens model equation, augmented with psychometric principles (Wittmann, 2011). That equation is also similar to the approach used by Hunter and Schmidt in their psychometric meta-analysis.

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**On Brunswik's Distinction
between Perception and Analysis (Thinking)**

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Original text edited by Lars Sjö Dahl

The power and characteristics of perception are based on the following observations. Perception is not a perfect, but a highly qualified, estimation of the true core of objects, i.e. of reality. On the whole, in the long run, perception is the best cognitive working-process for the individual in order to come to terms with the environment. The typical level of acceptable, but far from absolute, precision in perception is compensated by probabilistic interaction between different cues, which results in a balance of small errors, the final achievement approaching the true reality. Perception is based to a large extent on general "soft" principles of intuition, or perhaps we can call it heuristics. The perception process is guided by induction. It can be improved occasionally by rational and deductive reasoning, sometimes on a mathematical basis. Perception is partly the result of a successful use of our senses, e.g. our sight and hearing. However, these tools define only some necessary conditions for adaptive perception. Sufficient conditions also include higher order cognitive processes.

The deductive, analytical approach may often be successful, but is sensitive for gross, fatal errors. Still perception is in the leading position when it comes to cognitive processes. The validity of deductive inferences depends on the prerequisites for a well-functioning perception.

Recent research into perception has given increased evidence for an interrelation between perception and understanding, a higher order level of cognition. In the comprehensive presentation of research dealing with perception in visual art the neurologist Zeki (2000) summarizes the situation as follows: "The neurological literature presents us with a wealth of information that makes us suspicious about separation between seeing and understanding" (p. 71). Even though our brain seems extremely specialized with regard to perceptual functions, the integrative aspect on the relation between higher order levels of cognitive processes, like thinking, and sensory perceptions is still recognized as an interesting research field, according to Zeki (ibid. p. 80):

I do not of course mean to imply that cognitive factors do not come into play in interpreting what is seen, in what is known as the "top-down" effect. Seeing is perceived as understanding, as Gregory has so well emphasized, involves a hypothesis research area.

It is interesting to the observer how many scholars refer to the same main problems that caught Brunswik's interest for perceptual events relation to distal phenomena, as hypothetical thinking (Brunswik, 1952). In Popper (1959/2000, p. 10) we find the following notes:

I now feel that I should have emphasized in this place a view which can be found elsewhere in the book ... I mean the view that observation statements and statements of experimental results, are always interpretations of the facts observed; that they are interpretations in the light of theories.

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The Advantages and Costs of Rich Stimulus Sampling

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My laboratory has been using a stimulus sampling technique inspired by Brunswik's notion of representative sampling. In many experimental situations, the environment's natural characteristics are unknown – for example, the distribution of retention delays, the experienced temporal and spatial gaps in judgments of causality, or the delay to receipt of an outcome – or the distributional assumptions would be specific to a context. I was interested in the possible utility of randomly sampling stimulus values from a range of interest rather than the more common systematic sampling of two to three values from this range. By widely sampling the stimulus range, the relationship between the stimuli and behavior might be identified more clearly than if only a few values are chosen and oversampled. My students and I began by using this sampling method in a few empirical studies, many involving decisions in a video game environment (Racey, 2009; Sutherland, 2009; Experiment 2 of Young, Sutherland, Cole, & Nguyen, 2011; Young & Cole, in press; Young, Webb, & Jacobs, in press). We have followed these empirical uses of random sampling with a systematic series of Monte Carlo simulations examining of the benefits and costs of random stimulus sampling as well as evenly distributing the sampled values along the stimulus continuum (Young, Cole, & Sutherland, in press). Rich sampling, using either random or evenly-spaced values, of a between-subject variable produced much better identification of the shape of the generating function with a small loss in parameter precision. Through Monte Carlo simulation, we are now examining the impact of these stimulus sampling techniques for within-subject designs and factorial designs.

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**What Determines the Performance of Strategic Alliance Managers?
Two Lens Model Studies**

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There has been an increase in strategic alliances between organizations resulting in the institutionalization of human resources functions. In order to understand the effectiveness of those functions, we employed a lens model approach to investigate the performance of strategic alliance managers. Guided by the lens model pioneered by Egon Brunswick (1954), we conducted laboratory (Study 1) and field (Study 2) studies. In Study 1, we investigated the relationship between alliance competencies and alliance manager performance. Based on effectiveness theory, we proposed that alliance competencies will influence alliance manager performance (i.e., the total expected value to alliances of the behaviors of alliance managers during a period of assigned alliance tasks). Consistent with the job performance literature (Motowidlo, 2003), alliance manager performance relates to the behaviors that create value for alliance organizations. Competencies enable alliance managers to exhibit performance behaviors.

In Study 2, we examined whether certain competencies are evaluated by alliance supervisors as more important and most likely to contribute to alliance performance. Overall, these two studies depart from the literature in at least two significant ways. First, they show a link between managerial performance and alliance partner performance as predicted by alliance competencies. Second, they provide an empirical basis for the influence of behaviors on alliance outcomes. Overall, if alliance management is to lead to competitive advantage (Schuler, Jackson, & Luo, 2004), we believe alliance competencies are crucial to that process.

Through both studies we were able to answer the question, “what determines the performance of strategic alliance managers?” We found that structural, functional, and social/interaction competencies drive the performance of strategic alliance managers. More specifically, communication and cultural sensitivity seem more important drivers of alliance manager performance than other competencies. Overall, our findings show that alliance manager performance may be predicted by alliance competencies. Through the lens model approach we were able to leveraging and extending the OB and HR literatures on competencies to respond to the increasingly frequent call – often from macro, strategy researchers – for more micro-level probes into the drivers of strategic alliance dynamics.

The lens model approach enabled us to understand the correspondence between performance of managers and the cognitive systems vis a vis the environment of strategic alliances. It can therefore be used to examine the extent to which strategic management concepts cohere with strategic management researchers’ cognitive systems in other contexts (e.g., emerging economies). The lens model approach may improve the competence of strategic management researchers relative to strategic contexts characterized by uncertainty. To the extent that errors associated with the strategic management researchers or business policy environments can be drastically reduced, if not eliminated, practitioners (e.g., investors) may be more confident in using reports of strategic management researchers. The lens model approach can facilitate this objective.

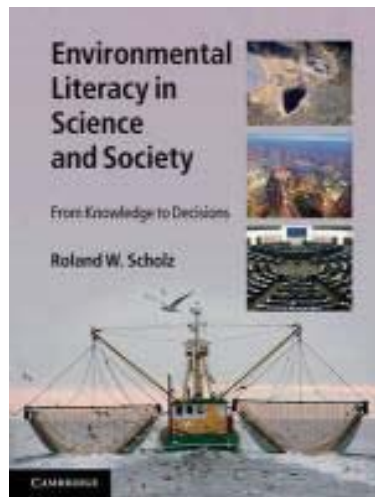
Unfortunately, the extant Strategy literature lacks studies of the lens model even though it is suitable for such areas of study as emerging economies and analysis of multinational subsidiaries (Zoogah, in press). In a review of the Strategic Management literature for a book chapter on the Lens Model in Strategic Management Research, Zoogah (in press) found that even though there are thousands of articles published in the strategic management research journals over several decades, only a total of 12 papers applied the lens model technique. Only 1 article each from the Strategic management journal; Management Science, and Marketing Science used the lens model. The majority of articles were in Accounting (n = 9). I did not find studies of emerging economies based on the lens model technique. The strategy field is characterized by high levels of uncertainty making it very appropriate for the lens model approach. It is expected that this article and the book chapter will expose strategic management researchers to the lens model as a tool for examining uncertainty in that field.

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Book Review

Environmental Literacy in Science and Society: From Knowledge to Decision – A Brunswikan View



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“Environmental literacy in Science and Society: From Knowledge to Decision” is the recent book by Roland W. Scholz published by Cambridge University press in 2011. Scholz starts by highlighting the dependency of the human being on the environment as follows: “Human’s concerns about and the interactions with the environment from navigating the seas to managing a farm or operating a nuclear power plant, have emerged from the core need to survive by using environmental information and resources“ (p. 3). In the preamble the second of three key questions leading through the whole book mention this dependency which is also found in Brunswik (1957):

Both organism and environment will have to be seen as systems. Each with properties of its own...Each has surface and depth, or overt and covert regions. It follows that, as much as psychology must be concerned with the texture of the organism or of its nervous properties and investigate them in depth, it must also be concerned with the texture of the environment. (p. 5)

In the first main chapter, Scholz introduces the concept of environmental literacy within the context of environmental science and sustainable development.

The text is arranged in nine main parts together including 20 chapters. Each chapter is enriched by examples from history or research. The text is well-structured; each chapter is introduced with an overview and closes with a summary of its key messages.

In the following chapters (2-6), environmental literacy is approached from multiple fields such as biology, psychology, sociology, economics and industrial ecology. In Chapter 6, dealing with psychology, Egon Brunswik is introduced as father of the probabilistic functionalism as he postulated that mental activity, consciousness, and behavior were to be evaluated in terms of how they serve the organism in adapting to its environment. Further Brunswikian concepts based on probabilistic functionalism are summarized as follows:

Brunswik's theory of probabilistic functionalism provides basic assumptions and principles such as functionalism, the human-environment complementary, probabilistic information acquisition, substitutability (i.e. vicarious mediation) to gain a sufficient representation of the environment, learning by evolutionary stabilization both on the ontogenetic and phylogenetic levels, and representative design (i.e. measuring performance in real-world settings and not in reduced environments). These principles are essential for the theory building in human-environment system (HES)... (p. 150).

In this chapter, Scholz also introduces Lewin's field theory – well known as the origin of social psychology – in which he “concentrated on the social environment and rarely referred to other environments, such as climatic conditions or the built environment” (p. 150). Contrary to the field theory, Brunswik's engineering background leads him to postulate that the real, physic world has to be related to the human's information processing. Hence, this approach is an ideal framework for studies in fields such as life science and sustainability science.

After discussing different disciplines' and sciences' importance for environmental literacy Scholz focuses on the importance of knowledge integration and transdisciplinary processes. In Chapter 7 a comprehensive framework for complex human-environment systems (HES) is presented. This framework is also based on Brunswik's approach. Scholz' HES framework serves as a tool for dealing with current and future environmental challenges, for example, “questions about whether we have sufficient knowledge of human-environment interactions or how we can sustain the Earth's ecosystems to prevent collapses and what roles should practitioners and scientists play in this Process?” (p. 1). According to the author the HES framework “allows a thorough investigation and understanding of complex environmental problems” (p. xxi). In the final chapter, Scholz underlines the key components that he argues are important for the promotion of environmental literacy.

The HES framework presented in this book stresses the importance of transdisciplinary understanding, applicable to a variety of academic fields. At the same time this approach is indebted to Brunswik's theory and conceptual world.

In summary, the book shows that, against the background of the present problems of adjusting to a changing environment, Egon Brunswik's perception theory has become increasingly important for the comprehension of general human environmental interaction.

Further reviews and a presentation of the book are available at:
<http://www.cambridge.org/aus/catalogue/catalogue.asp?isbn=9780521192712>

Reference

Scholz, R. W. (2011). *Environmental Literacy in Science and Society: From Knowledge to Decisions*. Cambridge: Cambridge University Press.

The Brunswik Society

<http://www.brunswik.org/>
