The Brunswik Society Newsletter

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This newsletter contains an impressive variety of research areas,
all related to Egon Brunswik's theoretical and conceptual world.
All contributions concern human perception and adjustment to a complex ecology.

We would like to say:
Thank you, Merci, Tack, Danke, Gracias, Obrigado to all authors.

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

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Contributions:

Research with Experienced Personnel

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I have continued performing research with experienced personnel on two projects this past year. The first project is a continuation of research with Dr. Paul Lehner and his colleagues at the MITRE Corporation with intelligence analysts. The two references below (Lehner, et. al., 2008; in press) describe our research on confirmation bias. The results presented in the most recent paper suggests that analysts do exhibit confirmation bias in their technical analysis of remote sensing data, and that structured consideration of alternative causes can mitigate it. What I think would be most interesting to Brunswikians is the representativeness of the tasks used in the research. The sensor analysts performed six tasks over the course of a day requiring the interpretation of various algorithmic analyses. For example, for the "Another Pipeline Leak?" task, they analyzed COMPASS imagery and in-scene and library spectral data for the soil-vegetation ground cover, the soil, the tainted areas, a nearby pond, the pipeline and trees, and library spectral data of the vegetation, hydrocarbons, and asphalt. This is far different from many previous confirmation-bias studies using abstract tasks where participants drew inferences from just a few items of evidence.

In the second project, I have continued working with Dr. Kathryn Laskey and students at George Mason University to conduct experiments assessing the value of geospatial tools to military decision-making. The tools are being developed by the U.S. Army's Topographic Engineering Center to support soldiers' understanding and utilization of terrain and weather information. Our experiments use active-duty military personnel and problem scenarios representative of actual planning environments. Powell et al. (2008) describe the design for one of our ongoing experiments.

References:

Lehner, P. E., Adelman, L., DiStasio, R. J., Erie, M. C., Mittel, J. S., & Olson, S. L. (in press). Confirmation bias in the analysis of remote sensing data. *IEEE Transactions on Systems, Man, and Cybernetics – Part A: Systems and Humans.*

Lehner, P. E., Adelman, L., Cheikes, B. A., & Brown, M. (2008). Confirmation bias in complex analyses. *IEEE Transactions on Systems, Man, and Cybernetics — Part A: Systems and Humans, 38*(3), 584-592.

Powell, W. A., Laskey, K. B., Adelman, L., Dorgan, S. Johnson, R., Klementowski, C., Yost, R., Visone, D., & Braswell, K. (2008). Evaluation of advanced automated geospatial tools: Agility in complex planning. Presented at *13th International Command and Control Research and Technology Symposium*, 17-19 June 2008, Seattle, WA.

Ecological Approaches to Cognition in Sport and Exercise

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The International Journal of Sport Psychology, vol. 40, n. 1, January-March 2009, will be dedicated to ecological psychology. A key contributor for this issue is Professor Kenneth Hammond. In his target paper he clarifies how Brunswikian psychology may be useful for sport psychologists. A particular emphasis is placed on the representative design of the training sessions. For doing this Ken Hammond worked with Robert Bateman a professional Tennis coach.

This issue of *IJSP* is intended as a contribution to the growing body of theoretical, empirical, and applied work in ecological psychology. Locating the present work in the domain of ecological psychology only serves to identify its focus to a point, however. The term *ecological psychology* has been adopted by a number of psychologists who, although sharing a broad point of view, otherwise hold somewhat different perspectives. As a result, for some readers the term 'ecological psychology' will call to mind the work of Egon Brunswik, whereas for others it will suggest the work of James Gibson, Roger Barker or Urie Bronfenbrenner.

The format for this special issue was to ask for leaders of the main schools of ecological psychology (i.e., Brunswikian, Gibsonian, Brofenbrennerian, Barkerian) to answer the question: why and how people decide to do what they do. The invited authors were Kenneth Hammond (Brunswikian perspective), Michael Turvey (Gibsonian perspective), Gerhard Kaminski (Barkerian perspective), and Ruy Krebs (Brofenbrennerian perspective).

One interesting link between these authors is that all of them had direct contact with the pioneers of their preferred school. We think it is worth highlighting Kenneth Hammond's description (personal communication, 11th April, 2007) of how he met Egon Brunswik and how he started influencing Ken's work:

> "I saw him in 1939 or 1940 when I was an undergraduate at Berkeley and he was a professor, though I did not take a class from him then. When I came to Berkeley in 1945 after the war, I did take classes and seminars from him and became acquainted with him, intellectually and personally. He was a very hard taskmaster. I did not do my dissertation with him because I was afraid I would never finish it if I did. I was married and had 2 children and could not afford to go on for years. Assistantships and fellowships were rare in those days and I had to support my family. I got my Ph.D in 3 years because I had to. But I became quite close to him and we corresponded after I left Berkeley".

Following these target articles, invited peer commentaries considered the key issues of relevance to sport and exercise psychologists raised by the lead papers. Commentators were Bruce Abernethy, Peter Beek, Jürgen Nitsch, and Neville Owen. Finally, the lead authors provided a brief response to the commentaries.

Below are the contents of this special issue of *IJSP*.

Introduction
Preface to Ecological approaches to cognition in sport and exercise
Duarte Araújo

Ecological approaches to cognition and action in sport and exercise: Ask not only what you do, but where you do it
Duarte Araújo and Keith Davids

Part I
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Kenneth Hammond and *Robert A. Bateman*

Sport in the perspective of Barkerian psychological ecology
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Ruy J. Krebs

Part II
Some brickbats and bouquets for ecological approaches to cognition in sport
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Ecological approaches to sport psychology: prospects and challenges
Peter J. Beek

Ecological approaches to sport activity: A commentary from an action-theoretical point of view
Jürgen R. Nitsch

Exercise psychology: Building ecological underpinnings for public-health action
Neville Owen

Part III
Reply to comments: The need for representativeness persists
Kenneth Hammond and *Robert A. Bateman*

(No) Final Comment: What I have learnt
Gerhard Kaminski

Reply to commentaries on "Information, affordances, and the control of action in sport"
Michael Riley, Brett Fajen, and *Michael Turvey*

Proximal Processes as the primary engines of development
Ruy J. Krebs

This forum offers an interesting and informative platform for discussing the relevance of ecological approaches to human activity in both sport and exercise contexts. These ecological views of sport action will provide an invaluable update for sport psychologists and could influence the direction of future research in sport sciences.

Interestingly, the different strands of thought related with ecological psychology do not have a tradition of engaging in dialogue with each other.

This special issue provides an opportunity for this exchange of views.

Cue Configuration in Single Lens Model Judgements

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The purpose of this program of research has been to examine how individuals differ in their ways of judgement and the extent to which this depends upon the configuration of cues or factors in a situation. This is now being extended to consider the difficulty of the cues and the probability of responding.

Previous research

In making judgements, we know that this will depend upon (a) the relationship between each factor and a person's judgement but also (b) the extent to which the factors in a situation are themselves related. The first aspect cannot be determined *a priori*. It depends upon the emphasis which the person gives to each factor in a situation and its relationship to the overall judgement, in other words, the correlation between each factor and the judgement. The second well-known aspect is the intercorrelation between the factors or the extent of multicolinearity. It will affect the overall relationship in a well-determined manner because it is linked to the value of a multiple correlation based on the correlation between predictors. From the equation for a multiple correlation, it is noted that:

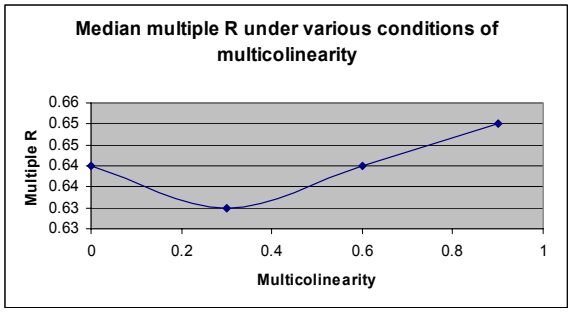
1. The multiple correlation tends to increase as the size of the correlations of the dependent variable and the independent variable increases provided the intercorrelation between independent variables remains constant; and
2. The multiple correlation cannot be less than the highest correlation of any independent variable with the dependent variable.

As the correlation between the variables (r_{bc}) increases then they become measures of the same factor and for the purposes of prediction, one normally aims for the situation where the cues are more independent of each other (i.e., the smaller the intercorrelation r_{bc}) so that there will be little overlap or redundancy and the greater will be their value in jointly determining the level of the judgement.

In the case where variables are highly intercorrelated one might expect that the knowledge of the extra variable in a multiple regression would add no additional information about the judgement. While one might assume the multiple correlation to increase as the correlation between the cues becomes smaller, this is not always the situation.

As an example, the multiple correlation was calculated for varying combinations of values when three independent variables are correlated 0.0, 0.2, 0.5 or 0.8 with the dependent variable and also when the independent variables have different levels of intercorrelation or multicolinearity from 0.0 through 0.2 and 0.5 to 0.8. An example of where the multiple correlation decreases then increases is when r_{ab} = 0.2, r_{ac}= 0.5 and r_{bc} = 0.0; then the multiple correlation ($R_{a.bc}$) decreases from 0.54 to 0.51 when r_{bc} = 0.2 then to 0.50 when r_{bc} = 0.5 and then increases to 0.60 when r_{bc} = 0.8. An example of where it increases is when r_{ab} = 0.0, r_{ac} = 0.5 and r_{bc} = 0.0; then the multiple

correlation ($R_{a.bc}$) increases from 0.50 to 0.51 when r_{bc} = 0.2 then to 0.58 when r_{bc} = 0.5 and then increases still further to 0.83 when r_{bc} = 0.8. In other cases it can decrease consistently, such as when there is a moderate to high correlation between the independent variables and the dependent variable – for example when r_{ab} = 0.5, $r_{a\ c}$= 0.8 and r_{bc} = 0.0; then the multiple correlation ($R_{a.bc}$) decreases from 0.94 to 0.83 when r_{bc} = 0.8.



Note: Excludes values from an impossible multivariate distribution

In the single lens model, it is not possible to know in advance what value an individual places upon a factor. Accordingly the effect of multicolinearity on the multiple correlation will be related to the cue-judgement correlations, but as noted earlier the cue-judgement correlations cannot be known in advance. In some instances the multiple correlation will increase, in others it will decrease then increase and in other instances it will decrease. For any combination of variables, the multiple correlation produces results that would be hard to estimate in advance and this is even more the case when there are numerous independent variables and a mixture of positive and negative correlations. As a starting point, however:

1. there is no basis to infer that the multicolinearity between variables is important for or even related in any way to the links between a predictor and a criterion;
2. it is likely that the higher the multiple correlation $R_{a.bc}$ then the higher will be the values of r_{ab} and r_{ac}. This is straightforward and follows from the multiple correlation formula; and
3. for all possible combinations of r_{ab}, r_{ac} and r_{bc}, it is unlikely that there will be a strong positive relationship between the level of multicolinearity and the multiple correlation.

Future research

These ideas have been applied in the study of student interest and occupational choice. Future research will move away from correlation and multiple regression and focus on the probability of responding. In particular, I intend to take up the ideas of Bjorkman concerning a non-metric judgement analysis and to apply this in a single lens model as this will be closer to the original ideas of Brunswik. In particular the difficulty of the cues and the configural arrangement of the cues in the single lens model will be investigated.

Recent reference:

Athanasou, J. A. & Aiyewalehinmi, E. O. (2007). Repeated judgements of educational interest. *International Journal of Educational and Vocational Guidance*, *7*, 47-57.

News from Ben Backus

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Ben Backus has moved his lab to the SUNY College of Optometry in Manhattan. He is teaching in the PhD and OD programs, and cue recruitment continues to be the main focus of his research. Brunswikians may recall in the dim recesses of their memories that Brunswik first developed his ideas about learning the ecological validities of cues to explain phenomena in visual perception. Whereas his ideas were confirmed in social cognition and other types of learning, visual perception experiments in the 1930's and 40's gave little support and Brunswik's theory stopped being taught. However, it now looks as though one can in fact catch the human visual system in the act of learning the ecological validities of visual cues, even new cues (hence "cue recruitment"). The Backus Lab currently has three active grants to study this phenomenon, from the Human Frontier Science Program, NSF, and NIH, respectively.

Evolution of the Interpersonal Conflict Paradigm

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Using Brunswik's (1952) lens model framework, Hammond (1965) proposed interpersonal conflict theory to explain the nature, source, and resolution of disagreement or "cognitive conflict" between parties performing judgment tasks. An early review by Brehmer (1976) highlighted the potential of this approach in, for example, understanding the structure of cognitive conflicts, and the effect of task and person variables on judgment policy change and conflict resolution. However, our bibliographic and content reviews from 1976 to the present day demonstrate that research on cognitive conflict using the lens model has declined sharply, while research on "task conflict" has grown dramatically. There has also been a shift to less theoretical precision and methodological rigor. We discuss possible reasons for these developments, and suggest ways in which lens model research on cognitive conflict can be revitalized by borrowing from recent theoretical and methodological advances in the field of judgment and decision making.

Keywords: interpersonal conflict theory, lens model, cognitive conflict, disagreement, task conflict, cognitive continuum theory, simple heuristics.

Reference:
Dhami, M. K. & Olsson, H. (2008). Evolution of the interpersonal conflict paradigma. *Judgment and Decision Making, 3*(7), 547-569.

News from Michael E. Doherty & Richard B. Anderson

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One of the main lines of our research has been to assess whether people can validly infer covariation from a single bivariate observation if they have some knowledge of the univariate distributions of the variables in question. I don't know if the research will count as Brunswikian in the eyes of the members of the Society, so I'll stipulate what I see as the definiens of Brunswikian research. (Maybe using the word "definiens" will get me a point or two?) I see the following six characteristics as constituting Brunswikian research, but I don't know if all six must be present to qualify. Maybe four will do?

1. Idiographic design. (This research is not.)
2. Situation sampling. (Yes.)
3. Focus on adaptiveness from a correspondence perspective. (No, but I see coherence as an important tool in achieving correspondence, at least in many situations.)
4. Allows vicarious functioning. (Yes. And highlights its importance.)
5. Recognizes probabilism in the ecology and in behavior. (In spades).
6. Representative design. (A matter of judgment, but I think Yes).

So here's the research. There were four studies showing that people can make probabilistically valid inferences of covariation from a single, bivariate observation. Several of the members of this Society participated in the first study a few years ago, as did quantitative faculty at Bowling Green and members of the Judgment and Decision Making Society. Participants were shown a Cartesian coordinate system with a single data point at Zx, Zy = 2, 2, and asked whether it was more likely to have come from a population with a correlation of 0 or of .50. Bayes' theorem shows that the population with a correlation of .50 is almost 5 times more likely to be the source of the datum than the population with a correlation of 0. More than two thirds of participants agreed.

In Study 2, students with a variety of statistical backgrounds, from elementary to graduate level courses in statistics, assigned posterior probabilities to five possible populations based on single *x,y* observations, again given knowledge of the univariate statistics, this time with a variety of nine different data points. In Study 3, statistically naïve participants, namely introductory psychology students, were given a problem analogous to that given in Experiment 1, framed verbally. Study 4 replicated Experiment 3, but added an "impossible to determine" response option. In all studies, participants' selection of the Bayesian response far exceeded chance levels. Non-Bayesian models of covariation detection all assume that people compute sample correlations. These models make no predictions about

these investigations. This research was presented at the Sixth International Conference on Thinking in Venice, Italy, last August, and it is now in press in Cognitive Science.

This paper shows that people are highly adaptive at drawing correlational inferences from even single observations, provided that they have the requisite background knowledge.

The concluding paragraph of the in press paper asserts that "Brunswik's (1956) conception of vicarious functioning posited that a person can arrive at the same goal in multiple ways, depending on the ecological constraints. These results are very much in line with that conception. In light of the concept of vicarious functioning, we take the findings presented to mean not that psychological theories of covariation inference based on sample variances and covariances are wrong, only that they are incomplete to the extent that the nature of the ecology is not explored and varied. Indeed, any theory of the inference of covariation that does not take into account the mathematical ecology in which the inference is drawn must be incomplete."

News from Philip T. Dunwoody

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My biggest Brunswikian activity is guest-editing a special issue of the journal Judgment and Decision Making focused on coherence and correspondence. I organized a symposium on this topic at the 2007 Brunswik meeting it turned into a special issue. My own article in this issue will address Brunswik as both embracing not just correspondence, but also pragmatism. Other articles address the coherence/ correspondence distinction in medicine, aviation, and more. Look for the issue to be coming out sometime in 2009.

Structure Monism and Physics (Brunswik's PhD thesis, 1927)

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In his doctoral thesis, Brunswik (1927) drives at a middle way between the doctrine of elements and *Gestalt*-psychology. His studies with Karl Bühler and Moritz Schlick seem to have had a decisive influence for his thesis: not only is Bühler's (1926, 1927) critique of Koffka's "elimintaion" of elements reiterated, but Brunswik reads Köhler's (1920) isomorphism as a form of psychophysical parallelism. As opposed to that, Köhler demarcates (tacitly in 1924; explicitly in 1960) isomorphism from psychophysical parallelism. Brunswik argues that physics cannot do without a notion of elements, for which he refers to Schlick (1925b), Weyl (1923) and Sommerfeld (1921). Even though the old matter-form dualism can *prima facie* be abandoned for an electromagnetic (i.e. purely "structural") description of elementary particles, the dualism must be reintroduced in the distinction between two forms of energy transport – one of which in turn has to be addressed as "matter" (as opposed to pure "form"). Brunswik's thesis is crafted around a machine analogy, and his argument from wear and tear is very similar to Erich Becher's (1907) in his defense of psychophysical parallelism against Hans Driesch (1903) – however, this controversy is not cited in Brunswik's thesis. At the University of Vienna, Brunswik had attended Schlick's lectures on Einstein's Relativity Theory and on *Naturphilosophie* (among many others in mathematics and physics, e.g. Hans Thirring's lecture on Relativity Theory), and it seems plausible that one result of the discussion between Schlick and Einstein, that there exist *Gestalt*-"processes", is taken up by Brunswik (1927); along with Schlick's (e.g. 1925a) version of psychophysical parallelism. On the other hand, Brunswik (1934) reinterprets the method of coincidences as a non-psychological method – as opposed to Schlick (1921), but consistent with Schlick (1925b), who had changed his mind after the aforementioned discussion with Einstein. Also, note that the correspondence between Schlick and Köhler yields an important difference between the Gestaltist's form and the empiricist's logical form. Brunswik's conclusion is that, as in physics, psychology has to entertain some concept of matter, i.e. elements. Brunswik holds that sensations are the elements of the description of phenomena in psychology; sensations appear "where our analytic disposition comes to a halt". The doctrine of "physicalism" plays an important role in Brunswik's thesis, because Köhler's "structure monism" has it, that *Gestalten* do exist in physics. Note, though, that this notion of physicalism – originally attributed to Köhler (1920) by Bühler (1927) – is far from the more developed notion in the discussions in the Vienna Circle. In Karl Popper's (1928) doctoral thesis, which, too, is written under the supervision of Bühler and Schlick and about the crisis in psychology, Schlick is depicted as physicalist. In the Vienna Circle discussions, Schlick rather opposed forms of physicalism. This might be a remnant of Schlick's early inclination

towards psychologism, which can be deduced from his correspondence with Reichenbach, and Schlick probably met in the middle with Brunswik and his taste for physicalism. For Brunswik, too, understands *Gestalt*-psychology as a "liberating thought" – in principle, but he is critical that the concept of matter can be done away with in psychology, as some Gestaltists seemed to suggest. My reassessment of Brunswik's (1927) thesis thus yields, that his notion of physicalism might be more multifarious than has been recognized so far (vs. Ash, 1997), and that Brunswik might owe more to traditional empiricist epistemology than has been suggested (vs. Hardcastle, 2007).

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Brunswik Based Robotics

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For the last 6 years, Jim Gunderson and I have been running Gamma Two, a small research and development company focusing on artificial intelligence and robotics. We have developed a biologically principled approach to embedded intelligence. This approach focuses on discovering the salient features in biological brains that allows them to function in the real world. Our research has led us to a brain model which is organized around three basic functions; reasoning, reacting, and reification. The first part is based on a probability aware symbolic planner, capable of manipulating symbolic information. The second part is a sensing and acting component (the perception/action system) that can both sense and move in the real world. While these two components have been well explored in the robotics and artificial intelligence communities, our recent work has focused on the third component, which we call reification. This is a bridge between the other two components, which allows sensory information to be turned into symbolic data (recognition) and symbolic information to be turned into expected sensory data (preafference). Reification uses the lens model for both phases. The recognition phase of reification works by using a lens model to make a judgment as to the correctness of a symbolic tag when it is applied to the actual sensory data. This lens model is also used by the preafference phase of reification to generate the appropriate expected sensory data, given a set of symbols and locations.

This work will be published by Springer-Verlag in December of 2008 in the book *Robots, Reasoning, and Reification*. It has also resulted in the creation of the first Basic Service Level robot (Basil 001). This robot has a cybernetic brain that is capable of containing the lenses for objects in its environment. It can also be given symbolic information about these objects; such that the probability aware planner can make plans using these objects. In addition, it has a mental model of the world, in which the knowledge about these objects is maintained. The combination of these abilities allows the robot to follow instructions in a changing world. Our current test application is the service of canapés, beer, and/or tea in a crowded room.

We plan on extending these abilities to allow the robot to do increasingly useful tasks. The next focus of our work will be adding automated learning to the cybernetic brain. This work will also be based in a large part on Brunswik's work.

Plans for a Choice Probability Approach to a Lens Model of Multi-Category Diagnosis Data

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In order to analyze a sparse set of diagnostic categorizations within a Lens Model framework, it is necessary to adopt an approach other than the conventional partitioning of shared variance in a pair of multiple regressions (environmental model and judgment model). In the data set I have, the task was to diagnose cases of chest pain, described on 50 possible features, selecting from 6 diagnoses. These data are unusual for a Lens Model analysis, first in that the response is a category rather than a numerical rating, and second in that there are not enough cases, nor are the cases systematically enough constructed, to permit pairwise logistic or discriminant analysis models to be fit. The cases were constructed to challenge the student's ability to discriminate between confusable pairs of diseases. Cases for 8 of the 15 possible pairs of diseases, from the 6 diseases, were used.

The analysis plan is to fit a two layer Multi Category Diagnosis Lens Model, using choice probability models. Each layer has a node for each pair, on both the Environment and Judgment sides. The first layer models the probability that the participant's choice was correctly within the intended pair. The second layer models the probability of the participant choosing the right diagnosis, conditional on it being in the intended pair. For the second layer, the environmental model is constructed by 1) making a similarity measure between each stimulus case and each disease's prototype, then 2) calculating an expected choice probability for each case, each choice of interest, using a Bradley-Terry-Luce type formula. On the judgment side, there are the actual choice probabilities. For the first layer, an analogous process will be used but focusing on "these two diseases" versus "the other four". Then the participants' choice probabilities will be compared to these predicted probabilities. Changes in the probabilities of the right choices can be used to assess learning, comparing diagnoses made before and after a tutorial. The exercise will be evaluated with respect to how it addresses various aspects of Brunswik's theory.

News from Kenneth Hammond

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My major effort this year was to prepare a paper for Bernhard Wolf's conference on "Original Brunswik" on the topic of "rationality".

I did that and my informants tell me that the paper was successful in that it generated some discussion of the central argument at the conference. I will be presenting a version of this paper at the Chicago meeting, and Mike Doherty, Gerd Gigerenzer and Alex Kirlik will comment on it.

I would like to use this opportunity to emphasize the importance of this topic for Brunswikians. As matters stand, the topic of rationality is being widely discussed (Amazon devotes 17 pages to books on this topic) and at least 2 of these books have arrived on the best seller list of the NY Times.

Yet only one from the Brunswik group (Gerd's "Gut Feelings") appears on the 17 pp. Admittedly, some of these books have more to do with economics and/or evolution than j/dm; nevertheless one can see a literature developing here that doesn't include our work. In addition, the failure of the global financial system has repeatedly raised questions about human rationality in a very serious way that have yet to be answered. In my view, we should address this topic, inasmuch as much of this literature (especially Thaler & Sunstein and Ariely) seems to me to be less than valuable.

I have also found Isaiah Berlin's chapter on the "The Originality of Machiavelli" (in "Against the Current") to be stimulating because of his emphasis and explication of the topic of "plurality"; that is, the plurality of values and/or goals. I think one great value of the Brunswikian approach lies in its emphasis on the plurality of methodologies (in sharp contrast to the singularity of the current methodological dogma of the rule of one variable.....principally in Woodworth's 1939 book "Experimental Psychology", that reached the status of a "bible" in psychology).

Does Policy Capturing Really Capture the Policies?

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We are currently working on an important and interesting question concerning Judgment Analysis' potential to correctly identify the strategies that agents use. This work is still in progress and manuscripts are not yet available. So far, some preliminary results have been presented at the Original Brunswik Meeting, organized by Bernhard Wolf in Landau, Germany (July 16-17, 2008), and at the International Congress of Psychology in Berlin (July 20-24, 2008). Here is the abstract that we sent to this year's JDM conference in Chicago where we will report additional results:

In an extensive simulation study, the outcome-based methodology of policy capturing was put to a critical test. We first created a population of agents, each defined by using a different inferential strategy. Then, the predicted inferences were then modelled by a set of policy capturing models to determine whether the strategies that initially generated the inferences could be identified accurately.

The task consisted of inferring which of two objects has the higher value on a quantitative criterion, based on a number of binary cue values. These decisions were made for all possible pairs in several existing data

sets. The set of strategies included compensatory and non-compensatory heuristics as well as regression-based methods and decision trees. The simulation was conducted in two phases, inference generation and modelling.

In the inference-generation phase, four factors were manipulated: Size of learning set, completeness of information, information accuracy, and reliability of strategy execution. First, the learning set constituted the sample for which the parameters of the inference strategies were estimated (fitting task). The percentages of objects in a data set that were randomly chosen to be included in the training set were 25%, 50%, and 75%. The remaining objects were used to evaluate how the strategies generalized to new data (prediction task). Second, 0%, 10%, or 25% of the cue values, respectively, were randomly determined to be missing. Third, 0%, 10%, and 25% of the cue values, respectively, were randomly determined to be wrong. Fourth, the percentage of strategy execution errors was set to range from 0%, 10%, or 25%; that is, the respective number of decisions, randomly chosen, were inverted. For each of the resulting 81 conditions, the decision strategies' predictions were computed in several hundred trials for each data set.

In the modelling phase of the simulation study, both the decisions and the unmodified cue values (but not the criterion values) were rendered available to a set of models which had to reconstruct the decisions based on the unmodified cue values. The parameters of these models were estimated based on the decisions made in the fitting task, whereas the generalization performance of the models was estimated based on the decisions made in the prediction task. A majority of the reconstruction models mirrored specific decision strategies in their basic structure. That is, the reconstruction models encompassed compensatory and non-compensatory heuristics, regression-based methods and decision tree models.

All decisions generated by each strategy were reconstructed by each model, so that it was possible to analyze (1) how the strategies used in the inference-generation phase differed in terms of their accuracy, (2) how well the models performed when reconstructing a specific strategy's decision outcomes, and (3) to what extent these two types of performances (inferring environmental states and modelling decisions) were affected by the various conditions implemented in the inference-generation phase.

One of the key results of this extensive analysis is that the outcome-based reconstruction approach is ill-suited for identifying the strategy employed by decision makers, especially in conditions with uncertain information and high percentages of application errors. Due to a high overlap between original decisions made by different strategies and between reconstructions achieved by different models, competing models for participants' decision strategies could barely be separated based on the strategies' observed outcomes. This result has implications for conducting policy capturing studies and evaluating their results. Furthermore, the present simulation study underscores the necessity of acquiring and analyzing process data.

Brunswikian Research at the University of Connecticut

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Research in the Brunswikian tradition continues at the University of Connecticut. We are working with Tom Stewart (University at Albany) and Jeryl Mumpower (Texas A&M University) on a project concerning how people learn to make decisions when feedback is limited. We are framing our work at UConn within the context of personnel selection.

A recent report in the journal *Psychological Science* by Elwin, Juslin, Olsson, and Enkvist (2007, pp. 105-110) claims that decision making is not impaired by selective and biased feedback, contingent on one's particular decisions, when compared to complete feedback about each and every decision. I investigated this claim, along with Tom Stewart, Jeryl Mumpower, and two graduate students (Kathlea Vaughn and Amy Reese) within the context of four personnel selection tasks, varying in base rate of successful employment. Like Elwin et al. (2007), we found that selective feedback did not significantly impair overall accuracy of judgment, when compared to both complete and partial feedback. Selective feedback did, however, lead to significantly more decisions to reject job applicants. This effect is not simply due to a reduced amount of feedback; selective and partial feedback conditions provided the same amount of feedback (same number of trials). Partial feedback is unbiased and therefore provides the same type of feedback as complete feedback, just not as much of it.

Results of this experiment suggest that selective feedback leads to caution, making decision makers less likely to make positive decisions (to hire). Given the prevalence of this type of feedback in personnel selection and many other kinds of selection and detection decisions, further study of its effects is needed. For example, there may be individual differences that make some people more or less responsive to selective feedback. In an experimental test of Gray's (1982; Gray & McNaughton, 2000) Reinforcement Sensitivity Theory concerning learning with selective feedback, Len Dalgleish and colleagues (2007) found that individual differences in sensitivity to reward and punishment account for treatment effects. Future studies of selective feedback will address individual differences of study participants and also effects of different task characteristics, including task predictability and different penalties for different types of error.

In her doctoral dissertation, Amy (Reese) D'Agostino is investigating cognitive styles variables as a source of motivation in a dynamic decision making task. She is using *Networked Fire Chief*, a software program developed by Alex Wearing and colleagues for conducting research into basic issues relating to command and control decision making. In two experiments, her research will examine the interaction between decision maker individual differences and task environment. Specifically, Study 1 will focus on unstudied and understudied individual differences (three primary dimensions underlying cognitive style:

structure, effort, and decisiveness) within the dynamic *Networked Fire Chief* decision making task. A dominance analysis will be used to determine which cognitive style dimension is most important in this particular dynamic decision making environment. Study 2 will test a decision aid tailored for the chosen cognitive dimension, with particular attention to possible interaction of individual differences with use of decision aids.

In his doctoral dissertation, Dennis Thomas is using judgment analysis to identify at-risk (automobile) drivers and to evaluate effectiveness of training for changing drivers' perceptions of crash risk. A multiple-cue judgment task with eight cues is being used. The eight cues in each driving scenario are: 1) inattention to the forward roadway (distraction), 2) time of day, 3) speed, 4) number of passengers, 5) weather/road conditions, 6) driving time, 7) road type, 8) traffic conditions. Participants will read a scenario and judge the probability of a crash. Cues will be presented in paragraph form, and the order of the cues within a scenario will be randomized. Study 1 will examine differences in crash cue weighting policies for younger and older drivers and how crash cue weighting policies are related to scores on Seymour Epstein's Rational-Experiential Inventory (REI) scales. Any differences in cue weightings among the younger age group and the older age groups would be suggestive that judgment analysis has the potential to discriminate between "good" and "bad" drivers. Any differences in the REI scale scores and cue weights would indicate that the REI is potentially capable of identifying people who give attention to certain cues, and therefore may be more susceptible to increased crash risk. Study 2 is concerned with how crash cue weighting policies are related to performance in a simulated driving environment. Study 2 will also examine the relationship between REI scale scores and simulator performance. Study 3 will examine the impact of PC-based training on cue weighting policies and whether or not training affects performance on the simulated driving task differently for participants who scored differently on the REI.

In her doctoral dissertation, Kathlea Vaughn will be examining the role of individual differences in justice orientation in personnel decision making. The effect of these individual differences will also be analyzed within the context of organizational motivations, expressed through experiment instructions and pay-off matrices. The potential interaction between individual differences and organizational motivations will be examined within the context of two different personnel decision tasks, one in which the decision is whether to hire an applicant, and another in which the decision is whether to lay-off an employee. The following hypotheses are proposed. H_1: In baseline trials, study participants biased toward individual justice will set a lower decision threshold in the hiring task and a higher decision threshold in the lay-off task, when compared to those biased toward social justice. H_2: Organizational goals will affect response tendency such that a pro-organization payoff matrix will result in an increased threshold relative to a pro-self payoff matrix. H_3: Justice orientation and organizational goals will interact such that the effect of the pay-off matrix will be strengthened for individuals with a congruent justice orientation (e.g., pro-organization payoff matrix and pro-social justice

orientation). This study is still in the design stage.

Also in the design stage is the dissertation project of Kris Korbelak. Kris is investigating relationships between stress, coping, and judgment. This project combines Brunswik's lens model paradigm with the cognitive-phenomenological model of stress developed by Lazarus and colleagues. A primary goal of the research is to better understand how both judgment and coping function within a stressor-strain framework. Another goal is to illustrate how these models of behavior are similar and may interact with each other. This study will utilize a modified version of the judgment/decision making task developed for our Albany-UConn collaboration. Four hypotheses are being proposed. H_1: Stress level will affect judgment achievement by affecting both judgment consistency and matching, H_2: Coping will moderate the stressor-judgment relationship. H_3: Coping will mediate the relationship between the stress and strain experienced by participants. H_4: Self-efficacy will moderate the effects of coping on judgment achievement and on strain.

I hope much more will be written about these dissertation projects next year.

From Probabilistic to Direct Perception

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In the last years, we have been undertaking research in close cooperation with the Automation Laboratory at the University of Heidelberg (Germany) in order to develop an assistance system for powered wheelchair control, which should significantly decrease the number of input commands required to execute a – from the user – desired behaviour. This project came up with interesting results on Brunswik, which could also be of general interest for the readers of this year's newsletter.

The general idea was that an assistance system can only significantly reduce the number of input commands, if it can estimate the user's desired future behaviour by mirroring the user's cognitive processes, which determine his/her future behaviour. Therefore, we investigated different theories of human information acquisition starting from perception-oriented theories, such as the ones by Brunswik (1957) and Gibson (1979), up to theories explaining higher cognitive processes such as problem solving and decision making.

Especially the comparison between Brunswik's (1957) probabilistic functionalism and Gibson's (1979) ecological theory of direct perception revealed interesting differences:

- Brunswik interprets perception and thinking as related to information processing, so that no direct perception takes place, as advocated by Gibson.
- With his concept of affordances, Gibson proposes that distal variables are perceived directly with no need for information processing.
- Gibson's world is not probabilistic; the human being has access to all required information.
- Brunswik, on the other hand, considers incomplete/ impoverished information.
- The manipulanda of an object (Tolman & Brunswik, 1935) resemble the concept of affordances.
- An object's discriminanda (Tolman & Brunswik, 1935) remind of Gibson's invariant information in the optic array specifying the affordances. However, compared to Gibson, the information specifying the object is of probabilistic nature in Tolman's and Brunswik's theory. Another difference is that the discriminanda explicitly specify the differences to other objects; whereas the invariant information only describes the unique information specifying an affordance.

Hence, Brunswik (1954) proposed ratiomorphic processes, which require a need for information processing: Thinking is applied when the available, perceptible cues do not allow judging on a distal variable, so that the perceived information is in any case equivocal. Direct perception as proposed by Gibson (1979) is not possible. In our opinion, both theories can be combined in the following manner: If the adaptation process to an originally unknown environment has not yet taken place, i.e., the observer is not yet fully adapted to his/her surroundings, direct perception without any information processing cannot take place, as the observer cannot directly transfer the available information into an appropriate action. This is why perception is probabilistic according to Brunswik (1937). If the conditions allow for reaching the final stage of perfect situation adaptation and further situation adaptation actually occurs, the probabilistic perception fades and direct perception is possible. Then, the observer no longer needs to process the information and the sensory input directly evokes appropriate motor patterns.

As indicated before, in some cases, it is impossible to reach that final stage of perfect adaptation, i.e., when the information is inconsistent or the observer does not have the required cognitive abilities to define cues which are optimal representatives for the successful action. These two conditions are derived from the field of skill acquisition and the importance of individual differences. Hence, individual differences, especially in the cognitive abilities (reasoning and perceptual speed), will determine whether a transition from direct to probabilistic perception can take place or not.

In order to test (1) the existence of this continuum between direct and probabilistic perception, (2) its dependence on situation adaptation and (3) its dependence on the individual differences especially in intelligence, we conducted a study with physically disabled wheelchair users at a vocational school in Volmarstein, Germany. Within the study's course, we confronted our participants with a new environment (a simulated garden market) and a new task, which they repeated four times. We measured the gaze behaviour with a head-mounted

eye tracking system and their intelligence. The results, especially regarding

- the repeated measurement effects of the variables reflecting the transition from probabilistic to direct perception and
- the two-way interaction effect between the repeated measurement effect and the individual differences with regard to the intelligence abilities

are quite promising (for more details see Jipp, 2007; Jipp, Bartolein, & Badreddin, 2008a, 2008b). They demonstrate that there is a continuous transition from different types of human information acquisition depending on the situation adaptation, which depends especially on the observer's intelligence. How these results can be transferred into an intention estimation behaviour for powered wheelchair control is summarized in Jipp, Wittmann, and Badreddin (2008). Please contact us for more information!

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A Neural Division-of-Labor in Multiple-Cue Judgment Determined by Task Structure

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The *division-of-labor hypothesis* (Juslin, Karlsson, & Olsson, 2008) predicts that *a*) multiple-cue judgment tasks should engage a common controlled linear and additive judgment process; *b*) in a *linear additive task*, the process involves linear additive integration of cues, because this affords accurate judgment (cue abstraction); *c*) in a *multiplicative task*, the process shifts to linear additive integration of exemplars (exemplar memory). This study, at this time revised and resubmitted, investigated if the division-of-labor hypothesis was supported at the neural level.

We expected *similarities* in activation when performing the additive and the multiplicative task. Serial adjustment of the criterion presumably demands cognitive control regardless of whether cues or exemplars serve as input to the process (Juslin et al., 2008). The regions of prefrontal cortex (PFC) most frequently related to core controlled processing is the dorsolateral PFC and anterior PFC (e.g., D'Esposito et al., 1999). These regions are also suggested to play a crucial role in decision-making (Krawczyk, 2002).

Concerning *differences:* with cue-abstraction there were reasons to expect distinct PFC activity. Several imaging studies highlight the role of PFC in *rule-based processes* (e.g., Bunge, Kahn, Wallis, Miller, & Wagner, 2003). Specifically interesting are parts of PFC associated with information integration and manipulation; dorsolateral PFC (DLPFC, e.g. D'Esposito et al., 1999), and the anterior-most parts of PFC.

To the extent that exemplar-memory involves conscious recollection of declarative past events, fronto-temporal activation was expected (e.g., Nyberg et al., 1996). However, few studies have investigated the neural basis of exemplar *use* (as compared to learning). The PET-study by Smith et al. (1998) explicitly instructing participants to rely on either rule-based or exemplar-based processes in categorization, found no differential fronto-temporal involvement. Previous studies have demonstrated caudate involvement in nondeclarative categorization tasks (e.g., Poldrack et al., 2001), suggested to be engaged in connecting visual representations in

inferior temporal cortex with response alternatives (e.g. Ashby et al., 1998).

In the present study participants learned two multiple-cue judgment tasks in the lab; one additive and one multiplicative. A design with randomized presentation of exemplars from the two tasks and a baseline task was used to acquire event-related fMRI-data during a test phase.

We found common activations in *frontal* (DLPFC) and *visual* cortical areas, interpreted to reflect demands for cognitive control in both tasks. Areas more activated in the additive task were *middle frontal cortex*, *frontopolar cortex* and the *anterior caudate nucleus,* interpreted to reflect working memory involvement. Areas more activated in the multiplicative task were the *cerebellum* and the *caudate tail,* interpreted to reflect implicit components of exemplar memory.

This study contributes to research in the tradition of Brunswik by demonstrating the importance of the task for the study of the mind. A multiple-cue judgment task might be mastered by different neural substrates depending on the cue-combination rule, presumably reflecting the adaptive use of different cognitive representations.

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On Brunswik's Trace in Achievement Studies

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We are still working on our meta-analysis project based on the one hand on individual's judgment achievements and on the other hand on judgment achievement data across individuals. Our project has already been introduced in the Brunswik Society Newsletter (see Kaufmann, Sjödahl, Athanasou, & Wittmann, 2007). This year, we had the opportunity to present parts of our results to the "Original

Brunswik" conference in Landau, Germany. Hence, we submitted a manuscript on "Brunswik's trace in idiographic achievement studies" for the Landau conference book, edited by Prof. Wolf. Since there are still many open questions, we look forward to presenting further findings presumably at the Brunswik Society meeting 2009.

Brunswik's Use of Visualizations

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Brunswik supported his central philosophical, theoretical, and methodological arguments by visualizations. Some of these visualizations also present data. For example, with his 1940 publication titled *Thing Constancy as Measured by Correlation Coefficients* he used a single table for presenting stimulus layout, the values of the distal stimuli, the proximal stimuli and the (averaged) perceptual responses (i.e., the data). Although conceptually distinct, environment and organism were generally represented as aspects of one and the same visualization. In his later work after 1940, Brunswik preferred the concepts of ecological variables and central responses and presented these as processes within one and the same functional unit, also visually.

The analogy of the lens, and later the lens model, is present in practically all of Brunswik's publications, as graphics and/or in words. Brunswik developed this visual analogy, both theoretically and as a visual design throughout his work. In my reading of this development, the lens was the point of reference for Brunswik's epistemiological understanding, that is, of its fleshing out. As is well known, Brunswik developed this understanding as a methodological design that was specific to psychology, thus the lens-analogy was the vehicle of a discipline-specific epistemology. Brunswik introduced the lens as an analogy, as an optical device it also carried metaphorical meaning, with vision standing in for insight.

Among the themes that Brunswik worked into the lens analogy were (1) the representation of process, (2) the relation between organism and environment, (3) the analytical use of visualizations, and (4) the unity of psychology. As a consequence the lens developed as a mixed analogy. With respect to its visual design, a noticeable aspect is his increasing use of curved versus straight lines. This design feature is related to his working out the place of probability in psychology.

Brunswik obviously used great care in designing his visualizations. This care and the central role of visualizations in the fleshing out of his ideas, mark Brunswik's visual style of thinking.

Confidence Biases Debiasing

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The relevance of ecological variables has been found in many calibration studies (Macbeth & López Alonso, 2008). The representative sampling of tasks was successful for debiasing purposes (Gigerenzer, Hoffrage, & Kleinbölting, 1991) and cognitive feedback manipulations have achieved the reduction of calibration distortions. Task difficulty was also found to be important to make confidence biases disappear (Dhami, Hertwig, & Hoffrage, 2004). In this context, we conducted a collection of experiments to study the debiasing effect of two groups of manipulations. The first group of manipulations was focused on the adjustment of the subject with himself through cognitive feedback (Doherty, Brake & Kleiter, 2001). The second group of treatments gave to the subjects different ecological cues like descriptive statistics about the behavior of non-biased subjects. These manipulations were conducted through a design for different tasks, subjects and environments. The first group of manipulations was only partially successful, but the second group was massively effective. The results showed that underconfidence bias, overconfidence bias and the hard-easy effect can be understood as a functional relation between subjective and objective success mediated by a collection of ecological variables (Macbeth & Cortada de Kohan, 2008; Macbeth & Razumiejczyk, 2008). In addition, we are developing a mathematical model of calibration that extends previous findings and offers predictions for different tasks, subjects and environments when some parameters are known. With this ecological aim we are working on the definition of calibration phenomena as polynomial functions. The production of confidence biases and its debiasing are modeled using calculus tools.

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How Memory Aids Strategy Selection

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How do people select among different strategies to accomplish a given task? We have been working to contribute to solving this puzzle. Our proposal is shaped by three ecological theories: the *fast and frugal heuristics framework* (e.g., Gigerenzer, Todd, & the ABC Research Group, 1999), J. J. Gibson's theory of affordances (e.g., 1979), and the *adaptive control of thought–rational theory of cognition* (*ACT-R*; e.g., Anderson et al., 2004).

From the fast and frugal heuristics framework, which is a research program that has been influenced by Brunswik's work (e.g., Gigerenzer, Hoffrage, & Kleinbölting, 1991; Goldstein & Gigerenzer, 2002), we adopt the thesis that people make decisions by selecting from a repertoire of simple heuristics. These heuristics exploit regularities in the structure of the environment and in basic cognitive capacities, such as memory. Gibson leads us to ask how the environment provides opportunities for selecting different heuristics. The ACT-R architecture provides a quantitative theory of cognition about how memory works.

Extending the ACT-R memory model, in a series of computer simulation studies and experiments we show how memory determines which opportunities the environment provides for selecting different heuristics. In particular, we model how the natural environment, outside the laboratory, structures memory and, in doing so, guides strategy selection by determining what strategies from the repertoire can be selected, how accurate they will be, and how much effort and time will be involved in using them. This work complements past efforts to study how the cognitive system nestles into the structure of the environment (e.g., Anderson, 1990; Brunswik, 1943, 1955; Gigerenzer et al., 1999; Oaksford & Chater, 1998; Shephard, 2001; Simon, 1956), integrating models of memory and decision strategies (e.g., Dougherty, Gettys, & Ogden, 1999; Gray, Sims, Fu, & Schoelles, 2006; Juslin & Persson, 2002; Schooler & Hertwig, 2005).

What might also be interesting for Brunswikians about this work is that it actually provides an ACT-R model of how the cognitive system fits into the structure of the environment, complementing the lens model equations. This ACT-R model can be applied to other frameworks and questions than the ones we focused on. Specifically, the model allows predicting people's recognition and knowledge about objects in the world, as well as the associated retrieval time distributions of corresponding memories. In doing so, it offers a method to populate models of cognition with tens of thousands of simulated memories. The characteristics of these simulated memories reflect not only the natural environment, outside the laboratory, but also how easily an actual person can retrieve like memories. That information in turn can be used to model how people base decisions on

the accessibility of memories, and various combinations of recognition and knowledge.

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Effects of Operator State on Pilot/ATC Conflict

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We are currently examining the relationship between operator state (e.g., level and type of stress, emotion, affect) and decision processes. Empirical laboratory research has shown that a number of operator state factors may influence the quality of situation assessment, information processing, and decision-making behavior (Peters et al., 2006). This has implications for processes during high-risk decision making in computer-aided environments such as aviation, in which the quality of these processes is critical. The influence of operator state may manifest itself in several ways. First, it may limit - and thus bias - information search. Anger, for example, is consistently linked with heuristic processing (e.g., Lerner & Tiedens, 2006). This influence has specific implications for operational phenomena such as automation bias (Mosier, Skitka, Heers, & Burdick, 1998) and automation-induced complacency (Parasuraman, Molloy, & Singh, 1993) which may occur when operators are aided by computers and which entail curtailed information search in decision-making. Operator states that foster reliance on heuristics

may exacerbate these phenomena. Stress and anger may lead pilots or controllers in the high-tech environment to information blindness and/or premature closure on a decision option. In contrast, anxiety or worry has been associated with systematic information processing and may moderate automation bias, but may also lead to hypervigilant attention to all available data, whether relevant or not, and delay of action (e.g, Loewenstein & Lerner, 2003). Operator state may also influence risk perception and risk-taking behavior. Anger, for example, is associated with risk-seeking behaviors, while positive affect as well as fear and anxiety are associated with risk-aversive choices (Isen, Nygren, & Ashby, 1988; Lerner & Keltner, 2001).

Operator state may also set a frame for coherence, and thus guide the integration of information and cues for situation assessment. That is, pilots or controllers may examine most or all of the information available to them, but the interpretation of information and situations in the operational context, the rationale for their decisions, and perceptions of risk will be impacted by state (Lerner & Keltner, 2001). Anger, for example, is associated with the perception of personal control over a situation, whereas fear and anxiety are associated with the perception that a situation is not under one's control. Anger may encourage a 'blame' mode, in which operators focus on responsibility and retribution rather than problem solving. Fear or anxiety, in contrast, may elicit an almost hypervigilant concern for self-protection and safety.

Influential operator states may be induced by the conditions of operational situations themselves, such as information overload, frustration, or fatigue. Conflict within a flight crew or between flight crew and Air Traffic Control can both exacerbate these states and be affected by them. As we move into NextGen airspace, it becomes critical to ensure shared situational understanding and cooperative problem solving between aircrews and ATC. This will include identifying the kinds of situations that are likely to elicit particular operator states, as well as evaluating the potential impact of specific operator states on decision processes. Through examination and coding of ASRS (Aviation Safety Reporting System) incident reports, we are addressing four research questions:

1) How are different types of aircrew/ATC conflict (operational, informational, cognitive) associated with words indicative of operator state?

2) In which type of conflict are operator state terms most likely to be in the narrative?

3) What operator state terms are associated with appropriate vs. inappropriate (e.g., social pressure) conflict resolution strategies?

4) When/what type of conflict situation is associated with differences in risk perception between pilots and ATC?

What operator states are involved or inferred? This research will enable us to better predict particular operator states, situations, and differences in risk perceptions that may impact decision making in the highly-automated Next Gen operations.

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Brunswik's Lens Model Adapted to Norm-Uncertainty

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In a critical incident study 5 interviewers (3 professional nurses, 2 behavioural scientists) interviewed 172 nurses and 350 cases were recorded, all referring to Maslow's psycho-social needs, as applied to the patient-nurse relation. Behavioural options to handle the situation are suggested by our informants as responses to the questions: How did you act in this situation? Can you think about other ways to handle this situation? These options will function as cues in our task descriptions.

A sample of 12 situations is used in a pilot study with 10 student nurses, asked to rank 8 behavioural options (O_1---O_8, randomized) according to their adequacy with regard to the patient's psychological need state, as inferred from the situation description. The student nurses, in the last term of their professional training, including clinical practice, are assumed to be familiar with situations similar to those in our case material. The 12 situations are selected according to the following requests:

1. The incident should be presented briefly, allowing small sample information. (Molar descriptions do exist but would invite more analytical approaches).
2. Sample should fairly well reflect the frequency distribution over the 172 nurses' different work contexts such as examination, treatment, doctors round, patient's discharge etc.

The eight behavioural options cover the following four content categories, categorised by an experienced nurse.

1. Avoidance options
2. Leadership options
3. Independence options
4. Dependence options

Each category, represented by two options.

A utility-matrix (options x ranks) for the group of 10 judges gives 80 rank-attributions for each of the 12 situations. Cell frequencies within each situation are transformed to relative ones in relation to the total number of rank-attributions. This group matrix is regarded as criterion against which individual judges' rank choices can be weighted. Thus the judge's utility-indexes are derived from corresponding cells in the group matrix

If we cumulate the highest utility value(s) for each rank position in the group matrix we get the maximum value (Gmax) a single judge can

achieve when his/her derived utility values also are cumulated (Imax). The difference between the two cumulated values (Gmax – Imax) is an estimate of the judge's deviation from the group norm, which is used as a correspondence criterion. As all our estimates are in terms of proportions and we prefer to express achievement in positive terms, we use the complement to our deviation estimate to designate achievement, i.e. achievement = 1.00 – (Gmax – Imax).

Task feed-back to judges who deviate markedly from the group norm can be established by analysing the judge's options showing low derived utility indexes, looking for ranks given to them by the judge. In our material, judge No. 9 deviates markedly from the group norm having the lowest derived utility values for options designated F, A and B, which, however, are given high ranks (1, 2 and 4) by the judge. These three options pertain to leadership and independence. Degree of deviation from the group norm can thus be described in terms of option-content and task feedback can be given on idiographic level.

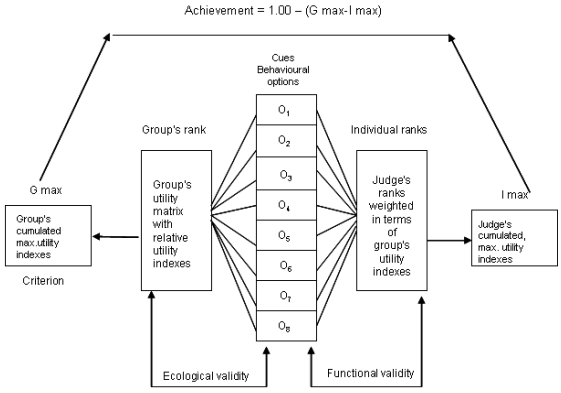
The group's ranking of the 8 options, based on the sum of all 10 judges' ranks, calculated separately for each situation, gives 12 rank series. Concordance between these 12 situation series amounts to Kendall's W = 0.05. With 8 options there is obviously hardly any commonality between the situations. If we reduce the complexity in our data, within each situation, by adding the 2 ranks representing the same content category, we get only four category items to rank, each represented by two options, similar in content. Now, Kendall's W for the 12 situation series amounts to 0.95. By grouping the cues, (the options in our data) according to content similarities, Kendall's W has been raised from 0.05 to 0.95. It has been shown by several researchers that decision makers may fall back on less demanding strategies when task complexity is increased, for example by enlarging the number of cues (see Rothrock & Kirlik, 2003). It should, however, be observed that our reduction of complexity is done only "on paper", i.e. by grouping cues (options) already classified according to content. Our subjects have thus never carried out an alternative, less complex version of the task. The results raise the question: What happens psychologically or statistically when complexity is reduced by grouping or reducing the number of cues?

The strength of the group-norm could operationally be defined as the degree of coherence between the members in their preferences or decisions. Applying this definition to our group of 10 student nurses we would like to know the concordance between them within each of our 12 situations. This group coherence varies considerably between situations. Kendall's W covers a range from 0.33 to 0.87. The strength of the group-norm seems quite dependent on the situation. Variations of this magnitude ought to be followed up by a qualitative content analysis. The situation with the low W = 0.33 is a very difficult, complex situation, a patient refusing a necessary treatment. This situation obviously presents with a high degree of norm-uncertainty. At the other end of the norm-continuum, Kendall's W = 0.87, there is a less complex situation, i.e. giving support to a patient training to walk again. Even though our situations objectively are the same for our 10 judges, they are obviously subjectively quite different, and that to

a degree that varies with the complexity of the situation.

The method described in this small scale study is applicable for studying, via difference matrixes, norm-uncertainty between groups, for example between nurses and doctors.

On idiographic level single judges' different out-group relations can also be analysed. Provided that task presentations are based on some form of representative sampling from a defined content or aspect domain, the method, presented above, allows descriptions of norm-uncertainty on nomothetical, ideographical and situational levels. In the figure below the method used is summarized in terms of Brunswik's lens model.



Brunswik's lens model adapted for estimating norm-uncertainty on nomothetical, idiographic and situational levels.

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How do Psychiatric Diagnoses Function?

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In medical science the diagnostic process always includes some elements of uncertainty and the diagnostic accuracy can vary considerably between different clinicians (Wigton, 2008; Kaufmann, Sjödahl & Mutz, 2007), because our judgments and decisions generally are based on information (cues) that are less than perfect (Brunswik 1952; Wolf, 1995, 2008). This uncertainty-problem is far more pronounced in psychiatric than in somatic diagnostics. At the Landau Conference "Original Brunswik" in Germany this year we submitted a manuscript "How do psychiatric diagnoses function?" for a conference book edited by Prof. Wolf.

We started from Milne's distinction between shallow and deep diagnostic systems (1987). Psychiatric criteria manuals like the present DSM-manual are mainly shallow, meaning that symptoms and syndrome do not refer to likely etiological factors as we usually find in somatic diagnostics. Progress to link symptoms and syndromes to differentiating neurological correlates has been extremely slow. Despite two Nobel prizes - Moniz in 1949 (lobotomy), and Carlsson in 2000 (dopamine function) - the nosological system in psychiatry is

still mainly a shallow system. Certainly, some good has come from these discoveries, but the results have been heavily misused in clinical practice. Humans' capacity for vicarious functioning has been ignored, sometimes even damaged. Vicarious functioning is, namely, the differentiating hallmark between a human and a robot (Brunswik, 1952, p. 17).

When studying open systems that exchange matter and energy with surroundings and have a tendency to stabilize end states and maintain steady states (Brunswik, 1952, p. 17) the choice of a proper unit for observation becomes crucial (ibid, 1952, pp. 18-34). This problem is also touched on by Boulding, (1956, p. 197) and by Barker (1963/1965).

In 1986, Geldard and Sherrick discovered by experiments a new kind of units on cerebral level, sensory fields that could be studied spatially and seemed to be generated centrally and not at the stimulation sites. The possibility to build on this discovery experimentally to get insight into the neurological disorder behind schizophrenia is discussed, and experiments proposed in Sjödahl (1990) together with a theory of field interferences. Perhaps schizophrenia research should switch focus from transmitter substances to the brain's glia-cells that have a supporting and structuring function. Recent studies have revealed that glia-cells "might organize not only the structural architecture of the brain but also its communication pathways, activation, thresholds and plasticity" (Nedergaard. Ransom & Goldman, 2003).

During the last two decades there has been a growing tendency to put the responsibility for mental care on the single community health care system. Mental hospitals have closed down instigating a need for new assessment instruments and follow-up studies. The importance of keeping apart symptoms from psychosocial functioning has been demonstrated by DeJong, Giel, Sloof, et al. (1985) in a longitudinal study, covering 3 years. Assessments were made for 82 patients at the end of each year. The correlations were moderate, varying between 0.31 and 0.38 (Kendall's tau). These nomothetical results were complemented with individual graphs, showing amazingly large inter-individual differences between the intra-individual profiles. Sometimes an increase in symptom level was paralleled with an improvement in psychosocial functioning. Sometimes the relation was the opposite. These idiographic results are, however, not discussed from a causal point of view by the authors. Their article ends at a point where it starts being really interesting. We would like to continue by asking the following two questions.

Can differences in patients' environmental conditions during the 3-year period be systematically related to the striking variation between patients' profiles? A similar question can be stated with regard to patients' medical (drug) histories. There are, however, no data in the authors' article making it possible to discuss this question. To remedy this lack we suggest a Brunswikian lens model design (Fig. 1) for a longitudinal study of the predictive value of psychiatric diagnoses according to axes IV and V in the DSM IV manual, taking also patients' environmental and medical conditions into consideration.

Even though a criteria-manual like DSM IV is mainly descriptive you cannot take for granted that it is applied as such in clinical practice. Diagnosing clinicians may read a depth into a shallow symptom – or syndrome-

descriptions, that varies with the single clinician. This is a subject for future research.

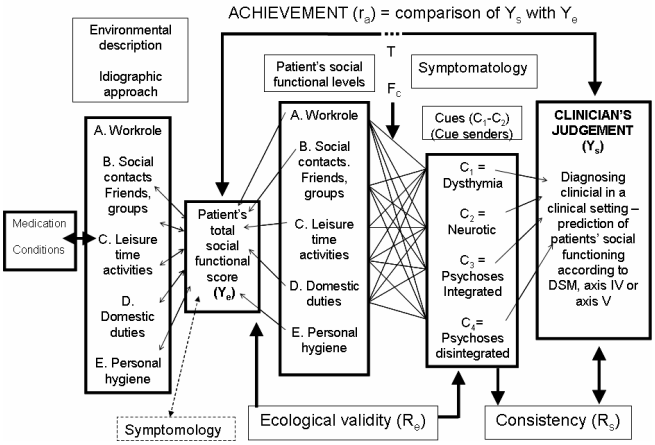

Figure 1. Brunswik's lens-model adapted to longitudinal study of psychiatric clinicans's diagnoses along axis IV or axis V of DSM-IV.

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On the Fringes of Brunswikianism

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Those of you who have heard me speak will know that I am not a true Brunswikian. However, I have great sympathy for what I see as its core, namely the examination of behaviors that people carry out in their "real" lives, as opposed to tasks that exist only in the laboratory. I have grown weary of the "fun and games" research that characterizes much of the recent J/DM field, where the trick seems to be to ask people to do something they have never done before, then give a catchy name to their foulups.

This year, I have been working on a new project that looks at how the fear inspired by terrorism affects people emotionally and behaviorally. My working hypothesis is that people are afraid, especially when an incident hits close to home, but their behaviors are largely unaffected. Perhaps our lives are sufficiently constrained by circumstances that our fears cannot translate into action. The methodological component of the project is the development of a factorial analysis of "variance" for nominal responses (NANOVA). The analysis is built on the fact that when responses do not match, they vary, and that variation can be partitioned according to the sources attached to the response. This new analysis permits direct comparison of how attitudes and actions are influenced by the same variables. Is it possible that a regression analysis can also be built for nominal responses?

News from Bob Wigton

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I'm continuing work on our project examining the cues physicians use in deciding whether to prescribe antibiotics in patients with acute respiratory tract infections. This is a good prototype to study because the cues are quite unreliable and there is much uncertainty in making the judgment. Since presenting this work at Brunswik last year I have further analyzed the judgments and found that the interactions between clinical findings such as cough, duration and fever are quite important. The strong interactions we found map well to the known clinical diagnoses we would expect the doctors to be considering in these vignettes (e.g., bronchitis, bacterial sinusitis). Since antibiotics are often given in excess of what is recommended by the clinical literature, the weighting and interactions allow us to identify misconceptions that may be giving rise to the over-prescribing of antibiotics. A paper describing this has just come out in the Journal of General Internal Medicine. (Wigton RS, Darr CA, Corbett KK, Nickol D, Gonzales R. How do community practitioners decide whether to prescribe antibiotics for acute respiratory tract infections*? J Gen Intern Med* 23(10):1615-20 Epub 2008 July 12).

Also, I wrote a review paper for a medical education journal that discussed applications of Brunswikian theories (mostly lens model) to medical education. (Wigton RS. What Do the Theories of Egon Brunswik Have to Say to Medical Education*? Adv Health Sci Educ Theory Pract,* 2008 Mar; 13(1):109-21). Since neither of these are core journals for Brunswikians, I do have pdf copies I can send. (Wigton@UNMC.edu).

Brunswik Symmetry: More News from Werner W. Wittmann

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In addition to the two promising students of mine who have extended Brunswikian concepts to computer interaction and to judgment and decision making research (see M. Jipp and E. Kaufmann in this newsletter), I have also continued with research and presentations about Brunswikian concepts relevant to research design and data analysis. I am deeply convinced that this is a greatly neglected facet of Brunswikian thinking and its implications for judgment and decision making must be acknowledged. Principles of symmetry are magical key concepts, for all successful sciences, evaluated in terms of predictive and explanatory power. Brunswik's lens model has all these virtues of symmetry incorporated; thus, we should continue to capitalize on it. I have developed and proposed a five data box conceptualization, synthesizing research designs and emphasizing the importance of symmetry between the predictor, the experimental /nonexperimental treatment, the criterion and the stakeholder data boxes in basic and applied evaluation research. Symmetry in the level of generality yielded better predictions and explanations in various research areas. Asymmetry explains many of our disappointments in terms of effect sizes. A completely new aspect derived from Brunswik symmetry is a hint to the danger of looking in the wrong direction once we try to improve on predictions. We may have too much information in the set of predictors with respect to criteria of interest. Such systematic, reliable but unwanted variance attenuates relationships in the same way as lack of reliability. Theory derived suppressor principles can be incorporated into research designs, helping reduce asymmetry and obtain better explanations even in non-experimental, correlational research. In order to get a better understanding, publications in German (Wittmann, 2002) and in English (Wittmann & Walach, 2002; Wittmann & Klumb, 2006) are currently available; additionally, several more recent PowerPoint presentations from international conferences (Wittmann, 2007, 2008) can be downloaded from our homepage. Furthermore, the forthcoming Landau conference book will give an update about the implications of Brunswik symmetry.

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Effects of Improved Representative Design on Nurses' Risk Assessment Judgements: A Comparison of Written Case Simulation and Dynamic Physical Simulations

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This thesis is concerned with the realization of representative design (Brunswik, 1949, 1955, 1956) in judgement analysis research in healthcare. Conventionally, written case simulations (e.g. using paper and pencil) are used in clinical judgement analyses. However, their environmental representativeness has been questioned in recent decades. The thesis explores the potential of dynamic physical simulations for examining nurses' risk assessment judgements in critical care. Specifically, it compares these high fidelity simulations to written case simulations. Using physical simulations allowed nurses to make judgements in settings more similar to their working environment. A purposive sample of 97 participants (63 nurse students and 34 experienced nurses) made dichotomous judgements (i.e. at risk of clinical deterioration or not) in paper and physical simulations on 25 clinical scenarios randomly generated from real patient cases. Ecological criteria were derived from the same case records. Data suggests that improving representative design in simulations to capture nurses' risk assessment judgments did not significantly affect nurses' cognitive control (R_s) in physical simulations compared to written case simulations. However, nurses were significantly less accurate (R_a) and used less linear knowledge (G) in physical simulations, as opposed to written case simulations. Improving representative design by providing high fidelity cues with dynamic physical simulations significantly impacts on nurses' achievements for risk assessment judgements.

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New books:

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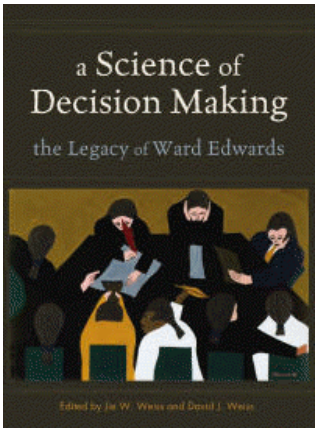
A Science of Decision Making: The Legacy of Ward Edwards



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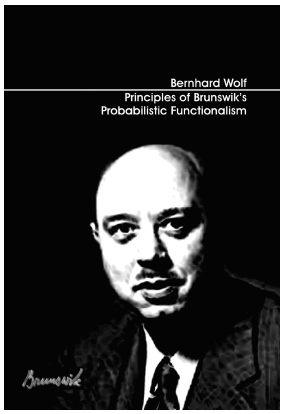
The labor of love that Jie Weiss and I have worked on, now entitled "A Science of Decision Making: The Legacy of Ward Edwards", has been published by Oxford University Press and is making its first public appearance at the 2008 Brunwsik/Psychonomics/JDM meeting. Twenty-nine of Edwards's published papers, spanning six decades, are reproduced with witty (?) introductions by the editors, along with seven new papers he co-authored despite the disadvantage of having died. Brunswikians may particularly enjoy the way in which Edwards both praised and took potshots at approaches that he felt did not sufficiently appreciate his own perspective; the targets included Anderson, Brunswik, Skinner, and Kahneman and Tversky. Additional information is available at my website,http://www.davidjweiss.com/Science%20of%20Decision%20Making.htm.

Principles of Brunswik's Probabilistic Functionalism



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A new book about Egon Brunswik.

Wolf, B. (2008). Principles of Brunswik's probabilistic functionalism (1st edition). Landau: Verlag Empirische Paedagogik. In English. Approximately 100 pages. With many figures and the complete list of Brunswik's 48 publications from 1927 to 1955.

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"The Original Brunswik" meeting

An international meeting on "The Original Brunswik" was held on July 16-17 2008, in Landau, Germany. This meeting was initiated and arranged by Professor Bernhard Wolf of Landau University. Furthermore, this conference was also supported by Professor Kenneth Hammond, Colorado University, USA and Professor Gerd Gigerenzer, Max-Planck Institute, Berlin, Germany as well as by the German Research Foundation (DFG). 18 experts from 8 different countries were speakers, as can be seen in the following agenda:

Wednesday July 16, 2008

Roman Heiligenthal
(President of the University Koblenz-Landau)
Welcome

Bernhard Wolf
Introduction to the meeting

Part I: Original Brunswik: Key Concepts
(Chair: Werner W. Wittmann)

Edwin Glassner
(Vienna, Austria)
Structure-monism and physics (Brunswik's Dissertation, 1927, Vienna)

Christoph Limbeck-Lilienau
(Vienna, Austria)
Perception and the world of objects – foundation of a psychology in terms of objects (Brunswik's Post-doctoral thesis, 1934, Vienna)

Elke Kurz-Milcke
(Ludwigsburg, Germany)
Measurement and uncertainty

Roland Scholz
(Zürich, Switzerland)
Coping with environmental complexity

Part II: Original Brunswik: Representative Design
(Chair: Roland Scholz)

Mandeep Dhami
(Cambridge, United Kingdom)
Representative design – An ecological approach to cognition

Alex Kirlik
(Urbana Champaign, IL, USA)
Vicarious functioning implies representative design: an empirical demonstration

Part II: Original Brunswik: Representative Design (Chair: Roland Scholz)

Lars Sjödahl & Esther Kaufmann
(Lund, Sweden & Mannheim, Germany)
Idiographic perspective in medical decision making

Bernhard Wolf
(Landau, Germany)
Quantitative single case research following the fundamental ideas of Representative design

Duarte Araújo
(Lisbon, Portugal)
Brunswik, Gibson and the functional representativeness of experiments

Duarte Araújo, Robin Hogarth, Alex Kirlik, Lars Sjödahl & Bernhard Wolf: moderated by Roland Scholz
General Discussion on Representative Design

Thursday July 17, 2008

Part III: Original Brunswik: Other Methodological Issues (Chair: Alex Kirlik)

Esther Kaufmann, Lars Sjödahl, James Athanasou & Werner W. Wittmann
Judgment achievement through the lens of domains – a meta-analysis

James A. Athanasou
(Sydney, Australia)
Probability of responding – Integrating the Rasch measurement into Brunswik's lens model

Ulrich Hoffrage & Jan K. Woike
(Lausanne, Switzerland)
Does policy capturing really capture the policies?

Robin Hogarth & Natalia Karelaia
(Barcelona, Spain)
Determinants of linear judgment: A meta analysis of lens model studies

Werner W. Wittmann
(Mannheim, Germany)
Brunswik symmetry

Part IV: Symposium Correspondence – Coherence
(Chair: Mandeep Dhami)

Gerd Gigerenzer
(Berlin, Germany)
The role of intuition in decision

Kenneth R. Hammond
(Boulder, CO, USA)
Not only intuition, but complementary ratiocination

Philip T. Dunwoody
(Huntington, PA, USA)
Brunswik: coherence, correspondence, or pragmatism?

Bernhard Wolf
(Landau, Germany)
Reasoning: perception and thinking (Brunswik, 1966)

Klaus Fiedler
(Heidelberg, Germany)
Brunswikian origins of the cognitive-ecological approach to decision making

Gerd Gigerenzer, Alex Kirlik, Roland Scholz & Bernhard Wolf
(Final discussion session)
Intuition over all – or in combination with analytical strategies?
(The "correspondence – coherence" – debate)

Grateful thanks to Professor Bernhard Wolf and his team at Landau University from us all who were given the opportunity to meet during two inspiring days of intellectual exchange under pleasant social conditions.

24th Annual International Meeting of the Brunswik Society
13-14 November 2008
Room Boulevard C, Hilton Chicago, Illinois

AGENDA

Thursday 13 November 2008

Time	Activity
12.00-13.00	**Late Registration**
13.00-13.10	**Welcome by Program Committee (Jim Holzworth, Mandeep Dhami, Elise Weaver)**
13.10	**Paper Session 1: Brunswikian Theory and Method (Chair: Tom Stewart)**
13.10-13.40	*Elke Kurz-Milcke:* Brunswik's lens
13.40-14.10	*Alex Kirlik:* Gibson's invariants and Brunswik's cues at 50: Ecological perception reinvents (not rediscovers) probabilistic functionalism
14.10-14.40	*Huiqin Yang & Carl Thompson:* Effects of improved representative design on nurses' risk assessment judgments: A comparison between written case and dynamic physical simulations
14.40-15.10	*Sarah Miller, Jennifer Tsai & Alex Kirlik*: Understanding and aiding expert judgment in baseball: Evidence for both heuristic and instance-based reasoning
15.10-15.30	**Tea/Coffee Break**
15.30	**Paper Session 2: Research Innovations (Chair: Jim Hogge)**
15.30-16.00	*James Shanteau:* Assessing expert performance when there are no errors
16.00-16.30	*Jason Beckstead:* A psychology of organism-environment interactions in time
16.30-17.0	*Bettina Von Helversen, Rui Mata & Henrik Olsson:* The development of task contingent changes in multiple cue judgment tasks with binary and continuous criteria
17.00-17.30	*Robert Hamm:* A choice probability approach to a lens model of multi-category diagnosis data
17.30	**End of Day One**
19.00	**Group Dinner at Berghoff Restaurant at 17 West Adams St. (sign up on the day)**

Friday 14 November 2008

Time	Activity
9.00	**Panel Discussion: Rationality (Chair: Jeryl Mumpower)**
9.00-9.20	*Kenneth Hammond* on "Reconciliation of opposing conclusions regarding rationality"
9.20-10.00	Discussants' Remarks (*Mike Doherty*, *Alex Kirlik*, *Gerd Gigerenzer*)
10.00-10.30	Open Audience Participation
10.30-10.50	**Tea/Coffee Break**
10.50	**Paper Session 3: Research Findings I (Chair: Elise Weaver)**
10.50-11.20	*Ignacio Martinez-Moyano:* Judgment and decision-making dynamics
11.20-11.50	*David Weiss:* Emotional and behavioral responses to terrorism threats
11.50-12.20	*Mandeep Dhami & Rocio Garcia-Retamero:* Expert-novice differences in decision strategies
12.20-13.00	**Buffet Lunch**
13.00-14.00	**Invited Speaker:** **John List on "Field Experiments in Economics"** **(Chair: Jim Holzworth)**
14.00	**Paper Session 4: Ecological Rationality** **(Chair: Mike Doherty)**
14.00-14.30	*Thorsten Pachur & Henrik Olsson:* Outcome feedback and ecological rationality
14.30-15.00	*Julian Marewski et al.:* How do people use name recognition as a cue to make inferences?
15.00-15.30	*Wolfgang Gaissmaier & Julian Marewski:* Ignorance-based election forecasts
15.30-15.50	**Tea/Coffee Break**

15.50	**Paper Session 5: Research Findings II (Chair: Alex Kirlik)**
15.50-16.20	*Shenghua Luan & Lael Schooler:* One is enough: On the efficacy of the single variable model
16.20-16.50	*Ryan Taylor:* Two empirical tests of cognitive continuum theory: Task properties, cognitive properties, and contingent accuracy
16.50-17.20	*Louise Gunderson & James Gunderson:* Lens model based robotics
17.20-17.30	**Hammond-Brunswik New Investigator Award presented by Ken Hammond**
17.30	**2008 Meeting Adjourned and Farewell by Program Committee**
17.45	**Business Meeting**

See also:

http://www.brunswik.org/annualmeetings/agenda2008.pdf

Special thanks to the organization committee:

Prof. J. Holzworth, Dr. M. Dhami and Dr. E. Weaver.