1999 FRED ATTNEAVE MEMORIAL LECTURE

MAY 3, 1999, 3:30 P.M.
Gerlinger Lounge

Professor Keith Holyoak
Department of Psychology
University of California, Los Angeles

RELATIONAL REASONING IN A BIOLOGICAL SYMBOL SYSTEM

Dr. Keith Holyoak, a world-renowned psychologist now in the Psychology Department at UCLA, will be presenting the Attneave Lecture. The lecture will be presented May 3, 1999 at 3:30 p.m. in Gerlinger Lounge.

The Attneave Lecture is dedicated to the memory of Dr. Fred Attneave, a former and long-time member of the University of Oregon's Psychology Department. Dr. Attneave was noted for his work on perception. Early in his career, he had notable influence on launching the study of information processing. He did important work on the problem of similarity scaling and made numerous contributions to such topics as form and depth perception, music, and imagery.

Dr. Holyoak received his Ph.D. in psychology from Stanford University in 1976. He has taught at UCLA from 1986 to the present. His research interests are in the general area of reasoning and problem solving. Much of his work is concerned with the role of analogy in thinking. One of the major themes of this work is the way in which analogy serves a psychological mechanism for learning and transfer of knowledge. In his book with Paul Thagard, he presents a general theory of analogical thinking that includes an analysis of how the capacity to use analogy evolved in primates, how it develops in children, and how it is used to reason in domains ranging from law and politics to science.

Other related research deals with the role of context in deductive and inductive reasoning, as well as the relationship between implicit and explicit modes of knowledge representation. Holyoak's research combines

SACKLER INSTITUTE FOR DEVELOP-MENTAL PSYCHOBIOLOGY

Michael I. Posner

A donation by the Sackler family to Cornell Medical University in New York City is the occasion for the start of a new program on human brain development. The Institute will be devoted to understanding influences on the developing human brain. It will tackle such questions as how attentional control systems develop, what roles they play in the lives of individuals differing in temperament and socialization and how environmental factors can influence development. The Institute will be concerned with the impact of schooling on the developing brain.

Many of the topics of the Institute will be familiar to students at Oregon because of the strong program we have had in this field. Indeed the first Director of the Institute is Michael Posner. Mary Rothbart and Helen Neville both play majors roles in the initial activity of the Institute which is to develop a state of the art report for the James S. McDonnell Foundation on research and research opportunities in human brain development. This report is similar to what was done in the early stages of Cognitive Neuroscience about ten years ago. Other panel leaders are John Fentress (Dalhousie University, Canada) who is at Oregon for a short visit, Mark Johnson (University College, London), Bob Cairns (University of North Carolina) and Jim Swanson (University of California, Irvine). You will be able to follow the activities of these panels on our web site **(http://www.sihbd.org/)**.

Attneave Memorial Lecture

empirical studies of thinking in people with the development of computational models. These models have integrated symbolic representations of knowledge with connectionist constraint-satisfaction mechanisms to account for phenomena involving human reasoning.

From this work, Dr. Holyoak has received numerous distinguished awards. He is a Fellow of the American Psychological Society and Society of Experimental Psychology. He is a member of the Cognitive Science Society, Psychonomic Society and the Society for Cognitive Neuroscience. Among many awards he has received the James McKeen Cattell Award, John Simon Guggenheim Fellow and the NIMH Research Scientist Development Award.

We are extremely pleased to have Dr. Holyoak come to the University to help us honor Fred Attneave in the Eleventh Annual Attneave Lecture.

Sackler Institute

A plan of the Institute is to develop joint research programs with fellows inside and outside of North America. The Institute will also eventually have imaging facilities for fMRI, PET and ERPs in its headquarters at Cornell Medical School.

The psychology and neuroscience community have a large commitment to provide information on the nature of brain development that may be helpful in the design of child care and socialization. It is hoped that the Institute through its research program and its effort to foster the field, will play a useful role toward meeting this commitment.

REPORT ON VISIT TO UNIVERSITY OF GRANADA

T. Givón

In August of 1998 I had the opportunity to visit the University of Granada (Spain), where I stumbled upon a group of young researchers engaged in trying to understand the process of cross-language translation. The initial agenda was to teach a one-week intensive course, "Philosophical, Linguistic and Cognitive Preliminaries to Translation". My hosts belong to a department of translation that trains, primarily, on-line (simultaneousa) interpreters. They see their enterprise as a direct descendant to the famed Medieval Translation School of Toledo, where translation work flourished for several centuries during the tri-cultural Spanish renaissance prior to the 1492 expulsion of the Moors and Jews from Spain.

During our many after-hours conversations (over lush helpings of *mariscos* and many *copitas* of Andalucian *fino*; having spent the preceding week hiking in *Las Alpujarras* south of Granada), my hosts described to me a phenomenon that should grab the mind's-eye of any cognitive scientist: while on-line translators are extremely accurate in translating the semantic import of utterances from one language into another; and while they are equally fluent—and 'correct'—at rendering utterances from input-language grammatical form into output language grammatical form, at the end of their task, which normally lasts only 15-30 minutes, they remember virtually nothing—*nada*—of what they have just translated. This stands in stark contrast to the literature on verbal episodic memory, where verbal episodic traces of just-heard discourse are quite robust.

The most obvious explanation for these facts is no doubt rooted in the heightened *attentional demands* involved in on-line translation. The normal rhythm (ca. 1-3 seconds per clause [proposition, idea]) is maintained during on-line translation. But, apparently, the added attentional resources required to acces the lexica & grammars of *both* languages, more or less simultaneously, are simply not there.

Wherein lies the paradox: Normally, attentional activation (working memory) is a prerequisite to episodic-memory storage. The obvious success of the on-line translators in 'transferring' the contents of fluent oral text from the input to the output language, and in rendering the contents in the appropriate grammatical form, is *prima facie* evidence that such attentional activation had in fact occurred *during* the on-line process of translation. Apparently, however, added attentional resources are needed in order to create a stable episodic trace of the translated text.

At the moment, my associates in Granada and I are engaged in trying to develop a series of controlled experiments to probe this phenomenon. It may well be that there is a parallel between what we see here and what Anne Treisman describes in her recent work on visual memory. That is, it may well be that the on-line attentional resource that drives simultaneous translation is *covert* (unconscious). So that, just maybe, one might be able to tease out some episodic traces by cues other than conscious probing.

All of which suggests that while orienting oneself consciously to the *mariscos*, *finos*, and the glorious *Alpujarra* mountains, one may stumble upon some hitherto unwitnessed covert treasures.

GROUP FORMATION AS A CARD GAME: HOW WELL CAN YOU BLUFF?

Scott Crosson

A "public good" is a good which people can enjoy regardless of whether they contributed to its creation. Unfortunately, since people cannot be excluded from the benefits of a public good, they have little incentive to help produce it. One potential solution to this sort of problem is to form a type of group called a "club", where only members who contribute to the group good receive its benefits. However, when people join groups for personal gains, their own interests sometimes diverge from the interests of other members. In particular, members of a group may overdraw from the group good and destroy it. I am interested in strategies that people use to resolve this problem: whether promise-making helps people form productive groups, and whether playing several games as opposed to a single game affects the strategies people use. In particular, I expect people will be more likely to keep their promises and strive for fairness when they know they will be playing multiple games with others, rather than engaging in a single interaction.

Under the auspices of the Social Poker grant from the National Science Foundation, I have been testing the conditions under which this problem occurs. Eight subjects are brought into a room, where each receives a few playing cards. They must combine their cards together in small groups to form poker hands that are worth $10. The catch is that although they may come to an agreement on how to divide that $10, there is no system for enforcing that agreement. Players make "claims" on their group's earnings in secrecy. If the total claims of group members are less then or equal to $10, then each person receives the amount he or she claimed. However, if the total exceeds $10, each member of that group loses 50 cents from his or her claim for every dollar over $10. For example, if there are three people in a group and one person claims $5 while the other two request $3 each, then the total comes to $11 and the group is "overdrawn" by $1. Each person loses $.50 from his or her claim. So the person who requested $5 will get $4.50, and the two people who requested $3 will each get $2.50.

In multiple round games, each player is shown his or her private payoff before the next round begins. Players who are good at "bluffing" (promising to claim a small amount and then taking more) can walk out with substantial sums of money at the expense of everyone else in their group, especially in the iterated version of the game. However, overclaiming detracts from overall wealth (in the experiment, how much subjects earned in aggregate).

Data is still in the initial stages of analysis, so observations here are merely anecdotal. Overclaiming does not appear to be substantially more common in single-shot games than in games with multiple rounds. Instead, cooperation in multiple-round games appears to depend more on whether groups form stable memberships from round to round. If memberships are constantly shifting, overclaimers can avoid detection (indeed, some players have actually worked to keep memberships shifting in order to exploit others). In games with stable memberships, overclaiming is generally only present in the opening rounds, if at all. Of course, the shifting membership may be as much a response to overclaiming as an opportunity for it. In one particularly memorable game, overclaiming in the opening round led to an increasingly vicious downward spiral, as players changed partners and raised their requests to try to take make up for earlier losses. By the end of the game, one player summed up her frustrations by noting that coming to any agreement was pointless, since no one could be trusted to abide by it.

Player conversations were also videotaped with the new equipment in the Hill center, which provided an unobtrusive view of what was happening at the different tables throughout the room, and will doubtlessly provide even more valuable data.
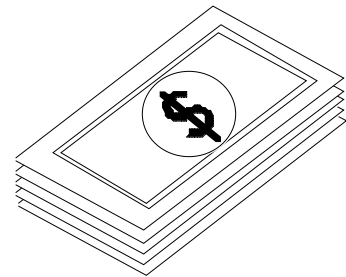
DISSERTATIONS

The Representation and Transfer of Sequence Learning

Benjamin A. Clegg

The ability to sequence events is fundamental to human performance. A productive approach to study sequence learning is the serial reaction time task. A review of literature suggests that the nature of sequence representation remains elusive. This dissertation employs the serial reaction time task to explore the representation of sequences by examining what is learned when one responds to a repeating sequence of stimulus events. Experiments used four simple spatial stimuli mapped as pairs to each of two responses. The use of these mappings separated stimulus from response sequences. Four experiments suggested that performance can be stimulus-based or response-based, even with the same sequences of stimuli or responses employed.

Three additional experiments explored the conditions that promote stimulus- and response-based learning and transfer. Previous transfer studies, have largely implicated response-based learning, but employed complex response selection demands. This confounds the potential for transfer with issues of stimulus-response compatibility. New experiments show that with low response selection demands transfer of stimulus-based knowledge can be shown.

The type of representation was examined through an analysis of re-action time to individual elements of the sequence. Response intervals revealed a remarkably uniform structure for serial position within the sequence and this would be consistent with a hierarchical representation of the sequence. The number of intervening elements between repetitions of the same response appears crucial to determining the composition of the structure. The same structure was found irrespective of whether subjects were aware of the presence of a sequence.

Overall this dissertation suggests that the representation of sequence learning can be based on different types of information, including both sequences of stimuli and sequences of responses. The utility of previous learning for current performance is influenced by response selection demands, however both stimulus- and response-based learning can transfer to new conditions.

This dissertation includes my previously published and co-authored materials.

Automatic Processing of Object Identity Location, and Valence Information

Diego Fernandez-Duque

A review of the current literature on attention reveals two major findings. First, even simple features need attention to be consciously perceived. Second, objects outside the focus of attention undergo extensive information-processing, including the automatic (and implicit) encoding of identity, location, and valence. These three basic attributes appear to be processed by distinct but interacting brain areas.

Observers are often very poor at reporting changes to their visual environment outside their focus of attention, a phenomenon labeled 'change blindness'. Change blindness studies suggest that the spatio-temporal coherence needed to represent a change in object identity can only occur at the attended location. However, these studies have always used explicit reports. Therefore, it remains possible that the visual system automatically integrates representations as they change across time, but that without attention those changes fail to reach awareness, and consequently are not reported.

The first set of experiments uses a modified change blindness task to demonstrate that sensitivity to change does occur in the absence of awareness. In a forced-choice task, people can 'guess' the location of changes even when they are not aware of those changes. Moreover, the location of change can be encoded without recruiting the orienting system, therefore suggesting a dissociation between implicit spatial representations and spatial attention.

Besides going through transformations over time and having a location in space, objects in the world frequently carry certain emotional valence. A second set of studies explores the automatic processing of object valence, and its influence on reaction times. Three experiments, using a modified Continuous Performance Task, demonstrate that the negative valence of an uninformative cue slows down the response, decreases commission errors, and increases errors of omission. These findings are consistent with an automatic shift toward a more conservative response criterion.

Overall, this dissertation reveals that representations of unattended objects can be (1) integrated across time, (2) localized in space, and (3) evaluated for valence. Despite such automaticity, temporal integration and spatial localization fail to reach awareness when they occur in the absence of focused attention.

Dissertations

This dissertation includes my previously published co-authored materials.

Costs and Benefits of Novelty on Attention and Object Processing
Gregory J. DiGirolamo

This dissertation tested whether novelty captures attention and the consequences of novelty on subsequent processing. Attentional processing was measured by probe discrimination or probe detection in the location of a previously presented novel or familiar object. Familiar objects are defined here as pictures that were studied, and then repeated frequently. Novel objects are classified here as pictures that were not studied, and only presented once. Each display contained multiple locations with an object in each location. Reaction times (RTs) to probes following All-Familiar displays were faster than probes following All-Novel displays. When a single novel object appeared in an otherwise All-Familiar display, RTs to probes were faster at the location of the novel object than the locations of familiar objects in this same mixed display. This result demonstrates the capture of attention by a single novel object embedded in a familiar display (Novelty Capture). Similar speeded probe RTs were found at the location of an abrupt visual onset of an object compared to an object appearing in a previously occupied location. Attention shifts to the location of an abrupt onset (Attentional Capture).

When only a single location was used, probe RTs were slower following the presentation of a novel object than a familiar object (Processing Capture). RTs to probes were also slower following the abrupt visual onset of an object than an object appearing in a previously occupied location. With a single location, the appearance of a new object captured attention, and attention remained on that object for further processing. Hence, RTs were slowed for subsequent probes. Further experiments demonstrated that visual masking eliminated the slowing in probe RTs for both objects that suddenly onset, as well as objects that were familiar but unexpected. In contrast, a novel object was unaffected by the mask and continued to produce slow probe RTs. This dissertation demonstrates that there are several forms of novelty that have different costs and benefits for attention and object processing.

AN EVOLUTIONARY SIMULATION
John Orbell

John Orbell and collaborators (Nick Allen, University of Melbourne; Cian Montgomery a programmer in Portland, and Tomonori Morikawa working with the UN) are developing a NSF-supported evolutionary computer simulation based on the "social basis of intelligence" idea. The essence of that idea is that a major adaptive problem for our ancestors, as well as for other social animals, has been negotiating a social space of conspecifics with whom there are shared interests, but also bases for cheating and for overt conflict. The simulation involves a population of n agents who encounter each other and who, when they do, must decide between entering vs. not entering a prisoner's dilemma game, a hawk-dove game or simply "walking on by." Prisoner's dilemmas are the prototypical formulation of the problem of cooperation and hawk-dove games a comparable formulation of conflictual situations. Agents are equipped with "capacities" for assessing the intentions of those they encounter, when for both games there is some basis for agents to conceal their intentions. Thus capacities for assessing others intentions ("perceptiveness") and for deceiving others about those intentions ("persuasiveness") are the basis from which agents assess the expected value of entering one or the other kind of game. If the game is entered by both, then it is played out with some fitness consequences, positive or negative, for both. At the end of agents' lifetime, they reproduce with the number of offspring being a function of their success in the "ecology of games." Transmission of information processing capacities to offspring is subject to mutation, thus the configuration and distribution of those capacities within successive generations is subject to evolution by natural selection.

Earlier analyses of the prisoner's dilemma and hawk-dove games have studied them in isolation as "stand alone" games, and a subsequent generation has developed the idea that agents do, in the natural world, have the option of refusing to play in the particular case. We are taking this sequence of ideas further to develop an "ecology of diverse games" in which players must choose among various different kinds of games that they can play, and in which their choices of games can have consequences for the evolution of information processing capacities for those respective games.

As with most such simulations, the "devil is in the details," and we are presently approaching the point at which we (believe) we can start taking our findings seriously.
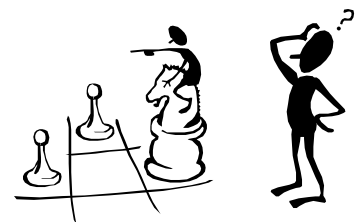
INSTITUTE TECHNICAL REPORTS

No. 97-1 "Toward a Functional Analysis of the Basal Ganglia"
by Amy E. Hayes, Matthew C. Davidson, Steven W. Keele and Robert Rafal
No. 97-2 "Brain Mechanisms of Cognitive Skills"
by Michael I. Posner, Gregory J. DiGirolamo and Diego Fernandez-Duque
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No. 98-3 "The Cognitive and Neural Architecture of Sequence Representation"
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by Douglas L. Hintzman
No. 98-10 "Pathologies of Attentional Networks Following Traumatic Brain Injury"
by Antonella Pavese, Anke Heidrich, Mckay Moore Sohlberg, Karen A. McLaughlin and Michael I. Posner
No. 98-11 "The Representation and Transfer of Sequence Learning"
by Benjamin A. Clegg
No. 98-12 "The Compulsive Brain: The Neurophysiology of OCD"
by Edward B. Cutrell

GRADUATE STUDENT POSTER PARTY!!!

June 7, 1999

The Institute's annual Poster party, held to celebrate graduate student research, will take place from 4:00-5:00 p.m. in the Fir Room of the Erb Memorial Union on Monday, June 7th.

Graduate students are enthusiastically invited to present posters (or other suitable media, such as handouts or videos) highlighting current research. We especially encourage the re-showing of posters presented at recent professional meetings. This is an excellent opportunity to both display and view the huge variety of research that done by graduates with our university.

We hope that all graduate students will participate this year and make the annual Poster Party an equally informative, valuable and fun event for everyone. Refreshments will be served.

Poster set-up will begin at 3:00 p.m. Art panels (basically, 4' x 6', double-sided, hard bulletin boards) and plenty of sturdy thumbtacks will be available. If any special equipment or supplies are needed, please notify Vonda Evans (vevans@oregon.uoregon.edu).

SUBMITTING TO THE NEWSLETTER

When preparing an article for submission to The Newsletter that is more than a page long, please include your disk. It is possible to transfer both IBM and Apple data onto the Macintosh. Formatting suggestions (to save time after transferring, as well as to assure the formatting that you want): IBM—save in or convert to DCA format if possible, otherwise save as text or ASCII; Apple—Appleworks Word Processor files; and of course, Macintosh (Microsoft Word, Microsoft Works or MacWrite) can be accepted. For any questions on formatting, consult your reference manuals. Also, be sure to include the name of the relevant document(s) on the disk. You can give these disks either to that month's feature editor, or directly to Vonda at the institute. It will be returned as soon as it's been transferred, which, in some cases, can be a matter of only minutes.