eccps european society for cognitive psychology

Abstracts
Fourth Conference

Como, Italy
September 15- 19th, 1990

european society for cognitive psychology

Abstracts
Fourth Conference

Como, Italy
September 15- 19th, 1990

WELCOME TO THE FOURTH CONFERENCE OF THE EUROPEAN SOCIETY FOR COGNITIVE PSYCHOLOGY

As one of our Israeli members wrote in a letter to me, these biennial meetings are in the nature of becoming a family reunion! We are certainly happy that so many of our 'old' friends are able to join us here in such a beautiful setting, and are looking forward to making many new friends amongst our more recent members.

As I mentioned in an ealier communication, the fact that so many of you wished to come and give presentations gave us some problems, particularly as we felt three parallel sessions was already on the extreme side. The priority rating that we chose was a group decision, but the actual carrying out of the plan fell to me. I am therefore responsible for any 'injustices' that may have slipped into the system! I hope there weren't (m)any of these but if I did slip up, it certainly wasn't intentional so please accept my apologies. (Incidently, Spanish is a difficult language in this respect! I seem often to have one surname for membership, another for the abstract and still another for the registration fee!!)

In spite of my typing errors, the programme looks an exciting one. I think we will all enjoy a stimulating meeting. This will of course be helped by the wonderful surroundings of Lake Como. We would like to thank Carlo Umilta and Beppe Vallar for their work in finding and organising arrangements with the Villa Olmo for us. We are also in their debt for the work they have put into raising funds for us from various Italian Scientific Bodies. This 'extra' money will be extremely useful in helping us to help our Eastern European colleagues who still have problems with currency restrictions.

We look forward to hearing all your views and ideas about our Society at the General meeting.

Have a good conference!

Janet Jackson
**(NB new address)
Institute of Experimental Psychology,
University of Groningen,
Grote Kruisstraat 2/1
9712 TS Groningen

ABSTRACTS OF PAPERS
(Presented in alphabetical order of first author)

Aladin Akyurek and John A. Michon
Instituut voor Experimentele Psychologie,
Rijksuniversiteit Groningen, The Netherlands

MEANS-ENDS ANALYSIS IN A COGNITIVE ARCHITECTURE

Soar, a recent cognitive architecture, responds to impasses that naturally arise during problem solving by universal subgoaling. That is, subgoals are created automatically by the architecture itself in a task-independent manner. Although there are a number of reasons why such impasses can occur, one of them, the so-called "operator no-change" impasse, is of particular interest to us. Whenever an operator is selected but cannot be performed on the current problem state because the operator's preconditions are not met by that state, an operator no-change impasse is said to have occurred. Soar's default response under these condition is to create a subgoal so that a state can be found where that operator can be performed. This strategy is referred to as operator subgoaling, an important weak method which is intimately related to the means-ends analysis that GPS and STRIPS have used for selecting relevant operators and creating subgoals. Although the Soar architecture is intended to embody the full range of problem solving strategies (Laird, Newell & Rosenbloom, 1987; Newell, Rosenbloom & Laird, 1989), the heuristic of means-ends analysis has not yet been demonstrated to be among them to any satisfactory degree. In this paper, we outline a scheme which suggests how the means-ends analysis can be included in the Soar architecture's realm of problem solving behavior.

The research reported here was supported in part by IBM Nederland under a Study Contract with the second author.

T. Arestov
Department of Psychology
Moscow State University, USSR

COLOR DIFFERENCE COMPONENT OF VISUAL EVOKED POTENTIALS IN MAN

A new approach of studying mechanisms of color vision is to analyse the structure of large color differences. The fruitfulness of this approach has been shown in a number of psychophysical studies on color discrimination. These have shown that most characteristics of color vision are integrated in the structure of the large color differences. However, much of the literature on color ERPs deals with measurements of partial color functions. VEPs have typically been recorded to color onset yet such responses include both color and brightness components. Experiments with color patterned stimuli showed that color-related effects may be suppressed by pattern response.
In the study to be described, we tried to find VEP-correlates of large color differences using unstructured stimuli. These were red (615nm), green (535nm), blue (480nm) and white, generated by a TV-monitor. VEPs from Oz were measured to the sustitution of

each stimulus with medium brightness by another stimulus which varied on seven levels of brightness. The amplitude of the N87 component was estimated for each of the 84 trails. A 4x4 rectangular matrix was constructed on the basis of these estimations.

Tansy Arthur
Department of Education, University of Manchester, U.K.

EVIDENCE THAT CHILDREN USE THE ARTICULATORY LOOP WHEN READING ENGLISH

Besner (1987) suggested that articulatory suppression does not interfere with pre-lexical phonological decoding and as such is an inappropriate technique for assessing the use of phonological coding in immediate visual word recognition when reading English. Three experiments are presented that indicate that English children do use the articulatory loop when reading. Experiments assessed performance with and without articulatory suppression. Both lexical decision tasks, one requiring a prelexical blending of letters, showed a significant decrease in response times with articulatory suppression (with no increase in errors). The rhyme judgment task showed the more usual increase in response times with articulatory suppression. The results suggest that although the children can carry out the word recognition tasks using phonological working memory, they do use this system when making lexical decisions and rhyme judgments. However, the system seems to be using a postlexical phonological store. Possible reasons for this will be discussed.

Talis Bachmann
Department of Psychology, University of Tartu, Estonia

IDENTIFICATION OF SPATIALLY QUANTIZED IMAGES OF HUMAN FACES: HOW MANY PIXELS DOES IT TAKE TO CARRY IDENTITY

Six images of human faces were spatially quantized at different spatial levels of quantization analoguously with the well-known procedure of Harmon and Julesz and exposed for identification at different exposure durations. Two main temporal conditions were used: variable brightness and isobrightness conditions. Identification efficiency increased with increase in exposure duration in both brightness and isobrightness conditions. Regardless of the other factors on the whole, conspicuous breakdown in the face identification efficiency was found when moving from 18 pixels/face condition of quantization to 15 pixels/face condition (these quantization levels were measured along the horizontal interauricular dimension). In addition, in the isobrightness condition and with the most coarse quantization, we found that, beginning with intermediate exposure durations, identification efficiency decreased with increase in exposure duration in a similar fashion as in our earlier findings (Bachmann, 1987; Bachmann & Kahusk, 1987). Taken together, these results seem to support the global-to-local microgenetic processing model of pattern identification (cf. Watt, 1988; Bachmann, 1987); are consistent with configuration-sensitive prototype models (e.g. Valentine, 1987); allow autocorrelation-type algorithms to be implemented in face recognition; but they are inconsistent with local feature processing models.

Lars Backman
Section of Psychology, Stockholm Gerontology Research Center and Department of Geriatric Medicine, Karolinska Institute, Sweden.

CONCEPTUALIZATIONS OF THE REMEMBERING OF SUBJECT PERFORMED TASKS: THE ROLES OF ATTENTION AND STRATEGIES

In research on memory for subject-performed tasks (SPTs), subjects are typically requested to carry out actions for purposes of later recall. These actions may involve the use of external objects (e.g., move the hammer, roll the marble) or not (e.g., nod in agreement, clap your hands). Although there are similarities in patterns of memory performance between SPTs and verbal materials, research on SPTs has revealed some results that are not easily predicted from the verbal memory literature. Dissociative patterns of outcome for the two types of material have been obtained for variables such as rate of presentation, level-of-processing, item generation, elaboration, subject IQ and subject age. These dissociations have nurtured a theoretical debate as to the processes underlying SPT remembering. This debate has predominantly been concerned with (a) whether similar memory laws are applicable to SPTs and verbal events, and (b) the nature of the encoding of SPTs. One view, which is held by Cohen and associates, posits that differences in recall patterns between SPTs and verbal materials may be attributed to qualitative differences in the nature of the encoding operations undertaken. Specifically, this notion assumes that whereas verbal materials typically are encoded with strategies and effort, SPTs are encoded non-strategically and with lesser effort. We have proposed an alternative conceptualization of the nature of SPT encoding. The main thrust of this conceptualization is that SPT encoding is attention-demanding and may be accomplished strategically, and that, when they exist, differences in encoding operations between SPTs and verbal materials are quantitative rather than qualitative. Relevant research pertaining to these models of SPT encoding is presented, focusing on studies on the effects of item organizability and attentional demands on recall of SPTs and verbal information.

Alan Baddeley, Constanza Papagno and Tim Valentine
MRC Applied Psychology Unit, Cambridge, England

PHONOLOGICAL SHORT-TERM MEMORY AND FOREIGN LANGUAGE VOCABULARY LEARNING

Data from foreign language learning in a short-term memory patient, and native vocabulary learning in children suggest that the short-term phonological store plays an important role in long-term learning.The present study used articulatory suppression to explore the role of the phonological loop system of working memory in the acquisition by adults of foreign language vocabulary.

Experiments 1 and 2 showed that articulatory suppression disrupts the learning of Russian vocabulary by Italian subjects. Two apparently equivalent experiments however, using English subjects failed to demonstrate the predicted disruption of Russian vocabulary learning by articulatory suppression. This was shown to be attributable to the greater association value of the Russian words to the English subjects. Two final experiments using English subjects replicated the Italian results, showing a differential disruption of the learning of unfamiliar material, when this comprises either CVC-CVC nonsense items, or Finnish words that were selected to be very dissimilar to English. It is concluded that the phonological loop concept of working memory is used in foreign language vocabulary acquisition, but can be circumvented if the material allows semantic associations to be created.

Maria Teresa Bajo
Universidad de Granada

Jose M. M. Ruiz-Vargas
Universidad Autonoma de Madrid

THE EFFECTS OF IMAGERY ON RECALL: DUAL MEMORY SYSTEMS OR DUAL PROCESSING SYSTEMS?

Considerable evidence indicates a better memory for high- as compared to low-imagery words. This finding has been explained in various ways. We shall focus on the two following: the dual coding theory and the relatioal-distinctive framework. The former assumes the existence of two separate but interconnected sub-systems for the represetation and processing of imaginal and verbal information which generate and store images and verbal codes in long-term memory. This approach attributes the superior recall of high-imaginary words to their elicitation of both codes. The relational-distinctive framework, on the other hand, proposes that dual coding must be considered as a processing distinction rather than a memory distinction. According to this view, recall depends on the encoding of relationships between a to-be-remembered verbal unit and other units in the context as well as on encoding distinctive attributes of the target unit. Outstanding proponents of the latter approach have claimed that effects of imagery in recall should increase with multiple learning trials and in intentional conditions and have made predictions on the basis of the two approaches mentioned above. According to such predictions, from the relational-distinctive framework effects of imagery in recall should only be obtained under cued recall instructions, while from the dual coding theory effects of imagery would be found in both free and cued recall conditions. The purpose of the present study was to test such predictions. Two factors, high-low imagery of target words and free and cued recall, were examined in a sentence frame orienting task under single trial incidental learning conditions. Results show main effects of both variables as well as a significant interaction. Performance was better on high-imagery words both in free and cued recall. This finding may be attributed to the effects of imagery on memory and supports predictions from the dual coding theory.

Maya Bar-Hillel
Dept. of Psychology

Menahem Yaari
Dept. of Economics

The Hebrew University, Jerusalem, Israel

JUDGMENTS OF JUSTICE

The basic rule of distributive justice is the proportionality rule, which says that: "Distributive justice involves a relationship between ... two persons, P1 and P2 ... ; and their two shares or ... rewards, R1 and R2. The condition of distributive justice is satisfied when ... : P1/P2 = R1/R2" (Homans, 1961). We studied this rule in survey style, using cases such as the following: "Suppose you have 12 grapefruit which you must divide between Jones and Smith in as just a manner as possible. How should this be done? In our problems, either one or two goods were to be allocated between two recipients who differed on at most one dimension, such as needs (e.g. "Smith requires more grapefruit than Jones"), or tastes (e.g. "Smith enjoys grapefruit more than Jones"). The results show that it is very hard to be more specific than Homan's formulation without being ad hoc. For example, with respect to needs, practically all people wish to distribute proportionately, but only insofar as this assures an equal level of meeting the needs. However, only a minority wishes to divide proportionately with regard to tastes. Moreover, the pattern of departure from equal split is radically different in these two cases: compensatory for needs (i.e. the weaker recipient gets a larger share) and non-compensatory for tastes (i.e. the stronger recipient gets the larger share). Since real world distribution problems don't come neatly labelled as needs, tastes, etc., it is difficult to predict - and to theorize - what would be considered "just" in them.

Stephen B Barton and Anthony J Sanford
Department of Psychology, University of Glasgow
ESRC Human Communication Research Centre
Univerities of Glasgow and Edinburgh

FAILURES TO NOTICE SEMANTIC ANOMALY IN DISCOURSE: INCOMPLETENESS OF PROCESSING IN THE MACHINERY OF COHESION ESTABLISHMENT

In text comprehension, one of the major processing goals is to use information from the text and from general knowledge to produce a coherent (logically consistent) representation of the discourse. Most existing models of discourse comprehension are concerned with how this is accomplished. The present paper examines the completeness of such cohesion processes.
Erickson and Mattson (1981) described a "semantic illusion" which showed incomplete processing of semantic information. They asked subjects to answer the question "How many animals of each kind did Moses take onto the ark?" Subjects typically replied "two", although it is the case that Noah, not Moses, built the ark. In this paper, we describe some other interesting cases, and examine one in detail.
Given that such incomplete processing occurs, it raises the question of how linguistic expressions or the state of the comprehension system control the likelihood of complete (deeper)

or incomplete (shallower) processing. We examine a number of potential candidates for such control, ranging from the speed at which people read examples, through to fine manipulations of the semantics of the critical expressions. Speed of reading and linguistic focussing phenomena have remarkably little (or no) effect on spotting the anomaly. On the other hand, small semantic manipulations had a great effect.
These results are discussed in the context of how text structure controls the degree of processing afforded to individual words in a text, and on the role of focus in language understanding in general. A resource-allocation account of the anomaly will be offered as an explanation of the results obtained.

Marta Olivetti Belardinelli, Eliano Pessa, Susan Pezzotta
Universita di Roma "La Sapienza", Italy

QUANTITATIVE ANALYSIS OF RHYTHMIC STRUCTURES IN SPONTANEOUS MUSICAL ACTIVITY

Spontaneous musical activity presents rhythmic structures which may be isolated with the aim of analyzing their underlying dynamics.
The aim of this study is, above all, to distinguish those structures with the aid of computer analysis. Appropriate analytical tools were used to calculate and manipulate the behavioural curves relating to intensities and to their sequence in time - which are the basic elements of musical rhythm (Olivetti Belardinelli, 1979) - in the spontaneous musical activity of 60 subjects (Olivetti Belardinelli, Rossetti, Capirci, 1985).
Secondly, this study proposes to examine the temporal sequences of the individual rhythmic episodes, to throw light on the random or chaotic-deterministic nature of rhythmic dynamics. The previously obtained data have therefore been analysed by a specially prepared programme with the aim of finding out: the smallest number of variables necessary for describing the dynamic system; the possible existence of attractors (which also characterise the deterministic dynamics in the neural system: Pessa, 1987); further information on the quantitative property of the dimensionality of the attractors themselves.
The final aim is to ascertain whether it would be possible to propose the salient characteristics of cerebral activity as the manifestation of determinist dynamics, rather than as the result of an inescapable stochastic process (Babloyantz, Salazar & Nicolis, 1985).

Francesc Salvador Beltran and Yolanda Duque Duque
Laboratori de Visio, Universitat de Barcelona, Spain

PHOTOGRAPHIC AND LINE-DRAWING PICTURES WHEN PROCESSING TYPICAL AND NON-TYPICAL OBJECTS INTO SCENES

The main goal of this paper is to study the influence of stimuli (photographs or line-drawing pictures) in scene perception. Many researchers have used the concept of "typicality" in order to explain the influence of knowledge structures on processing visual stimuli. The study to be described explores the influence of typicality on processing objects in environmental scenes. Our main hypothesis is that line-drawing pictures should be identified faster than photographs. Furthermore, we hypothesized that high-level and low-level typical objects should be identified faster than middle-level typical objects. We manipulated the variables "typicality" (low, middle, and high-level) and "type of stimulus" (photographs and line-drawing pictures), and reaction time (RT) was measured.
Subjects were undergraduate students from the University of Barcelona who volunteered for the experiment. All had normal or corrected-to-normal vision. Their experimental task was to identify objects into environmental scenes (e.g. "bedroom", "dining room", "classroom", "library", etc.). The level of typicality of the objects in each scene were calculated from a scale drawn up prior to this experiment (sixty independent judges calculated the degree of typicality of each object in each scene). The experimental design was a 2x3 factorial with repeated measures.
The results are interpreted in the context of perception processes in natural scenes. We will discuss the utility of photographs and line-drawing pictures as stimuli in identification processes in visual perception.

Shlomo Bentin
Department of Psychology and School of Education,
The Hebrew University, Jerusalem, Israel

TASK INFLUENCES SUGGEST A POST-LEXICAL SOURCE OF THE REPETITION EFFECT FOR WORDS: BEHAVIORAL AND ELECTROPHYSIOLOGICAL EVIDENCE

Stimulus repetition facilitates performance in a variety of tasks. In different word recognition paradigms, repeated words were responded to faster and more accurately both when repetition was immediate (lag 0) and when many unrelated stimuli and/or long periods of time itervened between the first and the second presentation. At lag 0 the effect is maximal, it drops sharply when more than one item intervenes between the two presentations, but remains constant when the lag is further increased. In addition, with nonverbal material, repetition effects were observed only at lag 0. This pattern suggests two sources of the effect: one, specific to words, is effective at both short and long lags, and the other, nonspecific, is effective only at very short lags. Several authors suggest that word repetition effects word recognition processes by reducing the threshold of lexical access (much in the same way as the logogen-model explains word frequency effects). Such effects might be relatively long-lasting, and are word-specific. Other authors suggest an episodic memory source of the repetition effect, common to both verbal and nonverbal material, accounting for the word-specific duration of the repetition effect by assuming that words are better mnemonics, and form stronger memory traces.
In a series of studies, we have found evidence for a non-lexical source of the repetition effect. In one study (with G. McCarthy) we have found that, at lag 0, the magnitude of the repetition effect with words is determined by the complexity of the task. Repetition facilitated performance significantly more in a letter-search task than in a lexical decision task, and least in

a word/number discrimination task. A late positive component of the Event-Related Potential (ERP) elicited by words (P300) was modulated by the discrimination task. Previous studies suggested that P300 is elicited by stimulus evaluation processes and it is not influenced by response selection. In a second study (with B. Peled), we have found that ERP-repetition effects at lag 15 were as big as at lag 0 in a lexical decision task, but significantly reduced when subjects studied the stimuli but no categorical decision was required. In a third study (with I.B. Feldman) we have found that, in a lexical decision task, repetition of the root in different derivations or in different inflections produced a repetition effect (at lags varying between 7 and 13) which was as big as the identity repetition effect at similar lags, but in a naming task only the identity repetition effect at similar lags, but in a naming task only the identity repetition effect approached significance.
In conclusion, our data suggest that, although repetition may very well facilitate word recognition and encoding processes, it also facilitates performance by changing task-related decision strategies.

Vicki Bruce, Tony Doyle, Neal Dench and Mike Burton
Department of Psychology, University of Nottingham

REMEMBERING FACIAL CONFIGURATIONS

A series of experiments show that subjects can remember rather subtle aspects of the configuration of facial features to which they have earlier been exposed. Subjects shown several slightly different configurations (formed by altering the relative placement of internal features of the face) of each of several different faces, are remarkably accurate at later distinguishing configural arrangements that they have seen from those which differ slightly from any shown. Their memory for configurations operates in a way that enhances recognition of the "prototype" configuration, even if this has not been studied. Prototype learning of face patterns was shown to be stronger than that for house patterns, though both classes of pattern were affected equally by inversion. Although subjects shown forced choice pairs cannot choose between unstudied prototype patterns and actually studied exemplars, further research showed that the unseen prototype patterns could be recognised with greater confidence even than exemplars that had actually been seen twice during study. Preference for the prototype was somewhat better under incidental learning conditions, and where different exemplars of the same face were distributed in the study series. We discuss the importance of these results for theories of the representation of faces and for instance-based models of memory.

Claus Bundesen
Copenhagen University, Copenhagen, Denmark

A THEORY OF VISUAL ATTENTION

A unified theory of visual recognition and attentional selection (C. Bundesen, "A theory of visual attention", Psychological Review, in press) is outlined. The theory was developed by integrating the biased choice model for single-stimulus recognition with a choice model for selection from multielement displays in a race model framework. Mathematically the theory is tractable, and it specifies the computations by which selection is supposed to be done. The theory has been applied to extant data on effects of object integrality in selective report, number and spatial position of targets in divided-attention paradigms, selection criterion and number of distractors in focused-attention paradigms, delay of selection cue in partial report, and consistent practice in search. The quantitative fits are encouraging.

Cristina Cacciari
University of Bologna

Sam Glucksberg
Princeton University

**ON BURNING THE CANDLE AT THREE ENDS:
SEMANTIC FLEXIBILITY OF IDIOMS**

How do people get the meaning of idiomatic expressions such as He cast the first stone? One view is that the meaning of such idioms is not derived from the combined meanings of their constituents. Instead, the meaning is stored directly as a lexical entry, with the phrase cast the first stone essentially functioning as a single, albeit long, word. According to this view, idioms require us to ignore or suppress word meanings since they play no role in idiomatic expressions. For example, no kicking is involved when one kicks oneself, a habit, or the bucket. But people cannot ignore the meanings of words, as shown by such phenomena as Stroop interference. Furthermore, some idioms can undergo syntactic transformations as well as semantic variations indicating that idioms may not be monolithic lexical items. The simplest semantic variation involves a word substitution (He THREW the first stone). More interestingly, people can also readily understand the intended meaning of such variants as He cast the first PEBBLE, viz initiating an attack in a matter of minor importance, or perhaps initiating a feeble attack. We examine the strategies adopted for inferring such meanings. We also consider how manipulation of semantic context interacts with the ease of extraction of the meaning of the original idiom as well as the variated idiom.

Manuel G. Calvo and Manuel Carreiras
Departamento de Psicologia Cognitiva, Universidad de La Laguna,
Tenerife, Spain

**EFFECTS OF TEST-ANXIETY ON READING:
ON-LINE PROCESSES AND COMPREHENSION EFFICIENCY**

Test-anxious people generate and attend to aversive thoughts (e.g., worry) under evaluative conditions (exams, aptitude test, certain experiments, etc.). Those representations may reduce transitorily the working memory capacity and interfere with task-relevant cognitive operations; but they may also motivate subjects to invest extra time in order to improve performance.

The aim of this research is to explore whether comprehension is impaired by test-anxiety as a consequence of its interference, whether the anxious person spends additional time to compensate for that interference, and which cognitive processes are affected.
High- and low-test-anxiety students read several texts word by word with the "moving window" technique. Multiple regression analyses on word reading times were computed with a number of psycholinguistic or text attributes serving as predictor variables. These variables are assumed to map onto specific reading processes (e.g., encoding is sensitive to word length). Comprehension effectiveness was measured by means of short-term recall scores; an index of comprehension efficiency was obtained by dividing recall scores with word-reading times. Working memory capacity and vocabulary knowledge were also measured.
The most relevant results indicated that: (a) anxiety did not impair comprehension effectiveness, but (b) increased average word-reading times; (c) reading times were affected interactively by test-anxiety and specific text variables (summary, narrativity, serial position within the text, and end of clause); (d) comprehension efficiency was deleteriously affected by test-anxiety under non-summary conditions in expository texts; and (e) the effect on efficiency disappeared, or was clearly reduced when differences in word kowledge, or reading span differences under stress conditions, were partialled out, respectively.
These data reveal that anxious readers need to employ a greater amount of processing resources than their non-anxious counterparts to obtain a similar comprehension level. Furthermore, the interactions between summary/narrativity/position and anxiety suggest that anxiety is selectively detrimental to test-level processes, such as identification of main topics and integration of information into a coherent test representation. Instead, anxiety does not impair low-level processes, such as encoding or lexical access; its role in sentence-level processes has not been clearly determined. Finally, the negative effect of anxiety on processing efficiency cannot be attributed to a permanent deficit in working memory capacity, but to temporary reduction in this capacity and, mainly to a deficit in vocabulary knowledge.

Jose Juan Canas, Maria Teresa Bajo and Luisa de las Casas
University of Granada, Spain

PRIME SET SIZE AND PRIME TO TARGET STRENGTH IN SEMANTIC PRIMING

Theories of semantic priming predict that the magnitude of the priming effect depends on the strength of the relationship between the prime and the target and on the number of concepts related to the prime (Anderson, 1983). The experiments to be described examine the effects of both variables in several priming tasks. Results are discussed in relation to current theories of semantic priming.

Manuel Carreiras and Manuel G. Calvo
Departemento Psicologia Cognitiva, Universidad de La Laguna,
Tenerife, Spain

THE RELATIVE INFLUENCE OF TEXT IMPLICATIONS, MACROSTRUCTURE AND PRIOR KNOWLEDGE ON INFERENCES IN READING

In a previous study (Carreiras & Calvo, 1989), sentences with main or important information (according to ratings of importance) in several texts were more likely to be recalled and recognized than secondary sentences. In a further experiment (Calvo & Carreiras, in press), main sentences showed a higher false alarm rate, a lower discrimination (d'), and a higher intrusion proportion, compared with secondary sentences.
In the present study, three hypotheses are tested to account for the inferential syperiority of main sentences: the probability of inference construction depends on (a) the number of implications in the text, (b) the presence of implications in the reader's macrostructure on the text representation, and (c) the reader's prior knowledge relevant to a sentence.
Five incomplete versions of each of four 500-words texts were written: in each version one main and one secondaruy sentence were removed randomly from the original texts, so as to create the opportunity for inferences to be made. Each subject read one version of each of two texts at their own pace, and, 10 min. later, wrote a 5-line summary, and performed a recognition test. Following this test, in an attempt to identify possible text implications, subjects were asked whether there had been any sentences stated explicitly in the text which could imply the removed sentences. Previously, several questions concerning the removed sentences (interspersed with other non-relevant information) were presented, in order to measure the availability of prior knowledge on those sentences before reading the texts. In addition, summary protocols were scored according to the presence or absence of sentences which had been identified as text implications, so as to gather an index of implication by macrostructure.
Results obtained by collapsing both over subjects and over sentences consistently indicated that; (a) there was a higher false alarm rate for main sentences compared to secondary sentences; (b) main sentences had a greater number of text implications in the summary, and a greater amount of prior knowledge, compared to secondary sentences; (c) in a multiple regression analysis, text implications were the best predictor of false alarms on both main and secondary sentences, compared to summary implications and prior knowledge; (d) when text implication scores were included as a covariate, the effect of sentence disappeared: the false alarm rate became equivalent for main and secondary sentences; (e) when implications in summary and previous knowledge were included as covariates separately, the effect of sentence also disappeared in analyses by subjects and by items, respectively, but not in both analyses; (f) when the three covariates were included simultaneously, only the effect of text implications on false alarms remained significant.
It is concluded that: (a) the number of text implications is the most powerful determinant of inferences; (b) sentences with important information are more likely to be inferred than secondary sentences because the former are implied more frequently by other information stated in the text than are the

latter; and (c) inferences responsible for the superiority of false alarms to main sentences are constructed to a significant degree during reading (encoding) and not only at retrieval. If those inferences were elaborated during retrieval, then the influence of implications in the summary (after reading) would have been greater than the influence exerted by implications in the text (during reading). Presumably, text implications activate the inferences during encoding and contribute to the representation and storage of those inferences together with the explicit text implication. Then, when the reader consults this composite trace at time of retrieval, it is difficult to disentangle explicit information from inferred information, which in turn, results in false alarms.

Jean-Paul Caverni and Jean-Luc Peris
CREPCO (Centre for Research in Cognitive Psychology)
University of Provence and CNR, Aix-en-Provence, France

IS PAPER GRADING A MULTIDIMENSIONAL ASSESSMENT?

Multidimensional analysis of assessment has been a central concern for the psychology of judgment. Assessment is assumed to be made about objects that can be described as a set of features. Any particular object can be described on a set of features. Any particular object can thus be described by listing its state regarding each of the relevant features.
In order to express assessment, the evaluator has to integrate these multidimensional descriptions so that he or she can compare the objects. This requires weighting the different descriptional features according to their usefulness for the evaluator. Different models (linear and non-linear) have been suggested in order to account for this integration process. In some situations, these models have proved to be adequate predictors of actual evaluations. When it comes to actually decribing the processes leading to these evaluations however, the validity of these models is questionable. Deciding whether multidimensional models can be upgraded from mere response descriptors to real cognitive process descriptors seems to raise two important questions:
1. Is the use of multiple independent descriptors traceable while subjects are elaborating their evaluation?
2. Is this use restricted to situations where the descriptors are explicitly specified or are subjects able to spontaneously create these kinds of multidimensional descriptions?

The experiments to be described were attempts to tackle these two issues.

Nik Chmiel & Andy Tattersall
MRC/ESRC Social & Applied Psychology Unit,
University of Sheffield, England

DISPLAY FACTORS AND THE CONTROL OF COMPLEX SYSTEMS

People were asked to control a model transport system based on that of Broadbent (1977): The number of people travelling by bus and the number of available car-parking spaces in a city could be controlled by altering the interval between buses and the car-parking fee. Levels of output variables (load and spaces) were related by two simultaneous equations only to current control inputs (interval and fee), thus the control system was static and incorporated no "memory". In experiment 1 information about the system state was presented to subjects on a computer screen in the form of figures or graphs. Subjects either had a history of past decisions and their outcome or not. In experiment 2 information was displayed graphically but Ss were required to meet predictably or randomly varied target outputs. Subjects' explicit knowledge of the relationships between variables was gathered by means of a questionnaire given before and after experience on the control task. There were indications that improvement in control performance led to improvements in question answering ability in contrast to past observations, provided the questions probed the simple relationships in the task. Under certain conditions however, explicit knowledge decreased. There was no improvement in explicit knowledge of the complex relationships in the task.

Axel Cleeremans & James L. McClelland
Department of Psychology, Carnegie Mellon University, USA

UNINTENTIONAL LEARNING OF SEQUENTIAL STRUCTURE

How is complex sequential material acquired, processed, and represented when there is no intention to learn? Recent research (Lewicki, Hill & Bizot, 1988) has demonstrated that subjects placed in a choice reaction time task progressively become sensitive to the sequential structure of the stimulus material despite their unawareness of its existence. This paper aims to provide a detailed information-processing model of this phenomenon in an experimental situation involving complex and probabilistic temporal contingencies. We report on two experiments exploring a 6-choice serial reaction time task. Unbeknown to subjects, successive stimuli followed a sequence derived from "noisy" finite-state grammars. After considerable practice (60,000 exposures), subjects acquired a body of procedural knowledge about the sequential structure of the material, although they were unaware of the manipulation, and displayed little or no verbalizable knowledge about it. Experiment 2 attempted to identify limits on subject's ability to encode the temporal context by using more distant contingencies that spanned irrelevant material. Taken together, the results indicate that subjects become progressively more sensitive to the temporal context set by previous elements of the sequence, up to three elements. Responses are also affected by carry-over effects from recent trials. A PDP model that incorporates sensitivity to the sequential structure and carry-over effects is shown to capture key aspects of both acquisition and processing of the material.

Lucia Colombo & Lisa Cipoletti
Dip.di Psicologia Generale Clinica di Neuropsicologia
Universita' di Padova, Padova, Italy

FREQUENCY EFFECTS IN THE TRANSCODING FROM ORTHOGRAPHY TO PHONOLOGY

According to recent studies reported by Besner and col. (Besner and Johnston, 1989; McCann and Besner, 1987; McCann, Besner and Davelaar, 1988) access to the entries in the phonological lexicon is not sensitive to frequency. This claim is based on the fact that pseudohomophones (nonwords sounding like real words) are not sensitive to frequency, although they are named faster than control nonwords. The aim of the experiment reported here is to provide more evidence on this issue using as material, not pseudowords, but real words that are usually familiar particularly in the spoken modality. If Besner and coll.'s claim is correct, then no frequency effect should be found when these words are visually presented, but only when they are presented in the auditory modality. The results are discussed with regard to the locus of the frequency effect and their implication for a model of the computation of pronunciation.

Cesare Cornoldi & Giuliana Mazzoni
University of Padova, Italy

STUDY TIME EFFECTIVENESS IN A SELF-PACED PROCEDURE

Many studies in the literature have shown that recall benefits from increased exposure time to study items (Cooper & Pantle, 1967; Waugh, 1967).
A recent series of experiments (Mazzoni, Cornoldi & Marchitelli, 1990) showed that the total time hypothesis does not hold in a self-paced study paradigm, where recall does not increase when study time is increased, and that in some cases more studied items are also recalled to a lower extent. In other words, we consistently found that less studied items were recalled as - and in some cases less than - more studied ones. The effect was independent of the type of material and of the total exposure time. The experiments also indicated that study time is allocated according to a preliminary judgment of knowing the item (JOK), and that subjects interupt the study being nevertheless aware that some of the items will not be recalled.
The experiments presented here intend to confirm and further extend the effect, showing that it does not depend on some artifactual data.
In experiment 1, using our material, we first replicated the total time effect, obtaining a greater recall when the study time was increased in an experimenter-paced procedure. In experiment 2, we ruled out the role of subjective judgments, and thus of the lack of accuracy on time allocation and its effectiveness. In experiment 3 we studied the possibility that lack of increase in recall with the increase in study time could be due to the time being too short, and in experiment 4, we extended the pattern of time allocation in a recognition task.
Finally, experiment 5 showed that the sort of ineffectiveness we found was only due to an item-by-item analysis, the amount of recall being greater in a self-paced than in an experimenter-paced procedure when average time is held equivalent.
Overall, the results demonstrate that metacognitive processes affect memory, but the relationship between the two is more complex than previously hypothesized. The theoretical implications of such relationships will be discussed.,

Carmen Dasi, Salvador Algarabel,
Alfonso Pitarque and Juan Carlos Ruiz
University of Valencia, Spain

INFLUENCE OF MASSIVE STIMULUS REPETITION ON AUTOMATIC PRIMING

The present investigation is focused in the study of memory retrieval mechanisms and the consequences that the information repetition have on its structural representation. A word naming experiment was carried out in which every trial was composed of the presentation of prime-target pairs: related, unrelated and neutral pairs. All of them were presented 50 times to each experimental subject. The results showed a generalized decrease in the reaction times for all three types of pairs. In the case of neutral pairs, the decrease was due to the "practice effect" and become stable very quickly. In the related pairs, the decrease was due to increased semantic priming, and so the decreasing times are due to episodic priming (result of the associated pairs learning). Later, the episodic priming gave rise to the development of semantic priming in the course of the repetitions because there is a parallel process of strengthening of the associative link (weak or nonexistent in the beginning of the experiment) between the two members of each pair. These results are discussed in terms of the semantic-episodic distinction.

Michel Denis
Centre d'Etudes de Psychologie Cognitive,
Universite de Paris-Sud, Orsay, France

IMAGINING OBJECTS THAT HAVE NEVER BEEN SEEN

The paradigm which has dominated the last decade of imagery research essentially consists in asking subjects to construct and manipulate images of visual patterns that they have observed and memorized recently or that they activate from long-term memory store. The purpose of these experiments is to test for similarities of response patterns between the processing of images and the processing of perceptual inputs. These similarities are usually interpreted as reflecting the structural similarity of the representations constructed from perception and from imagery, and the similarity of processes operating on these representations.
In recent years, however, imagery research has expanded its perspectives to include more creative aspects of visual imagery. This is the case, for instance, for situations where subjects are invited to construct visual images from a combination of elementary components to discover unexpected patterns. Another way of evidencing creativity in visual imagery is to investigate the

capacities of subjects to construct images of objects or configurations they have never seen, from exclusively verbal descriptions of these objects or configurations.
In the study reported here, subjects were asked to process verbal descriptions to construct the representation of a spatial configuration without direct perceptual access to this configuration. The capacity of subjects to engage in such construction is not, in fact, really questioned. But suppose that subjects who have learned a configuration from a description are later required to perform cognitive operations on this representation, for instance, drawing a picture of the configuration, or comparing distances between specific points, or inferring pieces of information that were not made explicit in the description. The issue is whether the operations performed on representations whose visual appearances have a cognitive, non-perceptual origin will be as efficient as those performed on images derived from direct perceptual processing.
In the three experiments reported here, subjects were required to construct the visual image of a spatial configuration from a detailed verbal description, and then performed comparisons distances between the main points of the configuration by using visual imagery. Subjects' responses evidenced a clear symbolic-distance effect, that is, the larger the difference between two compared distances, the shorter the decision time. In addition, subjects classified as high visuo-spatial imagers overall had shorter decision times than poor imagers. These findings are taken as reflecting the similarity of mental operations involved in the comparison of either perceived or imagined distances. They strengthen the claim that descriptive text or discourse makes it possible to elaborate and manipulate representations that exhibit genuine visuo-spatial properties. Further discussion examines linguistic factors likely to enhance the informational and functional value of images derived from texts.

D. Dubois, A. Tenin,
CNRSEPHE Lab. d'ergon. physiol. et cognitive, Paris cedex,
D. Fleury
INRETS, Arcueil, France
J.P. Barthelemy,
ENST, Department Informatique, Paris,

CATEGORIZATION OF SITUATIONS FROM PHOTOGRAPHS AND DRAWINGS: TYPICALITY, FAMILY RESEMBLANCE OR ANALYTIC PROCESSING?

Research on knowledge and conceptual structures in human memory has mainly tested hypotheses based on simple objects represented through verbal (even restricted to lexical) or pictural media. The line of research we present started from inductive analyses of "real world" situations (visual scenes of road landscapes within which the subject "acts" as a driver) presented through a photographic medium to get at a non a priori analysis of the relevant parameters of organization for this semiotic domain.
A first series of classification tasks showed that Rosch's hypotheses of hierarchical organization, and typicality can adequately account for the subjects' sortings of the photographs. From these first experiments, we could infer the main criteria which allowed us to construct, through an hypothetico-deductive processing, the construction of parametered drawings representing the "same" situations. A new series of 5 experiments were designed, controlling the "schematism" of the drawings (copy of the original photograph, line drawings with or without regularity within the representation of each parameter) and the distribution of the parameters ("natural" i.e. as present on the photographs, according to a family resemblance as defined by Medin et al, 1987; or exhaustive and regular). The instructions invited the subjects to sort this different material either freely or in three parts. The partitions obtained were processed using a mathematical model based on Tversky's contrast model and lead to an additive tree representation of similarity between stimuli.
The main results showed that
1) the relevant criteria remain valid as organizer of the subjects' partitions although
2) the properties of the classifications obtained from photographs (hierarchy and gradualness within a category, integrated explicitation of the classes) "faded" from "natural" combinatory to family resemblance and systematic configurations of parameters, and from "complex" drawings to highly schematic drawings within which the parameters were identically and regularly instanciated.
The discussion firstly considers the question of the main criteria and cognitive principles which underly the categorization for situations (perception and subjects common behavior as elicited by the scene). Secondly, it questions the generality of the processes implied in categorization tasks according to the perceptual constraints of the stimuli (holistic processing for photographs contrasting with analytic processing for some specific types and sets of parametered drawings).

Johannes Engelkamp
University of Saarbrucken

ENACTING DURING RECOGNITION

It was demonstrated repeatedly that simple action phrases such as "to open a door" are recalled and recognized better if the actions are performed while being learned than if they are learned under standard learning instructions. In the studies reported here, it was examined whether performing actions is also helpful during retrieval. For this purpose, one group of subjects learned action phrases under performance instructions, another group of subjects under standard learning instructions. Both groups had to recognize half of the items under standard learning instructions and half of the items under performance instructions. Under the latter condition, subjects performed the actions before they decided whether an action phrase was "old" or "new". There was found to be a clear effect of type of encoding. Recognition after motor encoding was better than after verbal encoding. In addition, there was a clear effect of type of retrieval after motor encoding, but only for those subjects who had performed the actions during learning. Also, only these subjects benefited from performing the actions before making their recognition decision. This effect is explained by assuming that part of the information provided by performing actions can be used for the recognition process only if the action is performed again at the time of testing; this part of information is best described as motor information.

Marie-France Ehrlich and Catherine Loridant
Universite Rene Descartes, Paris, France

METACOGNITIVE CONTROL IN THE RESOLUTION OF ANAPHORA IN SKILLED AND LESS-SKILLED COMPREHENDERS

In the past ten years, there has been a growing interest in research on metacognition in reading comprehension. However, the concept of metacognition is a "fuzzy concept" (Flavell, 1981) and the metacognitive label is used in different senses in different studies.
In the first part of this contribution, the historical root and the current conceptions of metacognition are briefly analysed. Then a proposal aiming at linking the metacognitive orientation to cognitive models of text comprehension is presented. The study of metacognitive control becomes a question of determining the extent to which cognitive operations implicated in comprehension are submitted to metacognitive control.
In the second part, our approach will be illustrated with an experiment on the processing of anaphoric ties in skilled and less-skilled comprehenders (15 years old), contrasted on the basis of a standardized test. Eight expository texts (about CANADA or CHINA) composed of three sequences of two sentences were written and the processing of the anaphoric cue in the beginning of the second sentence of each sequence was investigated. Four versions of each test were prepared: in the High Cohesion version (HC) the anaphoric ties were the reiteration of the nouns, while in the Low Cohesion version (LC), the anaphoric ties were pronouns; the Coherent version (C) was identical to the HC version, while in the Incoherent version (I) the anaphoric nouns were replaced by nouns whose meaning made the passage inconsistent.
Metacognitive evaluation was studied using two methods:
1) Self-evaluation of comprehension, on a six-point scale with High Cohesion and Low Cohesion texts.
2) Detection of the inconsistencies in the Coherent and Incoherent texts.
After reading, the effective processing of the anaphoric ties was tested with multiple-choice questions.
The main results were the following:
- The less-skilled comprehenders show poorer performances on the processing of the anaphoric ties than skilled comprehenders.
- The less-skilled comprehenders do not know how to correctly evaluate their own understanding and they detect fewer inconsistencies than the skilled comprehenders.
These results are discussed in relation to the theoretical and methodological problems raised by the metacognitive approach to reading comprehension.

G.B. Flores D'Arcais
Max Planck Institut fur Psycholinquistik

ORDER OF STROKE WRITING AS RETRIEVAL CUE FOR THE RECOGNITION OF CHINESE CHARACTERS

Chinese characters and Japanese Kanji are composed by a number of strokes, from 1 to 23. The order of writing of these strokes is fixed, and is roughly from top-left to bottom-right, with a number of precise rules constraining writing, which are applied rigorously in the production of the characters, with only very few exceptions for a very few characters. These rules are learned by all children in the same form and in the same learning phase. When trying to remember the form of some infrequent characters, as a mnemonic device readers not rarely trace in the air the strokes of the characters.
The study tests the hypothesis that order of writing the strokes is coded in memory as part of the information connected to the characters and, second, that this information is part of the access code to the charcters in semantic memory. Thus "early strokes (those which are written first in the production of a character) would be a better retrieval cue to character recognition than "late" strokes. One of the difficulties in testing this hypothesis is that most early strokes also have top-left positions, and most late strokes are right-bottom. This means that stroke writing order and position are confounded in most characters. For the present experiment a few characters have been selected, in which writing order and position could be taken as orthogonal factors.
Th technique used consisted in displaying a fragment of a character prior to the whole character, which had to be named as fast as possible. The fragment was either a random pattern of pieces of strokes, or one of the early or one of the late strokes. The fragment was displayed 40 msec before the whole character. The results showed an effect of writing order on ease of character naming: when the fragment given prior to the whole character is an early stroke, naming is facilitated more than when the framgent is a late stroke. Thus, early strokes can be taken as better retrieval cue for character recognition than late strokes, and this independently of the position.

Ram Frost
The Hebrew University, Jerusalem, Israel

PHONETIC RECODING OF PRINTED WORDS AND ITS EFFECT ON THE DETECTION OF SPEECH IN NOISE

When an amplitude-modulated noise generated from a spoken word is presented simultaneously with the word's printed version, the amplitude envelope sounds more speechlike. This auditory illusion presented by Frost, Repp & Katz (1988), suggests that subjects recode the printed word into a speechlike representation, and detect a correspondence between it and between the speech amplitude envelope presented auditorily. The present study investigated whether such speechlike representations are phonologically assembled from the print or whether they are lexically addressed, and retrieved from the mental lexicon.
In two experiments subjects were presented with speech-plus-noise and with noise-only trials, and were required to detect the speech in the noise. The auditory stimuli were accompanied with matching or nonmatching Hebrew print which was unvoweled in Experiment 1, and voweled in Experiment 2. The stimuli of both experiments consisted of high-frequency words, low-frequency words, and nonwords. We examined whether the illusion is affected by word frequency, lexicality, and spelling-to-sound regularity.
The results demonstrated that matching print caused a strong bias

to detect speech in the noise when the stimuli were either high- or low-frequency words, whereas no bias was found for nonwords. This pattern of bias was unaffected by spelling to sound regularity; that is; similar effects were obtained in the voweled and the unvoweled conditions. These results suggest that an amplitude envelope of the word is generated from the print. However, it is not phonologically assembled from the print, rather it is retrieved from the mental lexicon. Since amplitude envelopes are contingent on detailed phonetic structures, this outcome might indicate thar representations of words in the mental lexicon are not exclusively phonologic.

Angel Fernandez and Maria Angeles Alonso
Departamento de Psiclogia Basica, Psicobiologia y Metodologia
Universidad de Salamanca, Spain

MEMORY AND ENVIRONMENTAL CONTEXT: THE EFFECT OF CODING AND RETRIEVAL INSTRUCTIONS

The environmental context effect refers to the fact that memory performance is better when there is a match between learning and testing environments. However, the effect has proven to be unreliable in a number of previous studies. As part of an effort to solve the problem, two experiments were run in which major assumptions about the role of environmental contest on memory were examined. The first experiment tested the hypothesis that the context effect was dependent on the extent to which the learning environment was encoded at the time of study. Immediately before studying a list of words, one half of the subjects performed a drawing task inducing them to give extra processing to their learning environment; the rest were given an alternative drawing task. Later, subjects were tested either in the same context in which they had studied the list or in a different one. The results showed no advantage of the same-context condition, even for those who were led to give extra processing to the learning environment in the study phase. The second experiment tested the hypothesis that a context representation is more likely to be of help if subjects are instructed to use contextual cues when recalling. Learning conditions were the same as in the previous experiment. Retrieval instructions were manipulated to induce an explicit reinstatement of context in one half of the subjects. Again, the results failed to show a same-context advantage, even for those who, when recalling the list in the same room where they previously learned it, were explicitly told to use context as a retrieval aid. Statistical analyses suggested that lack of power is not a probable cause for the absence of the effect. Implications for future research are discussed.

Nico Frijda, University of Amsterdam, The Netherlands

IS EMOTION A MODULE?

See attached sheet.

Daniel Gaonac'h
Universite de Poitiers, Poitiers Cedex, France

**READING STRATEGIES
WHEN PROCESSING AN ANALOGY IN AN EXPOSITORY TEXT**

Analogical structures are frequently used in expository texts. Several studies, mainly focusing on the structural bounds between source domain and topic domain, show their role in the acquisition of new knowledge (Gineste, 1984; Vosniadou & Schommer, 1988; Gentner, 1989).
The present research aims to study some characteristics of the cognitive processes used by subjects reading an analogy in an expository text (spirit distilling, in analogy with rain making). the allocation of reading times between different parts of the text was used as an indicator of these processes.
In a first step, half of the subjects (A) were presented with a text on the source domain (rain); the other half (B) had to read a text without any bearing on the source domain. All these subjects were then presented with the same text on the topic domain (spirit distilling).
The main results are as follows:
- more time is allocated by subjects in condition A for reading the elements of the topic domain implicated in the analogical structure;
- but these subjects read more rapidly the remaining elements of the topic domain, presented as an application of the analogy.
These effects can be modified by the presence of linguistic marks related to the importance of some elements in the analogical structure.
It is concluded that the preliminary explicit presentation of the source domain leads the A subjects to reactivate the corresponding knowledge when processing the topic domain text. This activation is at first costly, but is then efficient for processing the end of the text.

J. E. Garcia-Albea & R. M. Sanchez-Casas
Universidad Complutense de Madrid Spain

SYLLABLE MONITORING TASK: HOW DO THE SUBJECTS RESPOND?

Results obtained from recent experiments using a syllable monitoring task in both French and Spanish (Cutler, Mehler, Norris & Segui, 1986; Sanchez-Casas, Bradley & Garcia-Albea, 1986) have shown that subjects detect targets which correspond to the initial syllable of the word (e.g. pa in paloma, or pal in palmera) faster than those that do not (e.g. pal in paloma, or pa in palmera). This and similar findings hae been put forward as evidence to support the proposition that the syllable acts as the unit into which the speech signal is segmented in order for lexical access to take place. The series of Spanish experiments presented in this paper have focused on both the finer grain aspects of this claim, specifically the pre-lexical nature of the syllabification effects, and on the task itself. Thus in addition to the standard manipulation of the syllabic status of the target, these experiments examined the role of word frequency and lexicality in the subjects' response, and investigate whether the

distractor items may influence the way the task is performed. While the results obtained seem to support the pre-lexical nature of the subjects' monitoring responses, they provide some evidence which suggests that the task can be performed in different ways, only one of which involves syllabic structure.

John M. Gardiner & Rosalind I. Java
City University, London, England

MEASURES OF MENTAL LIFE: REMEMBERING vs KNOWING

In this paper we describe experiments in which memory for the presentation of a word in a study list is measured by whether, at test, the word evokes some specific conscious recollection of its prior occurrence ("remembering"), or evokes no such experience, only an awareness of familiarity ("knowing"). In recognition tests, these measures of mental life give rise to clearcut dissociations. For example, unlike measures of remembering, measures of knowing show little evidence of forgetting over retention intervals ranging between minutes and weeks. In implicit word completion tests, these measures reveal that even though test instructions do not engage conscious recollection, many words evoke recollective experiences, or feelings of familiarity. Fewer words evoke recollective experience, however, than when the same test lists are given with explicit recall instructions. These measures are interpreted by a theoretical framework that combines certain processing views with the distinction between episodic memory and other memory systems.

H.-G. Geissler, University of Leipzig, DDR

TIME CODE INVARIANTS OF MENTAL ACTIVITY: A BRIDGE BETWEEN BEVIORAL AND PHYSIOLOGICAL OBSERVATIONS?

Wherever inquiry is directed toward relating rows of psychological and corresponding rows of psychophysiological observations, time and temporal dynamics serve as natural vantage points. However, despite a large body of facts accumulated on this basis, no convincing theoretical rationale have emerged which go beyond correlative statements. This paper attempts to contribute to this ultimate goal by representing regularities of temporal organisation as deduced from psychological data in terms of fundamental traits of brain processes. Specifically, this is accomplished by interpreting a time quantum model (TQM, cf. Geissler, 1987) in a language of time delays within self-organising networks.
This TQM reinterpretation ties in with ideas of the early 1960s (e.g. MacKay, 1962; Geissler, 1964). Within this framework the time quantum T_o of about 4.5 ms corresponds to an elementary delay module from which any longer delays are built (MacKay, 1962). The reinterpretation goes beyond this primitive by assuming (a) a functional mode of the brain where integer multiples of T_o are dealt with as smallest integral delays, and (b) variable operative lengths N_q of chains of integral delay time units active as functions of task and stage of processing. N_qs are constrained by upper bounds M_q according to $N_q \quad M_q$. As a stronger hypothesis $M_q = M \quad 30$ is proposed to hold.
The following implications for psychophysiological issues are discussed: (1) on a level of smallest behaviorally significant potential units (Bartsch, 1990) there is a minimum time shift of T_o between every two such "sub-potential units" which correspond to each other at topologically adjacent sites; (2) there is a fastest rhythm with the hypothetical cycle time of $2T_o$, i.e. about 9 ms, at the bottom of oscillatory activity within the cortex. Further implications concern psychophysiological correlates of (syntactical) TQM rules of temporal organization. The concepts of stability, merging and separability of systemic oscillations lead to conclusions about (3) the alpha band conceived of as a spectrum of nine stable frequencies within the range of $1 / 16 \times T_o$ and $1 / 30 \times T_o$; (4) STM capacity limitation caused by phase capturing (Lebedev, 1982) and the structure of alpha spindles; (5) a hierachy of band structures within the range of $8T_o$, i.e. about 37 ms, and $2T_o$, i.e. about 9.4ms. These consequences are claimed to apply to both spontaneous EEG and evoked potentials, the latter emerging as a result of outside-controlled syncronization.

Jonathan Grainger
Rene Descartes University, Paris, France

PRIMING LETTER RECOGNITION, PART 2: WORD AND NONWORD PRIMES

A series of experiments are reported that test whether the prior presentation of a letter in a word, nonword or flanked by lower case Xs facilitate the subsequent identification of this letter. Using briefly presented masked primes same letter primes facilitated processing in an alphabetic decision task (letter/non-letter classification). These effects were strongest when the letters were flanked by lower case Xs and were greatly diminished when embedded in random consonant arrays. Evidence for word-letter constituent priming was, however, only observed in certain specific conditions. Initial letters of words were subsequently facilitated when presented for identification either in the same physical location on the screen or in the same relative position in a string of hash marks. These facilitatory effects were significantly larger than the effects observed for the initial letters of consonant arrays. Position-specific coding of character arrays and the interaction of word and letter information are discussed in the light of these results.

Annette M.B. de Groot
University of Amsterdam, The Netherlands

BILINGUAL LEXICAL REPRESENTATION

A question that has directed bilingual research for more than 15 years is whether the bilingual's knowledge of the two languages is stored in two language-specific memory systems or whether it is somehow integrated in a single language-independent store. Part of the relevant research data suggest language-specific memory systems, whereas the remainder agree with a language-

independent view of representation. That the data do not converge on a single representational format may have several causes. One is that different tasks have been used which may tap different aspects of bilingual representation and processing. Another is that different types of materials have been used, e.g. concrete vs abstract words, and cognates vs noncognates. The storage format may well vary with what it is that is being represented. The purpose of this paper is to present an overview of the various tasks and stimulus materials that have been used in this research area, and to relate these to the data that have been obtained and the conclusions to be drawn from them.

Nigel Harvey
University College London

LEARNING TO CONTROL THE BEHAVIOUR OF A DYNAMICAL SYSTEM

A judgemental control task was framed as a problem of medical decision making. In three experiments, the same recursive system was used to simulate sequences of diagnostic indices emanating from patients. The control parameter of the system was initially set so that these indicators fell outside a target range corresponding to health. Subjects were told to bring them into the target range by specifying the dose of a drug that altered the value of the control parameter. Each subject made a sequence of ten prescriptions for each patient and treated eight patients in all. In Experiment 1, initial setting of the control parameter for each patient produced indices that were consistently above or consistently below the target range. The size of the deviation from the target range varied across patients. In Experiment 2, initial setting of the control parameter for each patient produced indices that alternated between being too high and too low. As before, the size of the deviations from the target range varied across patients. In Experiment 3, four patients drawn from Experiment 1 and four drawn from Experiment 2 were treated in a random order. Control performance improved over the eight patients in Experiments 1 and 2 but did not do so in Experiment 3. I will argue that subjects could have used the same cues to formulate control responses in the first two experiments but that results from the last experiment suggest that they did not do so.

Tore Helstrup
University of Bergen, Norway

**MEMORY FOR SIMPLE ACTION EVENTS:
THE IMPORTANCE OF THE VERB-NOUN CONNECTIVITY**

Some problems with replicating memory for performed action observations have suggested that there may be systematic inter-item differences. One of this is verb-noun connectivity. Standard subject-performed tasks are described by combinations of verbs and nouns, e.g. cut bread, bounce a ball, break a toothpick. For some items the predictability of one word given the other is low, for other items high. Experiments have shown that the probability of getting a primacy effect is low for low connectivity items, which only produce recency effects. High connectivity items, however, yield both types of serial position effects. Recent experiments have examined memory for low and high connectivity items under performance and non-performance conditions. The results are discussed in terms of strategic and nonstrategic interpretations of action memory.

L. Henderson, C. Lueck, C. Kennard & T. Crawford
The London Hospital Medical College and
Hatfield Polytechnic, U.K.

**TOWARDS AN INFORMATION PROCESSING ACOUNT
OF IMPAIRED SACCADES IN PARKINSON'S DISEASE**

Fast movements in Parkinson's disease (PD) exhibit a characteristic abnormality in which the action is accomplished by a faltering sequence of miniature steps (multistepping). There are some similarities between these abnormalities in the oculomotor and somatomotor systems. We have conducted a number of studies of saccadic eyemovements in PD using only mild-to-moderately impaired patients in whom the saccadic deficit can be shown to be highly selective. In these patients, only the metrics of the saccade are abnormal. Latencies and peak velocities do not appear to differ from those found in age-matched control subjects. By manipulating the stimulus and instructional conditions used to elicit saccades it is possible to construct a detailed description of the basis of the Parkinsonian abnormality. While the "reflex" saccades summoned by a novel peripheral stimulus are usually spared, the automatic/voluntary distinction does not provide a satisfactory account of the data. We have also been able to reject the theory that subjects with PD have a peculiar difficulty in uncoupling attention from the point of fixation. We shall discuss some theories that remain in contention.

Graham Hitch, Peter Walker & Tracey Porter
University of Manchester, Lancashire Polytechnic, U.K.

**SIMILARITY EFFECTS IN SHORT-TERM VISUAL MEMORY
FOR SPATIAL LOCATION**

In a simple test of short-term memory a series of coloured stimuli was presented at different spatial locations. Immediately afterwards, subjects tried to remember the spatial location of a probe item which was shown in white at a separate location. The visual nature of the memory used in this task was explored by manipulating the similarity of the colours and shapes of the stimuli, and by comparing the performance of adults under articulatory suppression and children young enough not to have developed verbal recoding strategies. Adult subjects under suppression were sensitive to shape similarity but not colour similarity. This confirms that the information is coded visually, and suggests that colour, shape and location are not represented in a symmetric fashion. Data from children will be discussed in terms of whether it provides converging evidence on the nature of representations in short-term visual memory.

Joachim Hoffman
Max-Planck-Institute for Psychological Research, Munchen

RESPONSE PREPARATION AND THE ANTICIPATION OF EXTEROCEPTIVE FEEDBACK

In the continuous stream of our daily behavior we generally react rather promptly, effortlessly, and suitably to steadily changing conditions. This is presumably due to an ability to predict the behavioral demands we have to face in the future. Consequently, we are often prepared to act even before the corresponding behavior is really demanded. But, what does it mean, to be prepared to realize a certain behavior? What components of the expected behavioral control are included in the preparation and what effects do they have?
Experiments will be reported which were designed to elucidate the effects of anticipating a behavioral outcome on preparing for the corresponding behavioral act. Our subjects prepared for two simple finger-responses. The effect of response preparation was measured by the acceleration of the response onset in comparison to unprepared responses. The two responses to be prepared "produced" either the same visual or the same acoustic feedback, or they "produced" different feedbacks, one visual, and the other acoustic. We found that responses could be relatively more effectively prepared if they "produce" the same rather than different feedbacks. The effect of this variable becomes weaker as training of the responses proceeds.
The results suggest that the anticipation of external stimulus conditions, which results from executing a behavioral act, is an important component of the readiness to execute this specific behavior, at least as long the behavior is not sufficiently trained. Possible consequences of such a coherence between anticipating a behavioral outcome and the efficient preparation of the corresponding behavior on learning-dependent formation of behavioral classes are discussed.

J.L. Jackson, S. Dijkstra, A. Erbrink
Institute for Experimental Psychology
University of Groningen
&
J. LeCoultre
Conservatorium Groningen

VIOLIN LESSONS AT 60+: A NATURAL HISTORY EXPERIMENT?

As the number of active retired persons in our society continues to grow, so too does the demand for different types of activity. It is therefore perhaps not surprising that the Music Academy in Groningen should pose the following question: Is there any point in persons over 60 years beginning violin lessons? And if so, do they need a special type of instruction? Moreover, since we are forever being encouraged to test out our theories in real life situations, it seemed an admirable topic to explore.
The psychological literature was not, however, very encouraging: in laboratory learning tasks the elderly, at best, require more trials than younger persons to reach a set criterion; the elderly experience more difficulties with motor behaviour; and age differences increase substantially as tasks become more complex. Violin playing is certainly a complex skill involving many components which may be susceptible to the effects of ageing, but learning to play an instrument also involves factors such as innate musical ability, motivation and hard work. Would such factors compensate for other possible age deficits and allow the elderly to perform as well as the younger pupils?
This paper will describe a one-year observational study involving nine beginners, three aged 8-9 years; three aged 24-26 and three older than 60 years. Discussion of the results will highlight the difficulties involved in such an enterprise, but will also show that progress is both possible and enjoyable, irrespective of age group, provided motivation is high enough.

Arthur M. Jacobs
Rene Descartes University, Paris, France

PRIMING LETTER RECOGNITION, PART 1: ISOLATED LETTER PRIMES

An alphabetic decision task was used to study effects of form priming on letter recognition at very short SOA's. The experimental findings showed clear facilitatory effects of primes being either physically or nominally identical to the targets, with a stable advantage for the former. It also came out that in the absence of name identity, visually similar primes facilitate processing of a subsequent letter stimulus more than visually dissimilar primes. The alphabetic decision task proved to produce sensitive and stable priming effects at the feature, letter and response choice level. The present results on letter-letter priming thus constitute a solid data base against which to evaluate other priming effects possibly involving top-down mechanisms, such as word-letter priming (cf. Grainger, Part 2). The results are discussed in the light of the interactive activation model of letter and word recogniton (McClelland & Rummelhart, 1981) and other continuous activation models of human information processing (Eriksen & Schultz, 1979).

Robert J Jarvella and Leila Kalliokoski
University of Umea, Sweden

ON RECOGNIZING WORDS IN TEXT BEFORE YOU SEE THEM

Words are shown to be recognizable in context before their printed forms become fully visible. In Exp.1, words made visible using a gating paradigm were correctly guessed in text after 30%-50% of their word-initial letters, depending on semantic predictability. In Exp. 2, a word-monitoring task was used and text presented via a self-advancing moving-window. By momentarily reducing the input rate during presentation of a target word, the word's point of recognition was shifted to the left, prior to word offset. Neither of two hypotheses tested concerning how much word-initial information should be needed for recognition was supported, however, and in Exp. 3, an identical shift in the point of recognition was observed when input rate was reduced just before, rather than during a target. Though words are thus

recognizable before they are fully seen, the results seem to point to contextual constraints on word recognition in reading operating at a delay from initial stimulus analysis. When input rate falls off, the reader's interpretation overtakes the visual process, and textual constraints help drive it.

R. Job, R. Nicoletti, R. Rumiati & F. Peressotti
Universita' di Padova, Italy

PROCESSING GLOBAL AND LOCAL INFORMATION: WHAT'S LEFT OF THE UNATTENDED LEVEL?

In this paper we address the issue of the time course of information of the unattended level in processing global and local information. In the past, empirical data have been obtained showing that the global level enjoys a superiority effect in perceptual processing (Navon, 1977) as well as in memory processing (Rumiati, Nicoletti & Job, 1989). While this effect has been repeatedly reported in the literature, its interpretation has given rise to some controversy, since some authors attribute it to a temporal precedence of the global level processing, while other claim it arises at post-perceptual level. Three experiments are reported in which we tested which information, if any, was still available to subjects once they had performed their task, on the assumption that accuracy in performance would reflect the degree to which different kinds of information (i.e. local and global) were available to the memory system. In all the experiments compound stimuli were used, consisting of large capital letters formed by small capital letters. The letters were either F or H and when they were the same at both levels the stimulus was said to be consistent, while when they were different it was said to be inconsistent. The experimental situation required a primary task, in which attention was focused on only one level, and an occasional secondary task, in which subjects were required to report which letter had appeared at the unattended level. In Experiment 1 the primary task was a same-different task to successively presented, masked stimuli. In Experiment 2 and 3 an identification task was employed, the former with masked stimuli and the latter with unmasked stimuli. In the first two experiments the usual global precedence effect was obtained in the primary task. This is to say, the subjects' response pattern showed a) faster response times when attention wsas focused to the global lebvel and b) longer response times to inconsistent stimuli when attention was focused to the local level but not when focused on the global level. Futhermore, Results showed that at the time of the secondary task global but not local information was available in both Experiments. In Experiment 3, on the other hand, in which unmasked stimuli were used, no global superiority effect was found either in the primary or in the secondary task. In particular, in the latter task both types of information were equally available. The pattern of results of the primary task accords well with a temporal precedence of global over local information, and the consequent greater availability of the former type of information when stimuli are presented with time limitation and/or are masked (Experiments 1 and 2) but not when enough time has been allowed for stimulus processing (Experiment 3). The pattern of results of the secondary task lets us conclude that in the memory system most information is available from the unattended level when it regards global information but that little is left when local information is concerned. The data here reported are analyzed with respect to the temporal relationship between perceptual and memory processing, and are discussed with reference to current models of information processing of visual forms.

Gregory V. Jones
University of Warwick, U.K.

Maryanne Martin
University of Oxford, U.K.

EVERYDAY MEMORY FAILURE AND ITS ORIGINS

What factors determine those aspects of their everyday environment which people can successfully remember and those which they fail to remember? A series of experiments were carried out to examine people's memory for information to which they had been exposed on many occasions in everyday life. Some of the experiments were concerned with coins. For these, discriminativeness, meaningfulness, redundancy, and identifiability all appeared to be important in determining what can and cannot be recalled. Further experiments examine memory across a range of different aspects of the everyday environment and a range of different groups of individuals.

R.J. Jorna, D.M. Mietus & J.L. Simons
Faculty of Management and Organization, University of Groningen
Groningen, The Netherlands

COGNITIVE STRATEGIES IN SCHEDULING NURSES; AN ANALYSIS OF KNOWLEDGE COMPONENTS FOR BUILDING EXPERT SYSTEMS

It is a well known fact that the scheduling of nurses in hospitals is boring as well as complex. It is boring because of the counting and recounting activity and it is complex because scheduling is an optimalization problem in which various constraints have to be fulfilled. This combination of characteristics makes it a very interesting object for implementation in an expert system. However, there seems to be no elegant algorithm by which all the aspects of nurse scheduling can be captured.
In the DISKUS-project (Dynamic Interactive Scheduling and Knowledge Utilization System) we distinguished two dimensions in the scheduling procedure. The first dimension concerns the organization which consists of three levels: an operational level, a tactical level and a strategic level. The other dimension is called the knowledge dimension which implies the analysis of a cognitive task. This paper will only be concerned with the analysis of the cognitive task.
We will present research that has been conducted in several hospitals. After interviewing the schedulers, by which means we obtained the entities and relations of the conceptual framework, we presented the schedulers with a test problem schedule. We consider this procedure to be a form of knowledge elicitation. The schedule was derived from the real situation in one hospital. One scheduler made this schedule with real names, whereas five other schedulers worked with fictitious names. The reason for this distinction is that we wanted to find out the influence of

personal knowledge on general scheduling strategies. The other aspects we were interested in were the constituent steps in realizing a schedule, the frequency by which administrative information was consulted and the ranking of staff at the start of the scheduling procedure.
The first results indicate that schedulers differ in the size and order of the scheduling steps. Although each scheduler started with the same entry conditions, the resulting schedules varied enormously. In a certain way this can be explained by considering each step to be a script in which a script is a fixed procedure. This does not mean that making the whole schedule is one script; scheduling is a dynamic decision situation. We consider the scheduling process to be a pattern in which schedulers store the outcomes of several routes that might be taken in realizing an acceptable schedule. We will discuss our results in the light of the theories of Schank & Abelson (1977) and Schank (1988).
The final intent of the DISKUS-project is to deliver an expert system which takes into account the flexibility in scheduling procedures. The first prototype will be delivered at the end of May 1990. This prototype will be tested in interaction with the schedulers in order to increase the performance of the system. This will be done, among others, by giving the expert system the same problem schedule the schedulers made before. A demonstration of the expert system will be shown at the conference.

Alan Kennedy
University of Dundee

Joel Pynte
University of Provence

and

Thierry Baccino
CER-IBM, La Gaude

SPATIAL CODING OF WORD POSITION IN TEXT DURING MOUSE OPERATIONS

In previous work, examining eye movements during the reading of single lines of test, we have established that fluent readers make use of a form of "spatial coding". The spatial code allows for the rapid re-inspection of selected words when this is called for. The present study seeks to extend the notion of spatial coding to the task of on-line editing, where an operator may need to locate and modify a word located several lines above or below the current point of inspection. The situation in which the operator makes use of a mouse to carry out such editing functions is particularly interesting, since it is possible to examine the accuracy of movements and also to ask whether the target co-ordinates are programmed in advance.
Subjects read passages of text, presented as multi-line displays on a screen. Each text was presented twice and two conditions compared: (1) Spatialised, in which words in the two successive presentations occupied identical absolute screen locations; and (2) Non-Spatialised, in which absolute screen position changed from one presentation to the next. In both cases, the relative spatial location of words was preserved. After the second presentation, with the text no longer visible, a target word appeared at the foot of the display. The subjects' task was to move the mouse from the target word to the screen-location of that word in the second text presentation. The results suggest higher accuracy in the Spatialised condition. In addition, analysis of movement trajectories indicates that the correct direction is established during the first 100 msec. No differences were observed between Spatialised and Non-Spatialised presentations in a control condition using synonyms of text words as targets.

Ruth Kimchi
University of Haifa, Haifa, Israel

CATEGORIZATION AND PART-WHOLE PERCEPTION IN CHILDREN

Concepts seem to be organized into taxonomies varying in inclusiveness and abstraction. For taxonomies of common objects and organisms, the basic level of abstraction (the level of table, car, bird, etc.) has been proven to be more informative than levels either superordinate or subordinate to it (e.g. Rosch, 1978). Young children too are able to form basic level categories. Tversky & Hemenway (1984) argued that the convergence of a wide variety of measures on the basic level is due to part configuration. The centrality of parts to the determination of the basic level of categorization suggests that parts should play an important role in the formation of basic levels categories by very young children. However, there is a prevailing claim that young children do not attend to parts, but rather, simply treat objects as integral wholes (e.g. Kemler, 1983).
The present study tried to investigate directly the relation between children's ability to form basic level categories and their part-whole perception. Preschoolers, first- and second-graders performed three tasks: 1) a classification of basic level objects; 2) a classification of parts of basic level objects; and 3) a part-whole matching which required matching a part to the appropriate basic level object. The choice of the basic level objects and parts followed the data collected by Rosch et al., (1976) and Tversky & Hemenway (1984). The object classification task was made a bit more difficult than the oddity task used by Rosch et al., in order to get more variability in the performance of the young children. The results indicated that performance in all three tasks improved with age: The preschoolers' performance was inferior to that of the first- and second-graders. Furthermore, preschoolers' performance in the classification task was highly correlated with their performance in the part-whole matching task. The relevance of these data to theories of children's categorization and part-whole perception is discussed.

Andreas Knapp
Johannes Gutenberg University
Henry C. Ellis
University of New Mexico

EFFECTS OF ENCODING DEMANDS AND MOOD ON PROBLEM SOLVING IN A RESOURCE DILEMMA TASK

This study examined the interactional impact of task difficulty and intensity of induced mood on problem solving performance in a resource dilemma task. In a first part of the experiment, either a sad mood, or no particular mood, was induced. Mood was induced in half the subjects by requiring them to free associate to a slide, and in the other half by having them read a story. This manipulation was intended to vary the capacity absorbed by the induced mood. Shortly thereafter, a new experimenter, blind to

the condition subjects were in, asked subjects to solve a resource dilemma as part of a second, supposedly unrelated, experiment. The difficulty and therefore the encoding demands of this dilemma task was varied by manipulating the extent to which resource propagation lagged behind resource harvesting, increasing the difficulty of identifying the harvest-propagation function. The significant interaction found among the effects of mood state, induction technique, and task difficulty confirmed the prediction that as strength of induction technique increased, preempting more capacity, capacity available for allocation to the criterion task decreased. Thus performance on the resource dilemma depended not only the difficulty of the task, but also on the strength of the induction technique.

R. Kolinsky, N. Martin & J. Morais
Universite Libre de Bruxelles, Belgium

LETTER MIGRATIONS: THE EFFECTS OF RELATIVE POSITION AND LEXICAL STATUS OF THE ITEMS

Previous studies of the letter migration phenomenon have yielded conflicting results as regards to the influence of the lexical status of the items. Thus, Treisman & Souther (1986), found no clear effect in a detection task using four-item displays; whereas McClelland & Mozer (1986), obtained a strong effect with an identification task and two-item displays. In this study, we used both a detection and an identification task and two-item displays. On each trial, one item was presented on the left side of the display and the other on the right. We observed a strong and previously unreported effect of the relative position of the items. Letter migrations occurred only when the illusory item could be created by combining the initial letter of the left-side item and the final letters of the right-side item. It appears that letter migrations do not arise directly from the erroneous combination of free-floating letters. As far as the influence of the lexical status of the items is concerned, we observed many more letter migrations when the items were pseudo-words than when they were words, in either task. Moreover, no migrations between words (as measured by d') occurred in the detection task. These results suggest that words do not undergo an internal analysis into letters during recognition, at least not as much as pseudo-words do. We contrast these findings with both Treisman's and McClelland's models of simultaneous visual word processing.

Asher Koriat
University of Haifa, Haifa, Israel

THE EXTRACTION OF TRANSFORMATIONAL INVARIANCE OVER SUCCESSIVE VISUAL EVENTS

Recent findings from the study of mental rotation will be reviewed, suggesting that an incoming visual stimulus is automatically screened for the possibility that it represents a transformational variant of the preceding stimulus. These findings imply a distinction between two transformational processes for recovering the identity of disoriented stimuli: an uprighting process in which the stimulus is imagined to rotate to the upright and then matched against its canonical representation in long-term memory, and a backward alignment process in which the stimulus is imagined to rotate into congruence with the short-term visual trace of the preceding stimulus, and thus "identified" with it. The results suggest that the two types of transformation compete, so that the response is determined by the process requiring the shortest transformational path. Some qualitative differences between the two processes will be outlined, based on tasks requiring reflection decisions on alphanumeric characters, and the identification of single and multi-element stimuli at different orientations.

Shulamith Kreitler and Hans Kreitler
Tel Aviv University, Israel

WHAT MAKES AN ANSWER RELEVANT TO A QUESTION ?

The paper deals with the problem of judging relevance of answers to questions. The empirical study was based on the system of meaning developed by Kreitler and Kreitler for characterizing and assessing meaning. The differet concepts developed within this framework include Referent, the carrier of meaning, Meaning Dimensions, the general categories of content used for characterizing the content of the expressed meaning, and Meaning Values, the actual specific content used for expressing or communicating meaning. The subjects' task was to judge the relevance of answers to questions, whereby the presented answers and questions consisted of systematic variations of referents, meaning dimensions and meaning values. Analyses of variance showed that the largest main effect was the factor representing the relations between the referents in the questions and in the answers. Implications for relevance in general and thinking in particular are discussed.

E. Ladavas, D. Cimatti, S. Della Sala & C. Trivelli
Dip. di Psicologia, Universita di Bologna; Centro Medico di Riabilitazione di Veruno, Italy

SELECTIVE VISUAL ATTENTION IN PATIENTS WITH FRONTAL LOBE LESIONS

The possibility of using both central cues and peripheral markers for directing attention towards a specific location has led to the important distinction between voluntary versus automatic control over covert movements of attention. Jonides (1981) proposed that peripheral markers can automatically capture attention much as they could automatically elicit an eye movement toward the location where they were presented. By contrast, central cues seem to initiate voluntary shifts of attention and do not automatically draw attention to the cued location.
The aim of the present study was to verify whether patients with a frontal symptom had a deficit in directing voluntary attention to a specific spatial location, as well as a normal performance when they automatically draw attention to peripheral stimuli. Patients with frontal lesions and without frontal syndrome and control patients with right hemisphere lesions were presented in the two visual fields with two vertically aligned square boxes.

In the voluntary attention experiment (central cues) the subjects deliberately allocated attention to each one of the four boxes prior to the presentation of the stimuli. On the contrary, in the automatic attention experiment (peripheral cues) the attention of the patients was automatically drawn to the cued location prior to the presentation of the stimuli. The experiment comprised three possible stimulus conditions: neutral, valid and invalid (see Posner's basic paradigm for the description of the experiment). The patients were instructed to press the bar of the computer when the stimulus ("X") appeared on the screen.
The results of the present study showed that patients with a frontal syndrome were unable to voluntarily direct attention to a specific spatial location. In fact, in the voluntary attention experiment (central cues) they were significantly slower and less accurate (more omissions) than controls (patients with frontal lesions without frontal syndrome and patients with right hemisphere lesions). On the contrary, in the automatic attention experiment (peripheral cues) there was no significant difference between the percentage of omissions in the three groups. However, the patients with frontal syndrome made more false alarms than controls and this pattern of results appear only in the peripheral cues conditions.
In conclusion, these results seem to suggest that patients with frontal lobe syndrome have a deficit in the selective aspects of attention because they cannot voluntary attend to a specific spatial position and also are unable to suppress the tendency to respond to the peripheral cue.

Steen F. Larsen
University of Aarhus, Denmark

A BASELINE FOR FLASHBULB MEMORIES

Vivid memories of the circumstances when one heard shocking news have been called flashbulb memories, implying that they are permanent and accurate. Research over the past dozen years indicate that the permanence and accuracy of (putative) flashbulb memories is less than complete. However, it is still under debate whether such memories are quantitatively and qualitatively so different from ordinary memories that a special mechanism is required for explaining them. But so far, it has not been made clear which "ordinary memories" would constitute a proper baseline for evaluating flashbulbs. All previous experiments in which accuracy can be examined have been case studies of extraordinary events, like memories of hearing that President Kennedy had been assassinated or that the Challenger space shuttle had exploded. This paper argues (1) that flashbulbs should be compared with memories of hearing mundane, everyday news, and (2) that memory of the news event itself should be investigated in addition to memory of the circumstances of hearing it (the news context, including the source of the news story).
The results of a diary study of my own memory of ordinary news (retention interval 1-11 months) show that memory of the news context could not be detected, neither in cued recall nor in recognition, after about 3 months; there was complete "source amnesia". Therefore, any memory of the circumstances of receiving news seems a departure from the ordinary. Furthermore, whereas the news context in flashbulb memories is apparently as well or even better remembered than the extraordinary news event itself, ordinary news in the present study exhibited the reverse pattern: the events were remembered far better than their contexts. This was the case even for two very remarkable and dramatic news items in the data, the shooting of Olof Palme and the Chernobyl disaster. Even though partly inaccurate and subject to forgetting, flashbulbs may thus call for a special explanation, if not necessarily a special-purpose mechanism.
The data indicate, finally, that rehearsal (thinking or talking about the news) is the most potent determinant of memory of ordinary news events, but that it does not affect the corresponding news contexts. This suggests that the qualitatively different pattern of memory found in flashbulbs may result from a redirection of rehearsal towards the context in which personally shocking news is learned.

A. Laudanna, O. Borelli, Istituto di Psicologia CNR Rome, Italy
& A. Caramazza, The John Hopkins University, Baltimore, USA

THE TIME COURSE OF ACTIVATION OF MORPHOLOGICALLY AND ORTHOGRAPHICALLY RELATED WORDS

The time course of morphological and orthographical structure activation was evaluated in three lexical decision experiments. For this purpose, both priming and repetition priming paradigms were used. We assessed the time course of activation of morphologically related words vs. stem homographs (words containing stems which are orthographically identical but semantically and grammatically different) vs. orthographically similar words.
The results show that whereas there are both inhibitory and facilitory effects of stem homographs and morphologically related words, respectively, at very short interstimulus intervals (e.g. Laudanna, Badecker & Caramazza, 1989), the only repetition effects for larger delays are the facilitatory effects for morphologically related words. The activation curves of both morphologically related words and stem homographs were compared with the activation curve of orthographically similar words. In both comparisons different patterns of activation were found.
The implication of these results is that morphological and orthographic structure of words constitute distinct sources of lexical activation and play functionally different roles in the lexical processing system.

Georgije Lukatela
University of Belgrade, Yugoslavia

DO THE EARLY BOTTOM-UP PROCESSES IN ENGLISH AND SERBO-CROATIAN WORD RECOGNITION DIFFER QUALITATIVELY OR QUANTITATIVELY?

We focus on certain difficulties we have with the contemporary understanding of how words are identified. The most commonly held view seems to be that phonological factors may play a limited, even negligible, role in the perceptual processes leading up to the identification of a word. This view is shaped almost entirely by research with English. A large body of research with a

different language, namely, Serbo-Croatian, suggests that phonology's role is central. If the received view is correct, then the Serbo-Croatian data must be looked at as anomalous, reflecting an unique orthography. It might, however, be the case that there is in fact nothing anomalous about the Serbo-Croatian data. Perhaps they look contrary because the Serbo-Croatian orthography provides a unique opportunity to isolate phonology's central role - a role that is frequently obscured, for as yet unknown reasons, in research with English materials. By this line of argument, in the present work, an understanding is sought of the differences and similarities between the data obtained with English and those obtained with Serbo-Croatian, with an eye to developing a single account of word recognition that would accommodate both orthographies. The present experimental data look promising to our endeavor.

Stephen J. Lupker
University of Western Ontario, Canada

Lucia Colombo
University of Padua, Italy

ORTHOGRAPHIC/PHONOLOGICAL SIMILARITY EFFECTS: AN EVALUATION OF CURRENT MODELS

For most of the past 15 years, phonologically/orthographically similar primes have been thought to facilitate target processing (Hillinger, 1980; Meyer, Schvaneveldt & Ruddy, 1974; Shulman, Hornak & Sanders, 1976). Generally, the explanations for these effects have been based on some sort of spreading activation process between nodes for the prime and target in lexical memory. More recently, it has been demonstrated that those same types of primes and targets can produce reliable interference effects as well (Colombo, 1986). As Colombo also reported, these effects seem to depend on target frequency with high frequency targets showing more tendency toward interference and low frequency targets showing more tendency toward facilitation. Colombo explained her results in terms of an inhibitory process that occurs during prime processing and which is directed mainly at high frequency orthographic neighbors. Since that time, a number of alternative explanations for the two effects have been proposed (Lukatela & Turvey, 1990; O'Seaghdha, Dell, Peterson & Juliano, 1989; Segui & Grainger, 1990).
The present studies were directed at an evaluation of the O'Sheaghdha et al. model. This model is based on the notion of two competing effects, a facilitation effect based on orthographic similarity and an interference effect based on phonological similarity. That is, orthographic similarity facilitates processing in a typical spreading activation fashion, while phonological similarity interferes with processing because the phonological processing of the target reinstantiated the episodic code for the prime. The result is a phonological competition between prime and target. At a general level, this model is essentially a time based model. That is, the facilitation and interference components have different time courses which allow for opposite results with high versus low frequency targets. It is also a general model of word identification and, thus, its predictions should be quite independent of the nature of the target task.
In the present experiments, a rhyming relationship between prime and target was used and both prime-target onset asynchrony (SOR) and the nature of the target task (lexical decision or naming) were manipulated. The lexical decision task results were entirely consistent with the O'Sheaghdha et al. model. That is, the results showed the predicted pattern of facilitation and inhibition as a function of target frequency and SOR. However, the same pattern was not found in the naming task, suggesting that this model is more a model of lexical decision making than a model of word identification.
While this pattern of results is even more at odds with the Segui and Grainger (1990) proposal, the naming results are consistent with one of the basic premises of the Lukatela and Turvey (1990) model. That is, in this model, the assumption is made that the naming and lexical decision tasks tap different processes. In general, the model suggests that the processes involved in naming a word are more likely to produce facilitation than the processes involved in a lexical decision task. Nonetheless, the Lukatela and Turvey model also appears to be problematic because it would seem to be somewhat inconsistent with the pattern of SOR effects observed in our lexical decision tasks. Thus, none of these models appears to be capable of accounting for the full pattern of results. Implications of the results for future development of these and other models are considered.

H. Marrero, O. Espino, E. Gamez, D. Castillo, I. Leon & L. Lentijo, Universidad de La Laguna, Tenerife, Spain

THE ROLE OF MENTAL MODELS OF SOCIAL INTERACTION IN SYLLOGISTIC REASONING

When people resolve a task, they build a mental representation of the resolution of that task as a kind of social interaction. The task resolution (whether right or wrong) has an effect on their interpersonal relationship. In our view, this mental representation is like a mental model (Johnson-Laird, 1983), in particular a mental model of social interaction (Gamez, Marrero & Espino, in press).
In building this kind of mental model, people identify interpersonal relationships which they update when an interaction is happening.
In this study, subjects were required to resolve two kinds of syllogism: one showing premises which talked about the resolution as a social interaction (e.g. all people who solve syllogisms well are very intelligent). Here, the premise suggests that the activity of resolving syllogisms could increase the subject's comparative position in relation to the group of subjects resolving the same task. This means that in doing this task his interpersonal relationships change. The other kind of syllogism shows premises whose contents are neutral (e.g. all people who practice some sport are very healthy).
We predicted lower resolution times in the first kind of syllogism. The subjects use a mental model of social interaction. This mental model will help them in the comprehension of the syllogisms. In the paper we will present data related to this hypothesis.

Elizabeth A. Maylor
Age and Cognitive Performance Research Centre,
University of Manchester, England

ALCOHOL, PRACTICE AND ATTENTIONAL CONTROL

It has been traditionally assumed that factors such as old age, low IQ, and ingestion of alcohol, reduce total available attentional capacity, and that performance of tasks requiring automatic processing should be less adversely affected by such factors than performance of tasks requiring effortful processing (for example, Hasher & Zacks, 1979). Four alcohol experiments will be discussed involving: 1) visual search and word categorization, 2) perceptual judgement, 3) divided attention, and 4) text recall. The results demonstrate that the extent to which moderate amounts of alcohol adversely affect performance is not influenced by practice and does not depend upon the attentional requirements of the task.

Elke van der Meer
Department of Psychology, Berlin Humboldt University, GDR

KNOWLEDGE OF EVERYDAY CONTEXTS

This paper explores characteristics of everyday contexts (cf. Conway & Bekerian, 1988). Everyday contexts relate to event-concepts (e.g. CONCERT, WALKING) or 'scripts'for action.
Knowledge of this kind enables the individual to plan and regulate his social behavior. Across a number of paradigms (controlled associations, recognition times, retrieval) we have studied properties of everyday contexts. Ss appeared to have an well-defined and shared knowledge concerning the general properties of events. This knowledge is characterized by a medium level of abstraction. It seems to be activated automatically. Everyday contexts enable the individual to anticipate particular causes, conditions and outcomes. By means of recognition and priming paradigms we have studied mechanisms, especially pragmatic inferences (cf. Cheng & Holyoak, 1985), underlying such prospective and retrospective thinking processes.
Data from this research program and corresponding theoretical conclusions will be presented and discussed.

Sergio Morra
Universita di Padova, Italy

WHY, ANOTHER MODEL OF WORKING MEMORY?

Theories and models of short-term or working memory were generally aimed at identifying stores, mechanisms, components (each with a limited capacity and a short duration) of a storage system, generally assumed to be independent from long-term memory. Baddeley's construct of an articulatory loop, which can hold as much verbal material as can be uttered in about 1.5 sec, clearly illustrates this class of theories. In the seventies and eighties only a few theories, in which the concept of "activation" was basic, questioned the distinction between short-term and long-term memory stores (e.g. Anderson; Pascual-Leone; Shiffrin; and the PDP framework).
This paper aims at re-defining the concept of working memory within the framework of the Theory of Constructive Operators (TCO: Pascual-Leone & Goodman, 1979). In the TCO, it is assumed that cognitive units (called "schemes") can be more or less activated, and that a few general-purpose mechanisms (called "metasubjective operators") contribute to increase or decrease the activation of schemes. Schemes are broadly distinguished between figurative (representations of states of affairs) and operative (representations of procedures which allow the transformation of the states of affairs or their mental represetations).
It is suggested here that, in any short-term memory task, the recalled items correspond to those figurative schemes which are activated by metasubjective operators until the time of recall, plus those figurative schemes activated only by the stimuli presentation, whose activation has not yet decayed below a threshold at the time of recall.
It is suggested that "subsystems" or specialized stores exist in long-term, rather than working memory. It is also suggested that such constructs as the articulatory loop and the visuo-spatial scratch pad can be re-interpreted as specific operative schemes (i.e. mental procedures) for keeping track of the temporal order of words, or the spatial position of items. Such operative schemes share the capacity of the attentional resources (metasubjective operators) of the system, rather than being endowed with a capacity of their own. They yield improvements in performance not because they add capacity to the system, but because they allow a better strategic use of the available capacity.
It is implied that the experimental manipulations, such as dual tasks, variations in materials, interfering tasks, distractors, etc. can affect performance in two ways: either by subtracting resources from the system, or causing a more rapid decay of the activation of the relevant figurative schemes. A brief review of the literature illustrates how this conception can account for well-known and novel results.
A specific model of short-term recall of word lists is also presented. It is an extension of a model by Burtis (1982) for the recall of sets of consonants, consistent with the conception outlined above, and incompatible with the view of a time-limited articulatory loop.

Philippe Mousty and Paul Bertelson
Universite libre de Bruxelles, Belgium

HAND MOVEMENTS IN BRAILLE READING : THE EFFECT OF SYNTACTIC AMBIGUITY

The question to be discussed is how far the hand movements of braille readers are controlled by on-line processes of sentence comprehension. Eight blind readers, using their preferred hand, read the kind of structurally ambiguous sentences used by Rayner, Carlson & Frazier (1983) in their study of the effect of syntactic ambiguity on reading eye movements. These sentences (e.g. "The spy saw the cop with binoculars, but the cop did not see him") allow either a "minimal attachment" interpretation, in

which the prepositional phrase ("with binoculars") is a complement of the verb ("saw") or a "non-minimal attachment" interpretation, where the same phrase is a complement of the noun ("cop"). Each sentence has two versions in which the propositional phrase biases the interpretation towards either minimal attachment ("with binoculars") or mon-minimal attachment ("with the revolver"). Rayner & al. observed an increase of reading time per character in the biasing region of non-minimal attachment sentences, but none in minimal attachment sentences. A similar pattern obtains for overall time spent by the readinng finger of the braille readers on the different regions of the sentences. More detailed analysis of hand movements revealed however that the difference between the two types of sentences was due essentially to more time being spent on regressive movements in the critical region of non-minimal attachment versions. No difference is observed at the level of first-pass scanning speed. This result suggests that in braille reading local changes in comprehension difficulty do not affect forward scanning speed, and that the first type of adjustment that is resorted to consists of regressive movements.

Linda M Moxey and Anthony J Sanford
Department of Psychology, University of Glasgow
Human Communication research Centre
Universities of Glasgow and Edinburgh

A PSYCHOLOGICAL APPROACH TO THE MEANING OF QUANTITY EXPRESSIONS

Natural language quantity expressions are very common in conversation and expository discourse (from argumentation, rational or otherwise, through to the expression of expert opinion and advice). They include terms for frequency (often, rarely) and adjectival expressions (few, many, lots of). Because of their ubiquity in language, and their significance as depicting all kinds of states of affairs where uncertainty prevails, it is of interest to develop a psychologically-motivated account of how they are used. Ideally, we would like to know under what conditions a particular expression is used, and what range of effects the expressions can have on listeners.
In a set of studies to be reported, we have attempted to understand the functions of these words from a communicative and psychological point of view. Although the typical treatment of these expressions by psychologists has treated them as mapping onto a scale (so "few" might mean 10%, and so on), our data suggest that they carry out much more complex functions, conveying information about expectations, and manipulating the state of attention of people listening to them.
In the first set of experiments, we shall show that a range of quantifiers convey not just information about an amount being asserted, but also information about the expectations of the producer, and possibly information about producer's beliefs concerning the listener's beliefs.
In the second set, we shall show how some quantifiers contrast in the subsets which they make listeners think about. For instance, "Few MPs were at the meeting" tends to make people think about those who were not at the meeting, while "A few MPs..." makes people think about those who were.
In a further novel experimental procedure, these two functions are shown to combine to define preferences for one quantifier over another in some test scenarios where focus and expectation turn out to be important. Other possible dimensions of differentiation of a wider range of quantifiers are discussed, and a number of implications for social cognition are introduced.
It is cocluded that the multiple-function analysis reveals a new and psychologically important picture of the role of quantification in communication.

Edward Necka
Institute of Psychology, Jagiellonian University, Krakow, Poland

DETERMINED BY CAPACITY AND RETENTION CAPABILITY OF WORKING MEMORY

Contemporary conceptions of intelligence (Eysenck, Jensen, Vernon) describe general mental ability in terms of speed of information processing, measured by various reaction time tasks. It is argued that mental processes responsible for efficient thinking and intelligent behavior are performed by some central executive mechanism (like attention or working memory), with great amounts of information being processed at the same time. Speed of processing is conceived as a means of executing appropriate mental operations before the system is overloaded and loses necessary information. This line of theorizing, however convincing, has not yet produced any direct validation of the hypothesis that capacity of working memory is one of the relevant sources of individual differences on the behavioral and psychometric level. The paper presents results of two experiments in which subjects were given tasks to assess three parameters: (1) speed of information processing, (2) capacity of working memory, (3) and retention capability of working memory. The data suggest that there are at least three styles of being intelligent, based on different cognitive characteristics of an individual. Speed of processing is only one of them, and appears less important if other characteristics are better developed. The paper ends with the presentation of a cognitive model of intelligence as determined by formal characteristics of working memory.

R. Nicoletti & C. Umilta, Universita di Padova, Italy

SPATIAL COMPATIBILITY FOR DISCRIMINATING SINGLE LETTERS IN VISUAL LETTER STRINGS

When parietal patients are presented with centered word and nonword letter strings, they often show extinction for nonwords but not for words. This finding has been interpreted as evidence that spatial attention is used to organise visual input for nonwords but not for words (Sieroff & Posner, 1988). In contrast, Caramazza and Hillis (1989) have maintained that spatially coded internal representations are also used for processing words.
In the present study, we have addressed the issue of whether words produce a left-right internal spatial representation. We reasoned that if a left-right spatial compatibility effect is observed, it can be maintained that the representation of a letter string has been segmented into left- and right-side parts

(Nicoletti & Umilta, 1989).
In Experiment 1 subjects were tachistoscopically presented with 5-letter word or nonword strings. The task was that of pressing the left-side key if one target letter was shown in the string and to press the left-side key for the other target letter. The two target letters could appear in either the left-side or right-side part of the string. Response latency was the dependent variable. The results showed that target letters were processed differently depending on whether they belonged to a word or a nonword, as attested by the presence of a word superiority effect (497 ms for words vs 578 ms for nonwords), and a left-right scanning effect in the case of nonwords (561 vs 594 ms for nonwords and 498 vs 496 ms for words). In spite of that, there was a clear-cut left-right spatial compatibility effect for both words (31 ms) and nonwords (34 ms).
The procedure of Experiment 2 was identical to that of Experiment 1 except for the fact that now focal attention was explicitly mainipulated. That is to say, subjects were forced to focus attention on the middle position of the letter string. The results of this second experiment replicated those of the first. In particular, there was a word superiority effect (622 ms for words vs 723 ms for nonwords), and the left-right spatial compatibility effect was nearly identical for words (28 ms) and nonwords (34 ms).
It was concluded that the internal representations of both words and nonwords are coded spatially.

Lars-Goran Nilsson
University of Umea, Sweden

COMPONENTS OF IMPLICIT AND EXPLICIT MEMORY IN SUBJECT-PERFORMED TASKS

We have argued previously that subject-performed tasks (SPTs) and enacted memory in general involves both explicit and implicit memory components. The basis for this claim has up to now solely been a crude comparison between data patterns in SPT experiments and implicit memory experiments. We have now collected data in two experiments on enacted memory that provide more direct empirical evidence for this notion. The data obtained are discussed in relation to the finding that SPTs generally produces a higher recall performance than recall of verbal commands.

Leo G.M. Noordman
Tilburg University
&
Wietske Vonk
Max Planck Institute for Psycholinguistics
and Nijmegen University
The Netherlands

READER'S KNOWLEDGE AND THE CONTROL OF INFERENCES IN TEXT UNDERSTANDING

When reading a text readers construct a representation of the information in the text. That representation is not a linguistic, but a cognitive representation. Readers do not only process the information that is explicitly expressed in the text, but also information that the writer supposes the reader will compute from the text and that is therefore left implicit. The computation of the implicit information is achieved by means of inference processes. The representation that is constructed can be more or less coherent and complete depending on the amount of inferencing.
The question that has to be answered is which inferences are made on-line in text understanding and what factors control the inference processes. Inferences may be controlled by the costs and profits associated with them. The profits are a more complete or coherent representation; the costs consist in the cognitive effort they require. Therefore one may assume that the knowledge of the reader is an important factor in controlling the inferences. The more knowledge a reader has with respect to the topic of the text, the easier it will be to make inferences and the more inferences will be made. But if these inferences do require time, the paradox arises that readers who are experts with respect to the topic of the text engage in many more time consuming processes than non-experts. A number of experiments are conducted to investigate these issues. In some experiments two groups of readers are used: readers who are experts and readers who are novices with respect to the topic of the text. In other experiments the kind of inference is manupulated: inferences that can be considered as computations of new knowledge or as activations of available knowledge. The results are discussed in terms of cognitive economy in on-line processes.

Costanza Papagno
MRC Applied Psychology Unit
Cambridge, England
&
Giuseppe Vallar
Istituto di Clinica Neurologica
Milano, Italy

PHONOLOGICAL SIMILARITY AND LENGTH EFFECT IN LEARNING OF NOVEL WORDS

The investigation of a patient with a selective impairment of phonological short-term memory has recently provided evidence that this system may be involved in long-term learning of novel words, for which a pre-existing semantic representation is not available (Baddeley, Papagno and Vallar, 1988). The present series of experiments in normal subjects explores this hypothesis by assessing the effects of two variables (phonological similarity and word length), that reflect the operation of the phonological short-term store and the rehearsal system, respectively, upon paired associate long-term learning of auditorily presented words and nonwords. The first two experiments showed that phonological similarity effects more substantially novel word learning and, when a delay is interposed between presentation and recall, the disruptive effect is confined to this group of items. The third experiment revealed that with novel words, but not with known words learning is affected by word length. These results, together with neuropsychological evidence, suggest a role for phonological short-term memory in the learning of novel word material and have developmental implications for the study of language acquisition.

Thomas Pechmann & Gilbert Mohr
Universitat des Saarlandes, Saarbrucken, FRG

INTERFERRENCE IN MEMORY FOR TONAL PITCH: IMPLICATIONS FOR A WORKING MEMORY MODEL

The amount of interference by different kinds of stimuli for the memory of tonal pitch was studied. Subjects heard a series of two tones of 200 ms seperated by an interval of 5000 ms. The tones were either identical in pitch or differed by a semi-tone. Subjects had to decide whether both tones were identical or not. Six conditions were realized. In a control-condition no interfering material was interspersed between the two tones. In a second condition, six further tones of varying pitch were presented for 200 ms each. In a third condition, subjects heard six monosyllabic words. A fourth condition was identical with the third one, but subjects had to decide concurrently whether the last two words rhymed or not. In a fifth condition, subjects saw six partially filled 4x4 matrices. The last condition was identical with the fifth one, but subjects had to decide concurrently whether the last two matrices were identical or not.
The results demonstrate that tonal material produces by far the greatest interference effect, followed by the attended verbal material. Comparable error scores were obtained under the visual attended and verbal unattended condition which both differed significantly from the control condition. Under the unattended visual condition, subjects did not differ from the control condition.
These findings will be discussed in the framework of Baddeley's Working Memory model. They suggest that the articulatory loop as assumed in this model is a language-specific processing unit which does not account for the processing of other acoustic stimuli.

Rudiger F. Pohl
Universitat Trier, Trier, West-Germany

CHANGING ONE'S MEMORY: INFLUENCES OF INTEREST AND PRE-EXPERIMENTAL KOWLEDGE ON THE HINDSIGHT BIAS OF MALE AND FEMALE PERSONS

That one's memory for original ("old") information can be changed by encoding subsequent ("new") information has been shown for a number of materials. For example, asking people to judge the outcome of an upcoming election and then - after the election- asking them to recall their predictions, revealed systematic distortions in the subjects' answers: In hindsight, the predictions were much closer to the real outcome of the election than those predictions actually had been. This phenomenon is called the "Hindsight Bias". As explanations, two general classes of theories are discussed: Automatic processes (of information integration) and motivational factors. Both theories found some support in recent experiments.
In the present study, level of interest and level of pre-experimental knowledge were correlated with the amount of hindsight bias shown by male and female subjects in remembering their answers to specific knowledge questions asked one hour earlier. The following results were observed: Both sexes showed an equal hindsight bias. Moreover, the hindsight bias was independent of interest and pre-experimental knowledge, again for both sexes. These findings strongly support automatic processes as explanations for the observed memory distortions.

Fenna H. Poletiek
University of Amsterdam, The Netherlands

THE INFLUENCE OF COMMITMENT TO A THEORY ON TESTING STRATEGIES

Since several years, interest is growing in the study of science from a cognitive psychological perspective (Fuller et al, 1989; Giere, 1988; Bechtel, 1988). One of the most frequently studied topics in psychology of science is hypothesis testing. Commonly, studies examine whether subjects are able and willing to use a falsifying strategy in testing their hypotheses. Wason's (1960) rule discovery task and his selection task (Wason, 1968) have often been used to observe hypothesis testing behavior. However, these tasks have been thoroughly criticised as to the internal and external validity of the tasks. First, the operationalisation of the concept of a falsifying test is very problematic (Klayman and Ha, 1987; Poletiek, 1988). Second, the kind of hypotheses subjects have to test in these tasks are unrealistic. In a scientific situation, scientists have to test theories to which they are committed or at least theories they believe to be true. Philosophers of science often have claimed that strong commitment to theories can cause biases in testing.
In this paper, I will discuss an experiment in which an attempt has been made to meet these shortcomings of the traditional research on hypothesis testing. First, subjects were asked to give their opinion on a psychological theory. Next, they were asked to test their favorite theory and the rival theory. They chose one out of five offered tests for each theory. The tests were more or less "severe tests" (Popper, 1963). It was expected that the more a subject was committed to a theory, the more he or she was inclined to select a weak test.
The design and results of this experiment are discussed in relation to the traditional experiments on hypothesis testing. More generally, the pertinence of these experiments to the understanding of hypothesis testing in a real scientific setting will be discussed.

D. Ponte & C. Rechea
Universidad de Santiago, Santiago de Compostela, Spain

PARALLEL SEARCH THROUGH MEMORY SET

We are interested in exploring conditions in which subjects can search for more than one item at the same time. There is extensive work showing that increasing the number of items to be looked for (memory set size) often has a harmful effect on performance, but practice can either reduce or eliminate this effect (Schneider & Shiffrin, 1977). On the other hand, Quinlan and Humphreys (1987) found evidence showing that subjects can search simultaneously for two features defined along different

dimensions (shape, size or color).
The beginning point of our research is the "Resemblance Theory" of Duncan and Humphreys (1989). These authors claim that, if target items can all be differentiated from distractors on the basis of some common property, then it may be possible for subjects to look for more than one target without cost to their performance. However, they do not specify the conditions and the properties that permit this kind of result. This study will attempt to investigate these variables.
The experimental trials followed the principles of Treisman's theory, in that the targets used were defined by features so that the subjects were able to give their response automatically. Any deficits in performance would therefore be due to the increment of the memory set. The kind of properties which defined the target-set were manipulated in three conditions: (1) the elements were defined by features belonging to different dimensions (size and curvature); (2) the elements were defined by different features belonging to the same dimension (the biggest and the smallest); (3) the elements were defined by the same feature (all were of a curved shape).
In this experiment we can therefore also try to extend Quinlin and Humphreys results to other conditions in which the subject has to search for elements defined by features belonging to the same dimension.
Our results are in agreement with the claim of Duncan & Humphreys. We have obtained evidence pointing to the fact that when all targets are defined by the same feature the subjects can realise a parallel search through the memory set, without showing additive effects in their performance.

C.D. Porpodas
Department of Education, Section of Psychology
University of Patras, Patras, Greece

LEXICAL PRIMING IN CHILDREN'S NONWORD SPELLING

The objective of this study was to investigate the degree of lexical influence on nonword spelling of Greek in two age groups of Greek children. An experiment was conducted involving the spelling of nonwords, as well as of the corresponding base-words, by second grade (N=114) and sixth grade (N=114) Greek children. Half of the children from each age group (the experimental group) spelled each nonword for which they had heard the corresponding base-word, whereas the other half of the children (the control group) spelled each nonword without having heard the corresponding base-word. The main findings and conclusions of this study were: First, while there was a significant lexical influence on nonword spelling in the sixth grade childrens' performance, such an effect was not evident in the second grade childrens' performance. Second, the younger childrens' spelling performance seems to rely mainly on the employment of the phoneme-grapheme rules knowledge for spelling. Third, the older childrens' spelling performance, although it continues to employ the phoneme-grapheme corresponding knowledge, nevertheless tends to rely mainly on the word specific knowledge for spelling.

Wolfgang Prins & Dieter Nattkemper
University of Munich, FRG

TARGET SELECTION IN CONTINUOUS SEARCH - LOCALIZATION BEFORE IDENTIFICATION

We address the issue of how to conceptualize the operations underlying the selection of targets in continuous visual search. The task requires the Subject to scan through lists made up of, e.g., strings of letters and to look for a predefined target that is usually inserted once in each list.
It has been suggested that target detection is accomplished by two mechanisms which may be conceptualized as localization (where-processing) and identification (what-processing). Within this view, target detection would be conceptualized as a two-stage process: Processing the identity of the critical object is preceded by the processing of its location.
To obtain some empirical evidence about the operations underlying the selection of targets we traced back the processes occurring right before a target was detected and analyzed the spatial and temporal parameters of eye movements when the eye approached the position of the target.
Results: (1) The duration of fixations next to the target (Fn) was longer than average fixation duration. (2) The duration of this fixation was a function of the distance to the target; the larger the distance between the fixation location and the position of the target, the longer the fixation duration. (3) The duration of the preceding fixation (Fn-1) located in more remote positions relative to the target was shorter than average fixation duration. (4) The amplitude of the saccade between these two fixations depended on the distance between the location of fixation Fn-1 and the position of the target; the larger the distance, the larger the saccade amplitude.
The overall pattern of results seems to suggest that target detection is accomplished by two mechanisms: On fixations located in remote positions relative to the target the position of the critical object is processed (locatization or where-processing). The subsequent saccade then sends the eyes near to that location in order to identify the target (identification or what-processing) and to stop the search.

Patrick Rabbitt
Age & Cognitive Performance Research Centre,
University of Manchester, U.K.

OLD AND SLOW?

In the only comprehensive theory of cognitive ageing, Salthouse (1986) suggests that changes in all cognitive skills are secondary consequences of a general slowing of information processing rate. Similarly Eysenck (1986) and Jensen (1985) suggest that all cognitive skills load heavily on a single general factor, Spearman's "G", which can be redefined in terms of information processing rate.
A new factor in this debate has been the introduction of novel techniques of meta-analysis of variance as well as means of RT data by Cerella, Hale, Matheson and Hertzog. A series of nine experiments are briefly discussed and jointly analysed to

discriminate cases in which individual differences in cognitive efficiency can, and cannot be discussed in terms of a single performance parameter of information processing speed.

John T.E. Richardson
Department of Human Sciences, Brunel University
Uxbridge, England

REMEMBERING THE APPEARANCE OF FAMILIAR OBJECTS: A STUDY OF MONARCHIC MEMORY

An experiment was carried out to assess people's ability to remember the orientation of the sovereign's head on contemporary British coins and postage stamps. Most people were accurate in describing a 20p stamp, but were less so when they had previously been asked about a 20p coin or when they were able to describe such a coin correctly. However, most people were inaccurate in describing a 20p coin, and their judgements seemed to be based on two strategies: one was to refer to memory representations of postage stamps, whereas the other was merely to select the first response alternative offered. These results indicate that many people may have no reliable memory even for the most salient physical characteristics of the objects they encounter in everyday life.

Jerker Ronnberg
Department of Education and Psychology, Linkoping University
Linkoping, Sweden

RECOGNITION FAILURE OF PROSE-EMBEDDED TARGET WORDS

In previous experiments on recognition failure of recallable words, the cue-target information has typically been confined to word pairs. The present series of eight experiments were explicitly designed to transcend these confines. By employing prose-embedded targets, it was possible to evaluate the effects of manipulations of semantic involvement during story acquisition and retrieval: (a) For immediate testing conditions, the probability of recognition given recall adhered to the Tulving-Wiseman (1975) function, (b) type of proposition, embedding the target, as well as the number of trials allowed for story acquisition, did not cause any systematic deviations from the Tulving-Wiseman functon, (c) deviations above the Tulving-Wiseman function were not a replicable finding, whereas (d) deviations below were replicable for longer delays (e.g. a 24-hour delay), and for targets that were thematically related to the overall contents of the story. The discussion centers around the generalizability of the episodic retrieval independence view (Flexser & Tulving, 1978), and to account for deviations two rival semantic, schema-based hypotheses, were proposed; that is, Jones' (1978, 1983) reconstructive view and the assimilation view (cf. Graesser, Woll, Kowalski & Smith, 1980; Yekovich & Walker, 1986).

Simon P. Ross
Department of Psychology, Portsmouth Polytechnic, U.K.

BEYOND ASSOCIATIVE & SERIAL MODELS OF HUMAN & COMPUTER MEMORY: TESTING & APPLICATION OF THE HEADED RECORD MODEL

The paper will examine the Headed Record (HR) model of memory from two inter-related perspectives: cognitive science and artificial intelligence (AI). The model itself provides a view of memory that accounts for a wide variety of human memory phenomena and meets the requirements for treatment in computational terms. An implementation of the model will enable the testing of empirical claims of the model which have been, in part, specified. In addition to this the model will be used as an architecture for the design, construction and evaluation of case-based and analogical reasoning systems which currently lack a consistent underlying representation of knowledge. The two activities are intended to be mutually beneficial in developing and refining the HR model both for relevance to human memory and efficient AI architectures.

Pertti Saariluoma
Department of Psychology
University of Helsinki
Helsinki, Finland

Sirkku Pihlman
Department of Archeology
University of Turku
Turku, Finland

APPERCEPTION AND CATEGORIZATION: CLASSIFICATION OF MEDIEVAL SPEARHEADS BY ARCHEOLOGISTS, BLACKSMITHS AND PSYCHOLOGY STUDENTS

By apperception is meant conceptual perception, i.e., second order perceiving in which the figure is controlled by the subject's prelearned conceptual system. Since concepts are the very core of apperception, experiments with skilled subjects provide relevant information on this process. The differences in the systems of task relevant cues selected by skilled and less skilled subjects are controlled by subjects conceptual systems, and therefore, the behavior of skilled subjects is a good way of studying the mechanisms of apperception.
In two experiments professional archeologists, archeology and psychology students were asked to classify a set of twenty-five photographs of medieval spearheads. In addition, the first experiment was also carried out with three skilled blacksmiths, who had specialized in making archeological objects, but who were not professional archeologists.
The classes of objects and systems of task relevant cues proved to be very different in the different groups. All groups used the form of the objects as the basis of classification, but there was great variation between the groups in the systems of task-relevant cues. While the professional archeologists concentrated on archeological relevant form primitives, the psychology students tried to search for analogies with familiar objects such as household knives or files. The blacksmiths tried to assess, among other things, the method of forging and its difficulty as well as the use of the object.
The results suggest a two-stage model of apperception in classification. In the first stage the objects are described by a set of unorganized form primitives of features such as socket, stang, middle rib or ruggedness. In the second stage the objects are

classified according to a set of schematic predicates, which define a set of necessary properties for each of the classes. The selection of features as well as the schematic predicates are both very strongly influenced by the subjects' background.

Ruth Schumann-Hensteler
University of Mainz, Mainz, Frg

MEMORY FOR LOCATION IN YOUNG CHILDREN

Our knowledge about memory development is far better in verbal strategy-dependent aspects of a working memory system than in visual-spatial aspects. In the studies to be described here, we focus on one special aspect of visual-spatial memory: that is, the encoding and storing of location of objects.
In order to study memory for location independently of verbal responses, we used a picture reconstruction task. Children are shown a picture-like arrangement of several objects (e.g. house, tree, car, dog, sun). Then the display is covered, and the children have to reconstruct the picture on an empty sheet of paper, by choosing objects from 21 alternatives. The number of objects of the picture-like arrangement is increased from four to seven.
We took a sample of 95 children from 4 to 11 years of age and measured (1) the number of correctly recognized objects and (2) the number of correctly located objects. Additionally, we measured digit span forward and backward as indicators of verbal components of the working memory system.
The results show an age-effect in the number of correctly recognized objects as well as in the number of correctly located objects: kindergarten children are less successful in both aspects. For all age groups the number of correctly recognized objects is significantly higher than the number of correctly located objects.
We discuss these results in the context of theories about visual-spatial memory development, especially with respect to the hypothesis of Hasher and Zacks (1979), that location is stored automatically.
Additionally, further experiments are being crried out to separate the recognition of the objects and their exact location more clearly.

Benny Shanon, Department of Psychology,
The Hebrew University, Jerusalem, Israel

A TYPOLOGY OF CONCEPTUAL FRAMEWORKS FOR PSYCHOLOGY

The dominant theoretical framework in contemporary cognitive science is representationalism. By it, human behavior is assumed to be made possible by virtue of people having the possession of knowledge. The knowledge in question is constituted by abstract symbolic structures - semantic representations, and behavior is accomplished through the manipulations of the symbols in the representations, in other words - by computations.
While representationalism totally dominated the study of cognition, both natural and artificial, for many years, it has recently come under attack. This attack has been mainly associated with the new paradigm of connectionism. In connectionist models cognitive behavior is characterized in terms of parallel activation in large, distributed neural-like networks. Yet, connectionism is not the only possible alternative to representationalism. In the present paper I consider the various possible non-representational theoretical frameworks in psychology and I suggest that they may be viewed as different profiles in a typological space.
The proposed typology is spanned by two dimensions. The first is the locus of cognitive activity, and the second is the type of basic entities by which cognitive activity is defined. The locus may be either internal or external. While simpler, the locus of cognitive activity is, per force, internal with the rejection of representationalism bringing forth the consideration of the shifting of the locus of psychological activity from the internal, mental domain outside - either to the external world or to the interface between the behaving organism and its environment. This shift of locus implies that the basic constituents of psychological theory are not covert symbols. The various alternative basic theoretical constituents are defined by the second dimension that spans the typology of non-representational frameworks. These include associative networks, invariances in gradient fields, affordances, patterns of actions, intentions, and structural patterns.
The cross of the two dimensions presents a variety of alternative, non-represetational frameworks for psychological theory. Among these are connectionism, ecological psychology, various action based theories, social cognition and phenomenological research. It is suggested that the various alternative models, as well as representationalism and behaviorism, may be viewed as the different solutions to one basic conceptual problem confronted by the conduct of research are considered as well. Taken together, the variety of frameworks places the current confrontation between representationalism and connectionism in a wider perspective. On the one hand, it indicates that connectionism is not the only alternative to representationalism. On the other hand, it suggests rich, mostly unexplored, avenues for psychological investigation.

Philip T. Smith and Susan Kelliher
Department of Psychology, University of Reading, England

USE OF SHORTHAND FOR TRANSCRIBING SPEECH

Shorthand systems present a novel perspective for students of reading and spelling processes. Such systems are designed to increase speed of transcription of speech, and as such use a variety of devices to compress linguistic information into a small number of symbols.
This paper examines one of the fastest systems for English, Pitman New Era. The rules for transcribing (1) /a/ and /z/, (2) /r/, and (3) /t/ and /d/, are presented in detail. For example, 29 rules are necessary for transcribing /s/ and /z/, and these rules are classified according to the amount of phonemic, morphemic and lexical context that must be taken into account in applying the rule. The frequency of usage of these rules is estimated from dictionaries and text, and performance of expe-

rienced shorthand writers in applying these rules to novel words is examined.
This work provides information about which types of transcription rules (spelling convention) are most 'natural' for spellers to use, and as such has implications for spelling reform and the teaching of spelling.

Gerhard Strube, Barbara Hemforth and Heike Wrobel
Ruhr University, Bochum, FRG

RESOLUTION OF STRUCTURAL AMBIGUITIES IN SENTENCE COMPREHENSION: ON-LINE ANALYSIS OF SYNTACTIC, LEXICAL AND SEMANTIC EFFECTS

Temporal onset and relative strength of effects of lexical preference and world knowledge were analyzed in relation to syntactic preferences in a series of experiments on the interpretation of sentences that contained structurally ambiguous propositional phrases. We found a significant effect of lexical preference (i.e. of main verb subcategorization) that was established before a decisive influence of world knowledge. Since the sentences were in German, transforming them into the "Perfekt" (presentperfect) tense allowed for studying the relative effects of those factors in head-final verb phrases. Under these conditions, world knowledge suppressed the influence of lexical preference, which nevertheless affected decision times. In all cases, a slight bias in favor of early closure was found. The results are discussed with respect to contrasting theories of psychological principles in sentence parsing.

Patrizia Tabossi, Universita di Bologna, Italy

PROCESSING AMBIGUOUS WORDS IN CONTEXT

One of the most widely accepted pieces of evidence in the current literature on word processing is that initial access to the meanings of an ambiguous word is not affected by prior sentential context and selection of the contextually appropriate meaning occurs only at a late, post-access stage (Swinney, 1979; Onifer & Swinney, 1981; Seidenberg, Tanenhaus, Leiman & Bienkowski, 1982). However, it has recently been suggested that the nature of the biasing context may have an effect on whether or not access occurs exhausively. In a cross-modal study, Tabossi (1988) found that when a prior context biasing the dominant meaning of an ambiguity was sufficiently constraining, there was no evidence of activation of the subordinate meaning at the offset of the ambiguous word. But what is the time-course of activation of the dominant and subordinate meanings of an ambiguous word in such constraining contexts? Do the findings reported by Tabossi (1988) reflect genuine selective effects of context on access or are they the result of an early integration process that leaves the initial access mechanism unaffected? The following experiment explores this possibility. The subjects listened to a sentence that biased the dominant meaning of an ambiguity occurring in it by placing constraints on its semantic features. Their task was to perform a lexical decision on a visual target word that was either associated to one meaning of the ambiguity or was an unrelated control. The target occurred 100 ms prior to the end of the ambiguouus item. The results showed that even at this early point in time where the ambiguous word cannot yet be recognised on the basis of its perceptual input only, the target associated to the dominant, contextually appropriate meaning was responded to faster than either the target associated to the subordinate meaning or the unrelated control which did not differ from each other. The findings were taken to strengthen the available evidence that context may have some effect on the early phases of lexical access.

Jan Theeuwes
TNO Institute for Perception, Soesterberg, The Netherlands

EXOGENOUS AND ENDOGENOUS CONTROL OF ATTENTION THE EFFECT OF VISUAL ONSETS AND OFFSETS

Two experiments investigated the relation between exogenous and endogenous control of visual attention. Subjects searched for a target letter among three nontarget letters which were positioned on an imaginary circle around a fixation point. At different cue-display intervals, a centrally located arrowhead cue indicated reliably the location of the target letter. At different SOAs a peripheral line segment near one of the letters was either abruptly switched on (Experiment 1) or abruptly switched off (Experiment 2). Presenting the central arrowhead after display onset prevents attention being focussed in advance to the critical location. In this unfocussed attentional state both onset and offset transients attracted attention. When the central arrowhead was available in advance, focussing of attention prior to display onset precluded attention attraction to the location of the onset or offset transient. Contrary to an offset transient, an onset transient presented at the attended location disrupted performance, indicating that an onset within the spotlight of attention automatically and unintentionally attracts attention. The results are reconciled with the zoom-lens theory of attention suggesting that outside the focus of attention abrupt transients are not capable of attracting attention. Since the size of the zoom-lens is under voluntary control, it can be argued that transients do not fulfil the intentionality criterion of automaticity.

Charles P. Thompson, Rajan Mahadevan, Jerome Friedman,
Rod Vogl & Thaddeus Cowan
Kansas State University, USA

PORTRAIT OF A SKILLED MEMORIST

We present a theoretical description of world-class skilled memory. We also present data showing that Rajan Madadevan has the characteristics of world-class skilled memory. Rajan will demonstrate his skill by a memory search of 5,000 digits of pi and by reciting a large matrix learned during the presentation.

Michel Treisman
Department of Experimental Psychology,
University of Oxford, England

TIME PERCEPTION AND THE INTERNAL CLOCK

Evidence for the proposition that human time perception is determined by an internal clock is largely indirect. It would strengthen the case for this hypothesis if a model for the internal clock were available from which predictions could be derived and tested, and if the basic parameter of such a model, the frequency at which the clock runs, could be estimated. A model for an internal temporal pacemaker is briefly described and its properties are explored by computer simulation. Results are obtained that provide a basis for predicting that under appropriate conditions interference between an imposed rhythm and the frequency of a temporal oscillator may cause perturbations in temporal judgment which are related to the characteristic frequency of that oscillator. Experimental data are reported which test this prediction.

Tiia Tuulmets
Tartu University, Estonia

PERCEIVED NUMBER DEPENDS ON MUTUAL INTERACTION OF PROXIMAL DOTS

Effects of spatial arrangement on discrimination of numerosity were investigated. Two random dot-patterns with different generation rules were presented, the observer's task being to indicate which of them contain more items. Four different stochastic processes for test pattern generation were used, manipulating differently the second order statistics of the pattern (distribution of interdot distances). The distribution of dots in the reference pattern was always random. All models explaining the perceived numerosity in terms of absolute distance between dots, appear to be unsupported. One of the possibilities for perceived shifts in the number of dots is the impact or contribution each dot makes to the total impression of numerosity. The contribution of each dot seems to depend on the presence or absence of another dot at a proximal distance (mutual interaction of proximal dots): a nearby neighbour reduces the dot's impact on the visibility of total number. The limitations of models, in which the perceived numerosity is predicted by the measure of area perceptually occupied by the elements to be estimated (Vos et al, 1988) or by the measure of regularity or clusterization (Ginsburg and Goldstein, 1987) are discussed.

Joseph Tzelgov and Avishai Henik
Ben-Gurion University, Beer Sheva Israel

CONTROLLING STROOP EFFECT

Most approaches to automaticity assume that automatic processes are effortless, unconscious and involuntary. The involuntary aspect of automaticity implies that automatic processes occur without intention, their operations cannot be fully suppressed and their products are hard to ignore. Thus, at least some theoreticians speak about automaticity and control as opposing concepts.
An important characteristic of automatic processing is its uncontrollability. Manipulations of expectation have been often applied to reveal the controlled aspect of cognitive processing. It is often assumed that when a process is sensitive to manipulations of expectations, it may be considered as in part controllable. The Stroop phenomenon is regarded as a prototypical example of this characteristic of automatic processing. In our experiment we generalized expectations by manipulating the proportion of the various kinds of trials. Two experiments were run using a Stroop paradigm in which the proportion of colour-related stimuli was manipulated to induce controlled processing. It was found that Stroop interference decreased as the proportion of colour words increased. Further analysis revealed that while the magnitude of the inhibition component of the Stroop effect was negatively correlated with the proportion of colour-related stimuli, the facilitation component was insensitive to the manipulation. In a third experiment we manipulated orthogonally the proportion of colour-related stimuli and the proportion of neutral stimuli. It was found that these two manipulations affect the magnitude of the Stroop effect independently. Furthermore, while the expectations for colour-related stimuli affect inhibition, the expectations for congruent stimuli affect facilitation. These results challenge the view that automatic processes and the Stroop phenomenon in particular, are uncontrollable. Furthermore the results imply that the control of Stroop effect is post-lexical. They also suggest that there may be more than one level of processing at which the Stroop effect may be controlled.

Tim Valentine
University of Manchester
England

&

Mitsuo Endo
Hachinohe Junior College
Japan

THE EFFECTS OF DISTINCTIVENESS AND RACE ON FACE RECOGNITION

The effect of distinctiveness of British and Japanese faces was explored in two experiments in which both British and Japanese students acted as subjects. The expected 'own-race bias' was observed as a race of subject by race of face interaction in a recognition memory task. Distincive faces were recognised more accurately than typical faces and the effect of distinctiveness did not interact with either the race of face or the race of subject.
In a task in which intact faces had to be distinguished from jumbled faces typical faces were classified faster than distinctive faces. The effect of distinctiveness did not interact with either the race of face or the race of subject. The results will be discussed in terms of an exemplar-based model of face processing.

Susana del Viso
Universidad de Oviedo
Jose Manual Igoa
Universidad Autonoma de Madrid
Jose E. Garcia-Albea
Universidad Complutense de Madrid

MORPHOLOGICAL PROCESSING IN LANGUAGE PRODUCTION: STRANDING AND ACCOMMODATION IN SPONTANEOUS SPEECH ERRORS

The richness and complexity of Spanish morphology makes this language a very informative tool to examine the role of morphological structure of words in the processes and represenatations subserving language production.
The data source is a corpus of more thsn 3800 slips of the tongue in Spanish (del Viso, Igoa & Garcia-Albea, 1987; del Viso, 1990).
The more outstanding result from the analysis we have performed is the interaction between type of morphemic unit and type of error, in the sense that roots and affixes (mainly inflectional affixes) are involved in different error categories. This result testifies for the relative independence between the two types of morphemic units, in terms of the processing mechanism applied to each of them in the course of sentence planning.
Other results in the same direction emerge from the "accommodation" and "stranding" phenomena. This latter indicates that when roots "move" in an error (e.g. two roots exchange their positions), the stranding of suffixes specifying the grammatical category of the word is observed; roots themselves do not get stranded. From these and other observations, the argument can be developed that whereas roots are selected from the lexicon and inserted into phrasal frames, inflectional suffixes act as heads of the words to which they become attached, thus "marking" and defining these phrasal frames.
Results can also be interpreted as supporting the specificity of lexical and syntactic processing.

Paolo Viviani, University of Geneva, Switzerland

MOTOR-PERCEPTUAL INTERACTIONS

The notion that movement can modulate the processing of sensory information is at least one hundred years old. Helmholtz, Mach and Wundt, among others, pointed out that many perceptual phenomena, ranging from visual illusions to perceptual stability, can be explained parsimoniously if one admits the possibility that motor commands not only produce movements, but also provide the cognitive system with a set of expectations about the consequences that these movements may have on sensory inflow. In their turn, these expectations contribute to set the conceptual stage within which sensory data are interpreted.
The suggestion was also advanced that at least some components of this conceptual stage actually reflect the intrinsic properties of the motor system, and are therefore active even in the absense of any intention to move. Hence, for instance, Poincaré's suggestion that the dimensionality of the perceptual space could be dependent on the geometrical and functional properties of the muscular system. More recently, the hypothesis that perception may be influenced by the intrinsic properties of the motor system has received some direct experimental support. The case for motor-perceptual interaction is built on the demonstration - given in recent years- that voluntary movements in humans are characterized by a set of structural properties that uniquely characterize their biological nature. These properties can be expressed as covariance principles relating the geometrical and kinematical properties of the movement. A number of experiments will be reviewed which show that visual perception, both in the presence or in the absense of motor activity, carry an imprint of these principles of motor organization.

Wietske Vonk
Max Planck Instirute for Psycholinguistics
and University of Nijmegen, The Netherlands

ON UNDERSTANDING THE THEMATIC STRUCTURE IN DISCOURSE

In general languages have several linguistic devices to refer to entities that are discussed in a discourse. One way in which these devices differ is in the specificity of referring to these entities. There appears to be a tendency to use the least specific device as long as there is no ambiguity in the reference. If a referring expression is more specific than what one would expect on the basis of an unambiguous identification of a referent, the expression may serve a function in the structuring of the discourse, in particular with respect to the thematic structure of the discourse. Some experiments on the production and comprehension of discourse will be discussed that aim to establish this claim.

Jean Vroomen and Beatrice de Gelder
Tilburg University, Tilburg, The Netherlands

RECENCY EFFECTS IN HEARD AND LIPREAD MATERIAL

Four experiments showed that heard, lipread, or heard plus lipread memory lists had recency effects in cases were the list items differed in vowel. Lists items which differed in consonant also had recency effects provided that the items did not rhyme; if they did rhyme, recency effects disappeared. Suffixes decreased recency recall. The suffix effect was greatest in cases where there was a match between modality of the suffix and the memory list. These findings are inconsistent with previous assumptions about a sensory memory for heard vowels (precategorical acoustic storage). Also, the notion of a common memory for heard and lipread material is contradicted. Together, these results suggest that there are two separate stores contributing to recency: a store which contains auditory information, and a store which contains both auditory and gestural information.

Peter Walker and Kathleen Moylan
School of Psychology, Lancashire Polytechnic,
Preston, England

COLOUR, TEXTURE AND OBJECT REPRESENTATION IN BLINDNESS

Blind and sighted subjects were given a simple verbal description in which a figure or its ground was assigned a colour (e.g. "Red triangle, white ground"). Subjects' recall memory for the figure-colour association was higher if the colour was assigned to the figure itself, an effect that was equally strong for both groups of subjects. For the blind subjects, this unitisation effect was independent of the proportion of their lifetime that had been spent without sight, and was even in evidence for the congenitally blind subjects included in the sample. When the feature assigned to figure or ground was texture, a unitisation effect occurred only for the blind subjects and was then contingent on the proportion of their lifetime that had been spent without sight. It appears that memory automatically associated surface colour directly with its object, but that it is only when texture becomes a particularly salient feature of objects, through the loss of sight, that memory structure gradually accommodates the association between an object and its texture.

G. Wolters and R.H. Phaf
Leiden University, The Netherlands

A CONNECTIONIST MODEL FOR SIMULATING IMPLICIT AND EXPLICIT MEMORY

An unsupervised learning neural network model for simulating implicit and explicit memory tasks is presented. The model implements the activation-elaboration explanation for implicit and explicit memory suggested by Graf & Mandler (1984). It is the first of a family of models based on a new learning network module, called CALM. The module was developed to be psychologically and neurophysiologically more plausible, and to solve some of the problems evident in recent connectionist models.
A simulation with the model of differential effects of word frequency in implicit (word-completion) and explicit (free recall) tasks shows results comparable to experimental findings. A successful simulation of anterograde amnesia is induced by artificially lesioning the model, so that learning by elaborations is eliminated. The simulation shows normal implicit memory, but virtually no explicit memory, for words presented after the lesion has been made. It is suggested that the function of the lesioned part of the network shows some similarities to the role of the hippocampus in the human system. The simulation of such a dissociation has so far been a problem in connectionist models.
It is concluded that on the one hand neural network modeling may benefit substantially from systematic attempts to incorporate psychological findings and theories, and that on the other hand neural networks may provide detailed explanations of psychological phenomena.

Hubert D. Zimmer
Universitat des Saarlandes, Saarbrucken

ON THE IMPORTANCE OF ITEM-SPECIFIC AND RELATIONAL INFORMATION FOR MEMORY OF SUBJECT-PERFORMED TASKS

Memory after enacting is usually better than memory after standard learning instructions or imagining instructions. Different explanations regarding this superiority effect for enacting have been proposed. In recent experiments we were able to show that one of the factors responsible for this memory improvement after enacting is an enhancement of item-specific information, whereas relational information seems to be uninfluenced by enacting (Zimmer & Engelkamp, 1989).The results of a further experiment on this topic are reported here. Two groups of subjects were required to learn a list of verbs. One list could be organized in taxonomies, the other in schemata. One third of the subjects received standard learning instructions, one third received imagining instructions and one third learned by enacting. Free recall (oral) and recognition performance as well as organization and the time pattern of the reproduction were measured. The results showed that free recall as well as recognition were clearly better after enacting than after imagining and after standard learning instructions. The two latter conditions showed results similar to each other. In contrast, the organization (ARC) was worst under enacting. The results are interpreted in favor of the assumption of better item-specific information after enacting. The possibility of a changed retrieval process is also discussed.

Abstracts of Poster Presentations

(Presented in numerical order)

1. POSITIONAL CONSTRAINT AND SYLLABIC STRUCTURE IN SOUND ERRORS

T.G. Chico & J.E. Garcia-Albea
University Complutense de Madrid, Spain

Evidence for a positional constraint on sound errors has been reported in several analyses of speech errors (Fromkin, 1971; Garrett,1975,1980; McKay, 1970; Shattuck-Hufnagel, 1979,1980,1987; del Viso,1990). This tendency of misplaced segments to take new positions which are similar to their target positions, can be captured by reference to the syllabic structure of the words. Several linguists and psychologists have proposed that the internal structure of syllables is hierarchical with two primary constituents: the onset (initial consonant or consonant cluster) and the rime. The rime contains the peak (vowel nucleus) and coda (final consonant or cluster). Using word games (Treisman, 1983), a pilot experiment was conducted in Spanish to study the preference of ten subjects to combine two CVC syllables to form a new syllable. The subject heard two nonsense syllables and they were asked to combine them into one new syllable. The results showed a preference for dividing the stimuli between the onset and the rime, and they are consistent with the view that onset and rime are the major constituents of the syllable. In another experiment, the Spanish subjects learned a blending rule to divide two CCV syllables after the initial C or after the CC onset so as to combine them into one new syllable. Their reaction times showed that they preferred the CC onset rule, which appeared to support the cohesiveness of the onset. These results have implications for some aspects of positional constraint on sound errors.

2. BILINGUAL LEXICAL REPRESENTATION EXPLORED USING A MASKED PRIMING PROCEDURE

Chris W. Davis, Rosa M. Sanchez-Casas and Jose E. Garcia-Albea
Universidad Complutense de Madrid, Spain

The current research investigated one of the enduring questions of bilingual research, that of how the different languages interrelate in memory. More specifically, it was focussed at the level of the lexical representations of the different languages.
Typically research at this level has used a repetition priming measure to explore how within language effects compare to those between languages (Kirsner, Brown, Abrol, Chadha and Sharma, 1980; Scarbourgh, Gerard and Cortese, 1984). The standard assumption is that such priming indexes aspects of lexical organization. Recently this assumption has been questioned as it applies to the repetition priming procedure used in previous studies, (Forster and Davis, 1984, Davis, 1990). In essence, the argument is made that a given pattern of priming may reflect a combination of lexical and nonlexical sources. It has been suggested that episodic contamination may lead to spurious facilitation of responses (see Napps and Fowler, 1987) or even inhibition (see Paterson, Dell and O'Seaghdha, 1989).
In order to mimimize episodic contamination, the current study used a masked priming procedure (Forster and Davis, 1984, Forster, Davis, Schoknecht and Carter, 1987). This procedure also curtails strategic factors which may arise with presenting the bilingual material inter-mixed, since from the subject's perspective only a single language is presented at a time.
The results obtained suggest that the nature of lexical representation is affected by degree of bilingual experience and by the form and meaning relationships between the languages.

3. PHONEME PROCESSING IN SPANISH AND ENGLISH: IMPLICATIONS FOR THE PERCEPTION OF VOICING IN STOPS

Luis E. Lopez-Bascuas and Jose E. Garcia-Albea
Universidad Complutense de Madrid, Spain
Richard Fahey and Burton S. Rosner
Oxford University, UK

The voice/voiceless distinction in stop consonants has been for many years one of the most studied problems in speech processing research. In the early sixties voice onset time (VOT) was proposed as the relevant parameter to be computed in order to make such a distinction. In these studies in spite of using a continuum of VOT, subjects showed a clear categorical performance in identification and discrimination tasks. Since it was thought that categorical perception was specific to speech signals, a specialized speech processor was postulated. However later demonstrations of categorical perception of nonspeech signals have suggested the possibility that general auditory capabilities could underlie this effect. Cross-language research can provide further valuable information concerning this issue. Although there have been previous studies with speech continua in which different category boundaries have been found for English and Spanish speakers, for nonspeech sounds no Spanish data have been available. Thus, in this work we have tested Spanish and English speakers with three continua of synthesized stimuli (BA-PA; noise-buzz; and two tones) in both identification and 2IAX discrimination tasks. The results confirm earlier findings on the difference between phoneme categorization boundaries for Spanish and English speakers, while giving no support to the claim that speech experience determines nonspeech perception.

4. PROCESSING OF LEXICAL AMBIGUITY: POLISEMY AND HOMONYMY

Adelina Estevez
Universidad de la Laguna, Tenerife, Spain

Ambiguous words have a single physical representation but two or more semantic meanings. The reader must select the right word meaning in order to interpret correctly the gist of the sentence. Studies of lexical ambiguity resolution in sentences have played an important role in questions about language comprehension and about the influence of contextual information on lexical processing.
The purpose of this research is to find out the time course of ambiguous word processing. Two different types of lexical ambiguity, polisemy and homonymy, have been distinguished. Polisemy refers to words whose several meanings are related. The meanings are similar, but not literally the same. Homonymy refers to words whose various definitions are unrelated.
We assumed a modification of multiple-trace memory model (Hintzman, 1986). When we read an ambiguous word several composed traces as well as meaning are activated in parallel in subject's memory. Polisemic word traces share many features and the corresponding additive trace or "echo" will be activated much more quickly and strongly. Therefore, the speed of the "echo" recovery will be facilitated by the number of the meanings. On the other hand, with homonymy words traces share almost no features and therefore they will be activated slowly and to a much lesser degree because the alternative meanings are competitive. The intensity of the "echo" will be independent for each meaning of the word and the retrieval of the proper meaning will take more time.
A first study was carried out to select polisemy and homonymy words in Spanish. Subjects had to think about the different meanings of several words and write sentences with each meaning. Fifteen polysemy and fifteen homonymy words with two meanings each of equal frequency of occurrence (equiprobable) were selected to produce materials.
An on-line study was performed to test our hypothesis. Fifteen texts (of about seven lines) were constructed with two versions (A and B) both for polisemy words and homonymy words. In version A the critical word appeared twice with different meanings each time. In version B the critical word appeared twice with the same meaning each time. A factorial design 2x2x2 with repeated measures in every factor was used (polisemy-homonymy; different-same meanings; first-second presentation of the critical word). Subjects read the texts using the moving window technology, word by word. The computer registered reading times. The results are discussed in terms of processes involved in the lexical access of ambiguous words.

5. THE ROLE OF SOCIAL EXPECTATION IN COMPREHENSION OF NARRATIVES

E. Gamez, H. Marrero, O. Espino,
D. Castillo, L. Lentijo and I. Leon
University of La Laguna, Tenerife, Spain

An experiment will be described which examines the role of social expectation in the comprehension of narratives. Subjects read narratives that had or did not have referents about interpersonal relations which elicited strong expectations about upcoming events. Three types of texts were possible: texts with referents where relations between characters were positive; texts where relations were negative; and texts without referents. Subjects' read the target sentences which coincided with the expectations activated from the mental model faster. We had two different measures: one, was the sentence that expresses the beginning of the interaction; the second, was the type of sentence that expressed the resolution of the interaction (Fit positive vs. Fit negative). The results support a model in which expectations about the social relationship between the characters of the narrative are generated from a mental model. When the reader recognizes the relationship referent and the specific cause of the interaction, he expects specific events to occur.

6. DISTINGUISHING THREE FUNCTIONAL KINDS OF PROPOSITIONS IN IMPLICIT THEORIES

Inmaculada Leon, Hipolito Marrero, Maria Dolores Castillo,
Luis Lentijo, Elena Gamez and Orlando Espino
University of La Laguna, Tenerife, Spain

In research about implicit theories, the need to collect an extensive amount of propositions to take into account all possible implicit theories about a certain social domain, has been emphasized.
However, no one has paid attention to whether or not such propositions are functionally equivalent. We think that, although all the propositions within an implicit theory share being implicational molecules, as conceived by Abelson and Reich (1969), they must be differentiated according to their function; as a description, or as an explanation, or as a prescription.
In our opinion, an implicit theory must have propositions representing each one of these three functional components, as occurs in a scientific theory. This information must be taken into account in research in this area.
To support our proposal, we submitted a group of propositions (descriptions, explanations and prescriptions) about the power relations between couples to factor analysis. Each one of the four implicit theories identified possessed representatives of the three kinds of propositions.

7. THE "RELATIVE GAIN SCORES" AS AN ATTENTIONAL MEASURE

Ernesto Darias, Luis Lentijo, Hipolito Marrero
University of La Laguna, Tenerife, Spain

The difference between the performance of a task performed without concurrence, and the performance of the same task when it is performed concurrently with another one, has a great importance in the attentional research. Based on this procedure, there are several versions of differential attentional scores.
In the present poster we propose the "relative gain scores" used in the investigation with measures taken "prior to and posterior to", as an alternative and suitable measure of attention. Its main advantages will be considered in our poster.

8. THE EFFECT OF TRAINING AND DIFFICULTY, ON THE PERFORMANCE OF A TASK OF ADDITION AND A TASK OF MEMORY LOAD, PERFORMED CONCURRENTLY

L. Lentijo, E. Darias and H. Marrero
University of La Laguna, Tenerife, Spain

Sixty students from a first course of psychology were asked to perform a task of addition while, at the same time, they tried to maintain a memory load. The memory load was manipulated in such a way that the students had to remember either 3 letters, 3 numbers, 3 words, 5 letters, or 5 numbers, while adding up; or they had to add up without a memory load. They performed four experimental sessions: three consecutively, and the fourth one a week later. In each experimental session, they performed fifteen trials per experimental condition, following a design of intragroup variation by random distribution of the trials. We have carried out several analyses of variance, considering as dependent measures, the performance in the addition task and the performance in the memory load task. We have found training, and difficulty of memory load, to have a significant effect; and that an interaction exists between training and difficulty of the memory load in both measures. These results will be discussed in relation to the relevant experimental literature.

9. THE RECORD OF PARTICULARY INFERENCES ABOUT SOCIAL NARRATIVES RELATIONSHIPS, FROM THE POINT OF VIEW OF MENTAL MODELS

M.D. Castillo, H. Marrero, E. Gamez, O. Espino,
I. Leon and L. Lentijo
Universidad de La Laguna, Tenerife, Spain

According to the mental model hypothesis (Johnson-Laird, 1983), when people are reading a text, they are building a mental model about the subject for comprehension. For social relationship mental models, readers also need to know: 1) the presence of a relationship between the characters (i.e. "X" and "Y" are schoolmates), and 2) the state of this relationship (i.e. they get on well together). Besides this knowledge, that is co-referential with other different information, a series of interactive events can happen, such as:
- "X" needs some notes that "Y" has
- "X" has seen "Y" at the library for the first time that day.

If the state of the relationship is good, the resolution could be:
- "Y" will lend "X" his notes (in the first case), and
- "X" and "Y" greet each other (in the second case).

The real events, then, could be expected or unexpected. The examples already given are of expected events. Unexpected events could be:
- "Y" doesn't lend "X" his notes, or
- "X" and "Y" don't greet each other.

Another question is the event nature: positive vs. negative. Positive nature means that the event modifies the relationship positively; and negative nature when the event modifies negatively. In our case, it could happen that "Y" could lend "X" his notes independently of the state of the relationship between them. If for example, "Y" lends his notes to "X", although the relationship is bad, this interactive event would be a case of positive nature for their relationship.
We suggest that the expected vs. unexpected dimension and the positive vs. negative dimension of interactive events are recorded in our memory and that they are inferred from the mental models of the relationship.
In this work we prove that when readers solve an interaction between characters, they use the end of the closest sentence to compute and to record these sorts of evidence. Using the Rapid Serial Visual Presentation technical, we reduce the necessary time for processing and recording, in order to prove if the retrieval of these evidence would decrease, through some questions to the subjects.

10. LINGUISTIC AND CONTENT-BASED REPRESENTATIONS IN THE INTERPRETATION OF PRONOUNS

Manuel Carreiras
University of La Laguna, Spain
Alan Garnham and Jane Oakhill
University of Sussex, UK

An assumption of the mental models theory is that objects are represented in the mental model in terms of properties that they themselves have. So, the man's name John introduces a male person into the model and a subsequent pronoun, he, can refer to John because it refers to a male person and the representation of John in the model is a representation of a male person. The properties of linguistic expressions used to introduce the objects into a text need not be encoded. The idea that pronouns take their reference from representations in terms of object properties rather than from representations of the linguistic expression that introduce them is supported by the fact that pronouns are deep or model-interpretive anaphors. The properties of deep anaphors suggest that thet are interpreted with reference to a representation of content (a mental model).
This theory was developed largely with English in mind. When it is applied to languages with non-semantic gender (i.e. Spanish) the following problem arises. Objects are not inherently male or female, but many of them are referred to by masculine or feminine nouns. If objects are represented in the mental model in terms of object properties (and not the properties of the nouns that refer to them), the fact that a table has been referred to as "la mesa" should be of no help in linking a subsequent feminine pronoun to it. This prediction seems implausible. Yet, if it is untrue, then the interpretation of pronouns must take place in part via a representation of the linguistic properties of the expressions that introduced their referents into the mental model.
The purpose of this research was to investigate whether a linguistic match between a pronoun and its antecedent speeds the interpretation of the pronoun both when used to refer to persons and when used to refer to objects. But also it is worthwhile knowing under which conditions this effect occurs, probably, when the pronoun is fairly close to its antecedent, since representations of surface details of text are known to be relatively short-lived. An experiment was carried out in which sentences containing anaphoric pronouns refering to persons or to objects were presented for self-paced reading. Some of the pronouns could be resolved on the basis of their gender alone, others required inferences based on knowledge about the world. Subjects spent longer reading the second clause of sentences about people when an inference was required to resolve the pronoun, but no differences were found in sentences about objects. The same pattern of results arose in the experimental task of answering a question about sentences. A second experiment was run using a different pronoun in sentences about objects in order to gain better control. Results showed that subjects spent longer reading the second clause of sentences about objects and answering questions when an inference was required to resolve the pronoun. It seems that the interpretation of pronouns take place in part via a representation of the linguistic properties of the expressions that introduced their referents into the mental model.

11. TEXT COMPREHENSION AND INFORMATION SELECTION

J.P. Rossi and A. Bert-Erboul
Universite de Poitiers
Universite Paris-Sud, Orsay Cedex, France

In a study designed to explore selection processes during reading, good and poor comprehenders were asked to select out important sentences on first and second readings of a text presenting hypotheses as to why the dinosaurs became extinct at the end of the Mezozoic Era. After completing two successive readings of the text, 23 adult subjects were asked to fill in a questionnaire on the main topics, the arguments and details in the text. Pre test performance was used to classify subjects into 2 groups: Good Comprehenders and Poor Comprehenders. Analysis focuses on two interrelated issues: a) does good selection lead to good comprehesion; b) does selection of type of sentences change over the course of successive readings? The text sentences were classified into three groups: "N" sentences contained sentences required to produce a standard summary. "N-1" sentences contained additional, non-essential information. "N-2" sentences provided details. Results show that poor and good comprehenders selected the same number of sentences. Poor Comprehenders made two identical selections. In contrast, Good Comprehenders modified their choices and selected more arguments (t_{11} = 4.91, p <.001) on the second reading. Analysis of decision times for selection of important sentences shows that Poor Comprehenders tend not to take the first reading into account, whereas Good Readers tend to center their first reading on the macrostructure units and their second reading on the arguments. The discussion analyzes these findings in relation to the Kintsch and Van Dijk text comprehension model.

12. SUBJECTIVE REPRESENTATIONS AND INTERPRETATIVE PROCESSES IN SUMMARIZING ARGUMENTATIVE TEXTS

J.M. Passerault and P. Coirier
Universite de Poitiers, Poitiers Cedex, France

Summarizing a text requires the selection of the most important information from this text. The selection processes are controlled by two types of representation:
- textual representation (TR): subjects' knowledge of linguistics and textual operations: how to elaborate the macrostructure of the text and using what types of cues.
- referential representation (RR): subjects' knowledge of the referential field (often linked to frames, schemas, ...) on one hand; personal values, judgments and the reader's

implication in the field concerned, on the other hand.
These representations are the main determinants of the central summarizing process: assigning relevance to the textual information (Van Dijk, 1979; 1982). In argumentative texts, for example, the subjects include primarily the macrostructurally important units, but this selection is modulated by their agreement with these units (Passerault & Coirier, 1987). Textual and referential representations interact in evaluating the different units.
In addition, we assume that the relative weight of TR and RR is controlled by a third type of representation: the representation of the task goals and objectives. According to whether they have a memorizing goal or a critical commentary goal, subjects don't produce the same summaries. In the latter case, the involvement of the referential representation leads to the evergence of interpretative tendencies: not only the selected statements vary from subject to subject but several summary-types are observed, congruent or not with the overall meaning of the text (Coirier & Passerault, 1988).
Our experimental data on interpretative processes have shown that:
1) Whether explicit (instructions) or not explicit (strategies), task goals have a marked effect on the relative weight of textual and referential representations in the summaries.
2) The interpretative processes are not reducible to a unit by unit selection. The selection of one unit is mutually dependent on the other selections made. This leads to the construction of a modified meaning of the text. Each individual summary may be viewed as a new and coherent text; this new text emphasizes such or such parts of the original text, for example retaining preferential information about the "situation model" (Kintsch, 1986), or retaining preferentially the macrostructural representation as such.

13. THE SIGNALS IN THE COMPREHENSION AND RECALL OF EXPOSITORY TEXTS

Jose A. Leon Cascon & Mario Carretero
Autonoma University of Madrid, Madrid, Spain

A primary goal of reading is to understand the writer's message correctly. To accomplish this goal, a reader must identify the information in the text that is most relevant to the author's message. A writer can facilitate the reader's task by using a variety of devices to signal relevant information. In the present study, we investigated the effects of signals on text comprehension and recall in different groups. Subjects were 48 Experts (post-graduate students) and 96 Novices (48 good readers and 48 poor readers, junior high school students). All of the subjects read two expository texts at different levels of difficulty, There were two versions for each text: with signal and without signal. Two recall tests were made: immediated free recall and delayed free recall. The results demonstrated that signals directing attention to the macrostructure they marked, led to better encoding of the organization of target information in all groups. This effect increased with the difficulty of the text and the skill of the reader.

14. THE EFFECTS OF DIFFERENT INTERFERING TASKS ON WRITING UNDER DICTATION

T.M. Sgaramella, C. Semenza, A. Piani,
Universita degli Studi di Padova, Italy
and A.W. Ellis
University of York, UK

This study assessed the effect of different interfering tasks on writing to dictation. Subjects were asked to write a number of nine word sentences in the following conditions:
a) Control: subjects wrote the sentences soon after dictation
b) "Semantic interference": before the dictation of the sentence subjects heard 3 words. A probe word was presented when they completed their writing. Subjects had to tell if it belonged to the word list heard before or not.
c) "Phonological interference": before the dictation of the sentence subjects heard 3 syllables. A probe syllable was presented when they completed their writing. Subjects had to tell if it belonged to the syllable list heard before or not.
d) "Graphic interference": before the dictation of the sentence subjects were presented with a visual display of 4 letters in either upper and lower case. A probe allograph was visually presented when they completed their writing. Ss had to tell if it was in the same case or not in the display.
An analysis of errors made under these conditions was performed. Errors occurring at each of three basic levels (stroke, grapheme and word) could be classified into two broad categories: selection and movement. Selection errors included substitutions, omissions, blends and additions. Movement errors included anticipations, perseverations and inversions.
A general increase was found in selection errors at all levels. The phonological interfering task increased the number of grapheme substitutions which were more phonologically related to the target in this than in the other conditions. The semantic interfering task increased the number of word substitutions which in turn were more semantically related to the target than those occurring in the other conditions.
In the more peripheral condition these effects disappeared: subjects made mainly grapheme and stroke selection errors; grapheme substitution errors were not phonologically similar to the target and word substitution errors were mainly phonologically or morphologically related. Finally, errors in graphic motor pattern (scale and upper/lower case errors) increased significantly with respect to the control condition.
These findings are thought to contribute to the understanding of agraphic phenomena, insofar asthey parallel some patterns of errors observed in specific cases of agraphias. They will be discussed in terms of alternative hypotheses, based on output interferences or resource requirements.

15. DYNAMIC SIMILARITY: THE INFLUENCE OF COGNITIVE PROCESSES ON SIMILARITY JUDGMENTS

Mark Keane
University of Wales College of Cardiff, Wales, U.K.

An extension of Tversky's "contrast model of similarity" is proposed to deal with subjects' similarity judgments of sentences describing complex events; for example, judging the similarity of "The football bounced across the roof and hit the tree". However, it is argued that this model is inadequate and should be replaced by a "dynamic similarity model"; the dynamic model maintains that the similarity of two complex conceptual entities is a function of the similarity of their representations combined with the similarity of the processes used to construct those representations.
Two main predictions follow from this dynamic view. First, in cases where the cognitive representations of two sentences are equally similar the perceived similarity of the two sentences should be affected by manipulations varying the similarity of the cognitive processes used to construct those representations. This prediction was tested and confirmed in an experiment that manipulated the familiarity of the sentences used in the judgment task. Second, the dynamic view highlights the contribution of cognitive processes to the mental representation of the entity; for example, comprehension processes can add implicit inferences to the representation of a sentence (e.g. inferring an implicit causal relation). This prediction is also confirmed in a second experiment. The wider implications of this dynamic similarity view are briefly considered.

16. THE DEVELOPMENT OF ARGUMENTATIVE DISCOURSE IN A DIALOGUAL PERSPECTIVE

Caroline Golder
Laboratoire de Psychologie du Language, Poitiers

We have characterized (Golder, '89) argumentative discourse by the use of specific textual marks or elements such as justifications, axiological statements, assumptions,...
These textual elements are the linguistic transposition of psycholinguistic operations which can be divided into two categories, justification and negotiation: in a dialogue situation, on one hand, the locutor must justify his opinions (he must support his views and he must base his arguments on collective rather than individual values or experiences); on the other hand, he must modulate the way of presenting them (he must resort to modalisations to modulate his judgements, and he must indicate the distance he keeps between himself and his assertions by the use of assumptions).
Three groups of children, respectively aged 10-11, 13-14 and 16-17, were asked to produce an argumentative discourse in a dialogue situation. The children's verbal products were divided into segments that corresponded to their turn-takings. Each segment was coded with regard to the presence or absence of the specific argumentative marks mentioned above.
A factorial analysis of the correspondences revealed two characteristic axes: the first one opposes the presence to the absence of the negotiation marks (assumptions "I think that..",..axiological statements "that's good",...and modalisations "It's really beautiful",...); the second one opposes the presence to the absence of the justification elements (presence of general arguments as opposed to their complete absence or the introduction of personal arguments). Hence, the existence of these two categories of independent operations, implied in the argumentative discourse, seems to have been confirmed.
This paper deals with the relation between these two categories of argumentative operations and the type of dialogue in which they take place. The dialogues can be divided into two categories according to the cooperativity implemented in the dialogues: the children can be satisfied with just exchanging turn-takings which are thematically related (dialogal cooperativity), or they can communually construct the discourse. In this case, each child takes into account the preceding assertion of his interlocutor and he modulates, specifies,... this assertion (argumentative cooperativity). Only this argumentative cooperativity permits the discourse to develop.
The analysis of the relation between the two categories op psycholinguistic marks described above and the cooperativity, revealed:
- negotiation marks are more frequent in argmentative cooperative discourse, as opposed to dialogual cooperative discourse.
- this differentiation increases with age.
- as far as the justification marks are concerned, this differentiation between the two discourses was not observed.
Hence, when the justification operation (the most crucial of all in the argumentative discourse) is precociously acquired whatever the objective of the interlocutors might be (to discuss, in the dialogual cooperativity, or to arrive at a compromise, in the argumentative cooperativity), the negotiation operation depends upon the type of cooperativity: the use of the negotiation marks is subordinate to the childrens' will to reach an agreement (even a partial one) through the dialogue.

17. UPDATING MENTAL MODELS IN EXPERTS "PREDICTIVE REASONING"

Javier Castaneda
University of La Laguna, Tenerife, Spain

A mental Model-based framework of predictive judgements for experts (physics and maths teachers) was tested. A mental model is a perceptual-like representation involving a setting with characters, objects, actions and events. Solving a predictive task involves the successive activation or updating of models as the relevant data are provided (e.g. quantitative and diagnostic sources). New data may require a refinement of the previously activated model, and sometimes a completely different representation. The final model is a compromise between the whole available evidence and the predictive demand and it determines the subjects' outcome. The present experiment examines the specific mental model of experts in a predictive task that provides successively: a diagnostic source (D), a quantitative source (Q), and a categorial choice. Two factors were manipulated: a) the order of sources (Q-D or D-Q) and b) the between-sources congruence (either congruent or incongruent). The first factor (a) allows us to analyze the contextual dependence of the updating processes. The between sources congruence (b) explores the nature of integration processes in model building. Neither contextual dependence nor integration were considered in earlier models (Formal-rationalistic and Heuristic). For a given item, the subject was able to view each piece of information successively on a computer screen by pressing a key, and finally he or she selected one categorical option by means of selecting one of two alternative keys. A number of dependent measures were used: reading time for Q and D sources, choice time, number of diagnostic choices, confidence ratings, and verbal reports (quantitative, qualitative and mixed explanations).

18. UNIQUENESS POINT AND COMPETITION IN SPOKEN WORD RECOGNITION

Manuel Perea, Arcadio Gotor and Salvador Algarabel
Universitat de Valencia, Spain

The effects of individual and neighborhood frequency are studied in two spoken word recognition experiments (lexical decision and naming). Neighborhood is operationalized, considering the speech signal directionality in time, from the words which share a specific number of initial phonemes. The results, taking into account the latencies measured from the uniqueness point, show a neighborhood effect in both tasks. Words with high frequency neighborhoods are recognized slower, and an individual frequency effect is also shown. Furthermore, latencies measured from word onset partially show an individual frequency effect, and inhibitory effects due to neighborhood.

19. CONFIDENCE-LEVEL AND FEELING-OF-KNOWING IN QUESTION ANSWERING: THE WEIGHT OF INFERENTIAL PROCESSES

J. Costermans
University of Louvain, Louvain-la-Neuve, Belgium

Recent research on meta-memory processes in question answering paid much attention to the feeling-of-knowing (FOK) evaluation when no answer is given (Nelson, 1988), but much less data are available on the confidence-level estimate (CL) about a given answer; moreover, FOK and CL were almost never compared as to their accuracy and reliability. Two experiments were designed to enlighten some aspects of these problems.

In Experiment I, Ss were asked a set of 250 general information questions. Their response latencies were measured. After each item, they were required to estimate their CL (when an answer had been given) or their FOK (when no answer had been given). The questions were presented twice, with 60 minutes time interval, and a recognition test immediately followed their second presentation.

This experiment allowed three main conclusions. First, it confirms the low accuracy of the FOK estimate as a predictor of the recognition performance (Goodman-Kruskal's Gamma coefficient G = .11), while the CL accuracy proves to be much more satisfactory (G = .58). Second, both the CL and the FOK estimates bear a high test-retest correlation (G = .87 and .82, respectively). Third, FOK values correlate positively with the amounts of time allocated for searching the desired information in memory (G = .55), and the CL values correlate with retrieval latencies, but negatively (G = -.51).

These observations give rise to an apparently paradoxical situation, since the FOK estimated at the same time bear low accuracy and high reliability. They also correlate fairly well with search times: positive FOKs tend to be associated with long search times. The FOK estimate thus appears to reflect very reliably some subjective variables affecting the time allocated to the search for information. However, contrary to a generally accepted standpoint, since the FOK accuracy is so low, these variables do not seem to coincide with the subject's actual knowledge state. In contrast, this should be less true for the CL, since its accuracy is much better.

Experiment II was designed to shed some light on this paradoxical situation. The hypothesis was that the FOK estimate results from a set of inferential processes applied to the question presented and reflects what the S feels he ought to know rather than what he actually knows. This feeling could be inferred from some statements like: "I should know that because I remember having read a paper on that matter", or "I should know that because that field is quite familiar to me", and so on. Therefore, each general information question was followed, not only by a CL or FOK evaluation, but also by a subsidiary questionnaire about a set of statements like "Do you remember in which circumstances you could have read or heard about this fact?", or "Is the domain of the question familiar to you?".

The main result of Exp. II is that these variables allow a fair account of the FOK variance (as derived from multiple

correlation techniques), and a less fair account of the CL variance, as hypothesized.
The generalizability of these findings will be discussed, along with their implications as to the source and significance of the confidence level and of the feeling-of-knowing impression.

20. LEVELS IN COGNITION

Hans Kreitler and Shulamith Kreitler
Tel Aviv University, Tel Aviv, Israel

The paper presents the new concept of levels in the functioning and structure of cognition. The levels are defined in terms of content units that differ in structure and complexity. The major constructs used in defining the units are referent and meaning value. Both are derived from the Kreitler and Kreitler theory of meaning and denote the carrier of meaing to which meaning is assigned, and the assigned meaning, respectively. The concept of levels will be exemplified in a study that deals with defensive behaviors. The two levels will be represented by belief constellations (viz. the molar level) that orient toward overt behaviors and enable their prediction, and predispositions for specific meaning assignments (viz. the molecular level) that are related to the beliefs but not to the behaviors. It will be argued that the different cognitive levels are characterized by different processes and properties.

21. 21.THE HUMAN COMMUNICATION RESEARCH CENTER

A.J. Sanford, L. Moxey and Steve Barton
University of Glasgow, UK

The poster display will describe the newly formed Human Communication Research Centre (HCRC), founded by the British Education and Social Research Council, in the Universities of Glasgow and Edinburgh.
The Centre is hosted by Psychology (Glasgow) and Cognitive Science (Edinburgh), and is aimed at genuine interdisciplinary research along novel lines. The Centre has some 12 principal investigators and a similar number of Research Staff, and has a large number of associates.
The nature of the Centre and its work will be depicted in the poster display, and other material will be available. The Centre encourages visitors (long and short term), and has a policy of active involvement in European research projects. We are actively seeking new project involvement at this stage, and the presenters will be happy to discuss this and any other issues with members of the ESCP.

22. RECONSTRUCTIVE PRECESSES IN TEXT COMPREHENSION

F. Valle-Arroyo
Department of Psychology, University of Oviedo, Spain

It has been argued that text comprehension depends on the reader's previous knowledge provided that this knowledge is activated either by some clues in the text or by a title that might supply the reader with an appropiate context or frame within which ambiguous sentences and words can be disambiguated. This essentially means that either activation is produced before or during the process of reading, and then comprehension is possible or, otherwise, comprehension will not be reached. That is, a title which is considered necessary for activating previous knowledge will only have some effect on comprehension if it is given before or during the reading, but will never profitably influence comprehension if it is provided afterwards.
A series of studies carried out, using question answering methods, do show that comprehension can be retrospective, since the "title after" groups significantly increase their level of comprehension (against Bransford & Johnson's position) and such increment cannot be fully explained by the subjects' general knowledge, but needs to rely also on the linguistic input. This essentially means that, contrary to the schematic conception of memory (see Alba & Hasher, 1983, for a review), sentences that might not have been understood and integrated - when read without a title - are, nonetheless, codified and that is why the title after can play a role in comprehension. Additional studies seem to imply that the title's function consists mainly in providing an answer to some of the questions that the reader might already have asked (himself) during the process of reading.

23. MENTAL MODELS AND TASK DEMANDS DURING COMPREHENSION

Carlos Saiz & Angel Fernandez
Universidad de Salamanca, Spain

Previous studies have shown that when reading a description of another person subjects form representations in which some pieces of information are more readily available than others. This foregrounding effect can be explained in terms of the characteristics of a mental model representation of the text being read. One characteristic of mental models is that their structure is affected by information not presented in the test, such as people's knowledge, expectations, processing strategies, etc.. The two experiments reported here were an attempt to explore the effect of extra-textual factors on the structure of mental models representing person descriptions further, as revealed by foregrounding effects. In the two experiments subjects had to make on-line recognition judgments on words that had previously been said either to apply or not to apply to the person in the description. Additionally, in the first experiment, subjects were given one of three instructions: to simply attempt to understand the paragraph, to form an impression of the person being

described, or to try to memorize the information presented. Then, word recognition times were analyzed as a function of the processing objectives given to the subjects. In the second experiment, one half of the subjects did the reading and recognition task while engaged in a concurrent auditory word detection task. Their recognition times were then compared to those of subjects who did not do the auditory task. Results are discussed in regard to the significance of extra-textual factors, such as processing objectives and attentional demands, in the on-line construction of mental models. The role of mental models in current views of coding operations in social information processing is also discussed.

24. AGEING EFFECTS ON SEMANTIC PROCESSING: AN ELECTRO-PHYSIOLOGICAL STUDY OF YOUNG AND MIDDLE AGED ACADEMICS

Thomas C. Gunter, Janet L. Jackson and Gijsbertus Mulder
University of Groningen, The Netherlands

The study set out to explore age differences in the N400 component, described by Kutas and Hillyard as an index of semantic expectancy. Research has shown this component to be elicited at approximately 400 ms after presentation of a semantically incongruent word. For example, Kutas and Hillyard (1980) performed a reading experiment in which they, for the first time, showed that the ERP pattern of a congruent ending of a sentence ('She spread the bread with butter') differed from the ERP pattern of an incongruent ending ('She spread the bread with socks'). In subsequent work these authors (Kutas and Hillyard, 1984) also showed the N400 to be elicited by words that were semantically acceptable but unpredictable in the context of the sentence (e.g., 'He mailed the letter without a cheque'). Kutas and Hillyard's interpretation of their results suggested that the N400 is sensitive to semantic processing. This claim has been substantially supported by other research. For example, in the study of Benson and Macar (1987) incongruity in music and other non-linguistic contexts (geometric patterns) were found to elicit a late positivity; an N400 was only elicited by semantic incongruity within sentences.
The experimental set-up used in the present study was as follows: A group of young students and a group of middle-aged academics read a number of congruent and incongruent sentences followed by a recognition task. Age differences were found in both accuracy and speed in the recognition task. The N400 elicited in the reading task was both delayed in latency and reduced in amplitude in the older group. These ageing effects coould not be attributed to early stimulus input processes since N1 did not differ between the age groups. A re-averaging of the ERPs during reading as an function of sebsequent recognition showed a small Dm for the younger group and a large Dm for the older group suggesting a difference in the encoding strategies of the two groups.
To check the generalisability of the results of this particular age group a further task (a memory scanning task) was carried out. The results, a delayed P3b and an increased RT, matched those found in the literature.

25. AGING, MEMORY AND DEMENTIA: A PROSPECTIVE STUDY

Karin Erngrund
University of Umea, Sweden

The poster will show some data from a large project called "Aging, Memory and Dementia: A prospective Study". It is a longitudinal project which will last for fifteen years and during that time almost four thousand subjects will be examined.
The project has several purposes. In the first place it will give a picture of cognitive abilities, especially abilities of memory, related to senile dementia and its prevalence in different ages. Other purposes are to get information as how to differentiate normal aging and pathological aging, to get pre-measurements of cognitive abilities of subjects who later on may become brain-injured by disease or accident and finally to determine early signs of different diseases, which can affect the central nervous system.
During the fifteen years the project will continue there are three periods of data collection, when a great deal of psychological, biological and social data from subjects in the ages of thirty-five, forty, forty-five and so on up to eighty years are collected. The first period of data collection is now being completed and some results will be shown in the poster.

26. FREQUENCY AND REPETITION EFFECTS ON IMPLICIT AND EXPLICIT TASKS

Alfonso Pitarque, Carmen Dasi,
Juan Carlos Ruiz and Salvador Algarabel
University of Valencia, Spain

An item can influence memory consciously (for example when we recall or recognize it) or unconsciously (observing for example how a previous presentation of an item facilitates its subsequent retrieval - repetition priming - or the retrieval of items semantically associated to it - semantic priming). Graf and Schacter (1985) labeled these retrieval modes as explicit and implicit memory, respectively. A variety of studies have different effects on the results found in implicit and explicit tasks (see for example Richardson-Klavhen y Bjork, 1988; Schacter, 1987 for reviews).
It is well known that frequency has dissociative effects over recall and recognition tasks, but we know less about its effect on indirect tests, partly due to its relation to repetition effect. Trying to understand such relations we manipulated within subjects the frequency (high vs low) and repetition (repeated vs non-repeated stimuli) in two direct tests of memory (recall and recognition) and an indirect test (word stem completion). The results are discussed in terms of their relation to the main theoretical positions about explicit-implicit memory.

27. PANTOMIMES OF OBJECT HANDLING IN NON-BRAIN-DAMAGED ADULTS

Arja Antervo
University of Helsinki, Helsinki, Finland

The aim of this study was to examine hand usage patterns of non-brain-damaged adults in object handling pantomimes. Subjects (unpaid volunteers) were classified according to their age into three groups (younger adults: 20-39 years, middle-aged: 40-59 years, older adults: 60-87 years); none of the older adults were institutionalized. Voluntary execution of unimanual and bimanual pantomimes were requested on a visual command, i.e. in response to a photo of an object(s). In order to compare pantomimes with actual object handling situations, a few object manipulations were required. Recognition of pantomimes was also studied.
In pantomimes, inadequate hand usage patterns such as the use of a body-part as an object (BPO) and the use of a substitute object were observed in all age-groups but mostly in the older adults. The inadequate hand usage pattern seemed to depend on the nature of the task: when the hand could easily be given the shape of an object (e.g. a hammer), or a substitute object could be used (e.g. a table as a typewriter) inadequacies were observed. Omission of actions executed with actual objects was noted in bimanual pantomimes. Misrecognition of pantomimes was rarely noted in any of the age-groups. The results are discussed in the framework of ideomotor apraxia.

28. MEASUREMENT OF IMPLICIT MEMORY IN ENACTED EVENTS

Lars Nyberg
University of Umea, Sweden

During the last decade a growing interest has emerged in studying memory of enacted events. An experimental method for the study of such events, referred to as subject-performed task (SPT), was developed by Cohen (1981). This method requires the subjects to perform a number of mini tasks which they are later asked to recall. When comparing SPT recall with verbal recall one typically finds that SPTs are better remembered than verbal tasks (VTs) (Backman, Nilsson & Chalom, 1986; Nilsson, Cohen & Nyberg, 1989). Several theoretical notions have been proposed to account for this superiority in memory performance (Cohen, 1981, 1983; Backman & Nilsson, 1984, 1985). One recently proposed view is that the processing of SPTs involves both explicit and implicit memory components (Nilsson & Backman, 1989). The processing of verbal information in episodic memory tasks is on the other hand thought to involve only explicit and implicit memory components. The purpose of this experiment was to try to find some way to test this proposal of both explicit and implicit memory components experimentally. The method of triangulation as developed by Hayman and Tulving (1989a), was adapted and used. The specific question was whether or not the potential implicit memory components would affect the degree of dependence between a reference test and a direct or indirect test of memory for SPTs compared to VTs. The results showed no differences in dependence between SPTs and VTs. However, as shown by Hayman and Tulving (1989b), if the same stimuli (fragments) are used in two successive, indirect tests of memory they are dependent, but not if the stimuli differ (altered fragments). Based on this finding, it is possible that the conditions in the reference test were too different from the conditions in the indirect test for dependence to occur. This possibility is tested in an ongoing follow-up experiment.

29. DOES PHONOLOGICAL ENCODING DISRUPT TRANSFORMATION OF VISUAL IMAGES?

Maria Antonella Brandimonte
University of Triest and University of Manchester

Manipulating mental images can involve memory in different ways. When hearing the name of a familiar item, adults can easily generate a mental image of that item and reinterpret it in mental imagery. When an image of a nameable item is loaded in the visual short-term store directly from new visual input, this will involve short-term memory encoding. This study addressed the question of whether the predominant use of a speech-based or a visual-short-term memory code affects performance on a task involving manipulation of visual images.
An imagery task called subtraction has been devised. It consists of mentally taking away a part from a picture that has just been seen in order to discover an image of another familiar object which can be named. For example, in one item, if the rope of a skipping rope is subtracted, the handles of the skipping rope look like 2 ice cream cones. Previous experiments showed that adults can easily do this task if one item is presented at a time, and the subject immediately subtracts the second item from the first image to discover the new pattern. This task does not necessitate generation from information stored in LTM but can be done directly operating on images loaded from the eyes in the visual-short-term store.
In the study reported here, this condition was contrasted with 3 conditions in which the images to be manipulated were stored in LTM. However, the kind of short-term memory buffer (visual or phonological) initially used to encode materials was thought of as influencing the LTM encoding and, consequently, transformation of visual images. A series of pictures was first learned so that subjects could recall their names with 100% accuracy. The subtraction task was then presented by showing, for each of the 6 pictures, another item that had to be subtracted from it to form a new item. In condition 2 subjects were not forewarned of the subtraction task, whereas in condition 3 they were first given training in subtraction. In condition 4, subjects engaged in articulatory suppression while memorizing the series of pictures. It is predicted that in conditions 2 and 3 subjects are likely to encode materials in a speech-based form, which should impair performance on the subtraction task. In fact,

although forewarning is given, in condition 3 subjects should not be able to adopt a form of visual coding, since presenting a series of items should induce them to recode pictures into an auditory format, independently from their awareness of the nature of the imagery task. On the contrary, articulatory suppression, in condition 4, should bias subjects towards a visual form of encoding and hence improve performance on the subtraction task.
Results will be discussed in terms of a tentative integration of the working memory model by Baddeley and Hitch (1974) with the Kosslyn (1980) model of visual imagery.

30. IS SPATIAL MEMORY AUTOMATIC?

J.C. Andrade & P.R. Meudell
University of Manchester, Manchester, U.K.

An experiment was conducted to test Hasher and Zacks' (1979) hypothesis that spatial information is encoded automatically in memory. Subjects saw two blocks of sixteen words, the words appearing singly and in different corners of a computer monitor screen. Subjects were asked to remember the words and their positions on the screen and to perform a concurrent counting task. All subjects counted by ones during presentation of one block of words (light task load) and by sevens during the other (heavy task load). Half the subjects were asked to focus their attention mainly on the memory task and half were asked to concentrate mainly on the counting task. As predicted, word recognition was better when subjects concentrated on the memory task and following performance of the easier concurrent task. In accordance with Hasher and Zacks' hypothesis, spatial memory was unaffected by variations in task load and attentional focus.

31. REPETITION AND THE EMERGENCE OF COGNITIVE ENTITIES

Yaakov Kareev and Judith Avrahami
The Goldie Rotman Center for Cognitive Science in Education
School of Education, The Hebrew University of Jerusalem

The question of how a sequence of stimuli is broken down into separate entities is central to many cognitive operations, be it perception, categorization, or memory representation. Still, the question of decomposition has been relatively neglected since the days of Gestalt. In this study we advanced and tested a hypothesis that would explain decomposition on the basis of experience. Following James, our hypothesis states that a sequence of stimuli becomes a distinct cognitive entity if it is experienced repeatedly in different contexts. To test if repetition alone can result in the emergence of cognitive entities, and to differentiate the predictions of this hypothesis from associationist claims, we had subjects of three age groups (4th graders, 6th graders, 8th graders) play a "memory game" in which they were presented with 48 coloured shapes and instructed to try and remember the sequence. Within that whole sequence a certain subsequence occured a number of times.
The repeating subsequences differed in the mode of their presentation (simultaneous, in four groups of 12 each, or sequential), in the length of the repeating subsequence (it consisted of three, four, or five shapes), and proportion of the repeating subsequence within the whole (.50, .75, or 1.00). During the testing stage which followed learning, we compared subject's recognition of the entire repeating subsequence to that of a part of it. Our hypothesis that the entire repeating subsequence would emerge as a whole, led to the prediction that it would be better remembered than its part in measures of both percentage and speed of correct recognitions. The data strongly supported this prediction. As expected, the variables employed did not have significant effects, thus supporting our contention that repetition operates in a similar manner across a wide range of conditions.

32. THE ROLE OF AUTOBIOGRAPHICAL MEMORY IN DESCRIBING COMMON ACTIVITIES

Barbara Dritschel
Medical Research Council Applied Psychology Unit,
Cambridge, U.K.

Three studies investigated how information is used to help solve common problems. In particular we were interested in the extent to which generic knowledge or episodic memory is used in solving the problems under different contextual constraints. In order to answer this question, two different types of responses were obtained, a metamemorial response based on subject's impressions of what they were using, and observer ratings of the number of specific and general memories produced in oral speech. The methodological issues associated with use of these different measures are explored in Experiment One. Experiment Two examined the different ways in which autobiographical information is used when the problem to be solved varied on dimensions of their openness, that is, the flexibility in terms of how they are executed (e.g. setting a table versus celebrating Christmas) and their frequency of performance. Experiment Three examined the changes in autobiographical memory while the contextual instructions under which they had to make their response changed. The results indicated that the reliance on specific autobiographical memory (as rated by observers) was influenced by openness as well as by contextual goals. Metamemorial (self-rated) responses were influenced by frequency and to a lesser extent the perceived goals of the remembering situation.

33. FAMILIARITY EFFECTS ON THE COMPREHENSION OF IDIOMS IN CHILDREN

Maria Chiara Levorato
Universita' di Padova

Cristina Cacciari
Universita' di Bologna

Several studies have examined children's understanding of non-literal uses of language, e.g., metaphors, similes, irony. These studies show that children younger than 9-10 years old rarely comprehend the non-literal meaning of these linguistic forms and therefore tend to interpret figurative language literally. Recently, Cacciari & Levorato (1989) showed that when idioms are presented within a rich informational environment, children are able to grasp the figurative sense even at the age of seven and that children are less able to produce idioms than to comprehend them. In a further set of studies, we analyzed whether the level of familiarity of the idiomatic expression plays a role in improving the ability to comprehend the non-literal interpretation. Results show that familiarity plays a role only for children who are not yet able to use contextual information but per se is not sufficient to explain how children get to a figurative interpretation strategy.

34. ON THE ROLE OF TACTILE INFORMATION IN VISUAL SPEECH PERCEPTION

Bjorn Lyxell and Jerker Ronnberg
University of Umea, Umea, and
Linkoping University, Linkoping, Sweden

In two experiments the role of supplementary tactile information in visual speech perception was investigated. Two different methods of transmitting tactile information were used: in Experiment 1, the subjects received tactile information by holding the hand directly on the speaker's larynx, whereas a wrist-worn device (MiniVib) was employed in Experiment 2. The results from Experiment 1 revealed a general (i.e. non-interactive) improvement in speech perception across conditions in a lipreading test. This facilitating effect was talker-independent and independent of hearing-status (i.e. normal hearing vs. hearing-impaired). In Experiment 2, speech perception criterions with varying demands on speech decoding were compared. The results demonstrated a general (i.e. non-interactive) improvement across all speech perception criterions used. Breakdown of data reveals that "less skilled" speech readers benefit the most from tactile information. Thus, both experiments suggest that the tactile information provides a general facilitation which is talker-independent, task-independent, and independent of hearing-status and transmission method. The results are discussed with respect to how multiple sources of information influence visual speech perception, with particular reference to the issue of modularized information-processing.

35. PERCEPTUO-MOTOR AND LINGUISTIC ASPECTS OF HANDWRITING: A DEVELOPMENTAL STUDY

Pierre Mounoud, Pascal Zesigner and Claude-Alain Hauert
University of Geneva, Switzerland

The study of children's graphomotor activities has evidenced a non-monotonous pattern of development (Mounoud, 1986; Meulenbroek & Van Galen, 1988), as has been reported in other areas of motor behavior (Hay, 1979; Von Hofsten, 1984; Mounoud, Viviani, Hauert & Guyon, 1985). These developmental changes have usually been interpreted as reflecting the use of different strategies or types of representation involved in movement production. Handwriting is not solely a motor task but implies the linguistic system: in adults, handwriting movements have been shown to be affected by phonological (Wing, 1980) as well as by lexical factors (Pynte, 1989). The issue of the present research is to investigate both perceptuo-motor and linguistic aspects in the acquisition of handwriting skills.

Method: The productions were recorded on a digitizing table (Summagraphics Microgrid II 1724H, RMS = .127 mm, sampling rate = 168 Hz) connected to a microcomputer (Olivetti M24).

Subjects: 5 groups of 8 girls aged 8 to 12 years and 8 adult females (mean age = 26) participated in the experiment. All of them were right-handed and had normal or corrected vision.

Procedure: The subjects were to write 10 times 4 French words and 4 pseudo-words; the stimuli were 6 letters long and were visually presented at pseudo-random prior to the production. Each pseudo-word contained the same first trigram as one of the words. The words were approximately balanced for frequency and orthographic regularity.

Data processing and analyses: All the handwriting samples were filtered (cut-off frequency = 9 Hz) and then segmented on the basis of the absolute velocity pattern. The duration, trajectory length, mean and maximal velocities of the first trigram (last stroke excepted) were computed. The number, duration and location of pauses have been separately analysed for each word. The frequency spectrum (FFT) and the dysfluency (number of inversions in the velocity pattern) for each trigram remain to be performed.

Results: Preliminary results seem to confirm the discontinuous developmental trend regarding several indexes. Additionally, the mean number of pauses steadily diminishes between 8 and 11 years but increases at 12. Both results suggest the presence of qualitative differences in the programmation and execution of handwriting movements in children. Finally, some differences between words and pseudo-words seem to emerge, although they still need to be more precisely specified.

36. THE INFLUENCE OF AGE AND MEDIUM OF REPRESENTATION ON PERCEPTUAL CATEGORIZATION

C. Pacteau, M. Brun, P. Perruchet
Laboratoire de Psychologie Differentielle
Université de Paris V

It is generally assumes that developmental trends in category learning reflect a shift from grouping objects on the basis of family-resemblance (hollistic categorization, HOL) to grouping objects on a single or more attributes (analytic categorization, AN). On the other hand, we (Pacteau et al., submitted) have shown that medium of representation can exert a predominant influence in orienting perceptual categorization: photographs favour HOL responding whereas line-drawings favour AN responding. To investigate the effects of both factors - age and medium- we examined how 6-, 9-, and 12-year old children learned to categorize faces constructed in such a way that they can be processed either holistically or analytically. For each age, the same faces were presented to different groups of subjects, either as photographs, veridical line-drawings, or schematic line-drawings.
After being exposed to the prototypical faces of two categories, subjects were submitted to a category-assignment task patterned after Kemler-Nelson's (1984) procedure which allows them to be classified as HOL or AN learners. RTs were recorded. Subsequently, children were observed in an attribute-identification task, which we previously designed to ascertain subjects' knowledge of isolated attributes. Results show that AN strategy prevailed in all groups, but corresponded to different forms of knowledge according to medium and age. The medium effect was revealed by the type of attribute which subjects focused upon to categorize: the chin on photographs and more local attributes (nose, mouth ..) on line-drawings. Interestingly, the chin was poorly identified when presented in isolation, whereas the other attributes were well identified. Developmental trends reflect an evolution in the efficiency and form of AN responding. Accuracy, speed in categorization, and performance in identification improved with age. Moreover, multiple-attribute learning only occurred in older children.

37. VISUAL ATTENTION AND INTERFERENCE: "EARLY" SELECTION FOR ACTION CONTROL

Werner Schneider
University of Munich, Munich, Germany

The general framework views problems in action control as essential for understanding the nature of attention (e.g. Allport, 1987, 1989; Neumann, 1987, 1990; Prinz, 1983; Van der Heijden, 1990). Motor control structures need sensory information for specifying their parameters in order to generate overt behavior. The organism is faced with a visual selection problem if more adequate information for parameter specification exists within a fixation than can be actually used ("overspecification problem", Neumann, 1987). Typical examples for this situation in experimental psychology are "interference paradigms" (e.g. Eriksen & Eriksen, 1974; Galti & Egeth, 1978; Stroop, 1935). In Eriksen's paradigm (Eriksen & Eriksen, 1974) interference is produced by a "late" conflict of alternative response "tendencies" which compete for action control.
We suggest that "early" visual-spatial attention ("spotlight") is the mechanism which resolves the "late" conflict and initiates the overt response. Five experiments were performed both to verify this general idea ad to make a contribution to the further conceptualisation of this mechanism. The first two experiments established a new paradigm which manipulated visual attention by spatial preceuing (e.g. Eriksen & Hoffman, 1973) and by the cost-benefit method (Posner & Snyder, 1975) independently of response competition interference (Eriksen & Eriksen, 1974)- similar but decisively different from Eriksen & St. James (1986). The results confirmed our expectations. The next experiment was able to show with the same paradigm that the mechanism for resolving the response conflict works non-intentionally and at an "early" (low level) stage of processing.
In the second part we exploited the possibility of our experimental procedure to test different hypothesis about the shape of basis of the attentional mechanism. In other words we wondered whether analogy of "spotlight" is an adequate one. The data of experiment 4 gave a negative answer. But instead the results of the next experiment suggested that representational basis of visual-spatial attention should be conceptualized in a "blob-based" (Marr, 1982) way. Finally we want to discuss implicatios for the "early-late selection" controversy and the concept of selection in general.

38. SUSTAINED ATTENTION IN VISUAL DETECTION TASKS

M.A. Proverbio and P.S. Bisiacchi
Universita' di Padova, Italy

Recent investigations have been concerned with the orienting of visual attention using a phasic-orienting paradigm, i.e., a shift of attention to different spatial location. Few studies have been concerned with sustained attention, i.e., maintaining attention to a visual location throughout a series of events.
The present experiments were designed to investigate sustained visual attention and the influence of different attentional demands on RTs with a task in which Ss were cued before each block of stimuli as to which visual hemifield was to be attended. The stimuli were bright squares presented tachistiscopically to either hemifield in a random presentation.
Exp. 1 was a go-no-go task, Exp. 2 was a simple reaction time task and Exp. 3 was a choice reaction time task. The results showed an equal ability to allocate attention to the right or left visual fields. However, differences were observed at varying of attentional resources required in the tasks.
The results are discussed in the light of theories of covert visual attention.

39. PERCEPTUAL TEXTURES AND MENTAL ROTATION

Eliano Pessa
Francesco S. Marucci and Vilfredo De Pascalis
University of Rome "La Sapienza", Rome, Italy

This study examines how the different textural properties of visual non-familiar stimuli influence the subject's performance in recognition tasks. Stimuli were constructed by filling adiacent regions of a plane figure with different textures according to n-th order statistics as proposed by Julesz (1971). In our experiments stimulus-pairs were presented; stimuli belonging to every pair were presented in sequential order, with the first member exposed at 0 degrees and the second at different rotation angles. The rotation angle was presented in random order. In half of stimulus-pairs the first and the second member were constituted by the same stimulus. Our hypothesis was that the reaction time in a same-different judgment paradigm would grow monotonically with the rotation angle. We expected also that the slope would increase with textures characterized by higher order statistics.
Two experiments have been carried out with 20 subjects, one with stimuli constructed using first and second order statistics, and the other with third and fourth order. The rotation angles were restricted to two blocks of 5 stimuli. Each stimulus belonged to a 6 angle rotation values (0, 60, 120, 180, 240, 300 degrees). Each member of a pair was presented for 700 ms.. No significant differences between orders of statistics were found. The shape of the relationship between reaction time versus rotation angle was found to be different from that obtained by Shepard and his colleagues (Shepard, Metzler, 1971; Cooper, Shepard, 1973; Metzler, Shepard, 1974; Cooper, 1975). The stimulus x angle interaction was found to be significant. These results suggested a revision of our current idea about mental rotation hypothesis in the case in which data from stimuli constructed using textural properties must be explained.

40. THE EFFECT OF ENCODING TASKS ON THE EPISODIC MEMORY FOR FAMILIAR AND UNFAMILIAR FACES

Sakiko Yoshikawa
Otemon-Gakuin University, Osaka, Japan
and
Vicki Bruce
The University of Nottingham, Nottingham, U.K.

In the present research, we examine the nature of episodic representations of familiar and unfamiliar faces. After one of three different encoding tasks (Face shape judgement, Friendliness judgement, and Intentional learning), subjects were asked to judge as quickly as possible whether each face is the same view as before or the same person's face but wearing a different facial expression. The results showed that in personality judgement and intentional learning conditions, the episodic memory of familiar faces were better than that of unfamiliar ones but there was no difference in the physical judgement condition. While the types of encoding tasks had no effect on subsequent memory of unfamiliar faces, episodic memory of familiar faces after intentional and semantic judgement conditions were better than that after the physical judgement condition. We will discuss how these results could be assimilated into the recent face processing framework such as Bruce and Young (1986).

41. MENTAL IMAGES - NOT EPIPHENOMENAL BUT NOT PICTURES EITHER

Benny Shanon
Department of Psychology
The Hebrew University, Jerusalem, Israel

The research to be reported sets itself to clarify the status of mental images and to call for a view which is distinct from the views commonly entertained in the literature in this regard. In the literature, three basic positions are noted. First, a position denying the existence of mental images. In the article that triggered the imagery debate Pylyshyn (1973) pointed out that while the experiece of imagining is common to everyone, in itself it does not demonstrate that the concept "mental image" should have a place in cognitive theory. Mental images, he thus argued, are epiphenomenal. To show this is not the case, one has to demonstrate the existence of cognitive processes that cannot be characterized in symbolic-propositional terms and that necessitate reference to concepts akin to those employed in the perceptual domain. Demonstrations to this effect have been offered by the proponents of the second position, that defending the existence of mental images. The seminal experiments were conduted by Shepard, Kosslyn and their associated (Shepard and Metzler, 1971; Cooper and Shepard, 1973; Kosslyn, 1989). On the basis of such findings, what seems to be the current paradigmatic theoretical characterization of mental images was suggested. According to this, mental images are modelled as pictures appearing on what may be regarded as the mental equivalent of a CRT screen (Kosslyn and Schwartz, 1977). The experimental findings did not abate the imagery debate, but rather they carried it further and further. An important argument raised by Pylyshyn (1981) was that for mental images to be veritable, they should reflect cognitive structure, not the cognizer's knowledge and belief. Given that this is not the case Pylyshyn concluded against the characterization of mental representations as imaginal. While the debate between the advocates of mental images and their critics continued another, third position was raised. Anderson (1978) argued that there is a principled inability to distinguish between propositional and image-like representations. He pointed out that in specifying mental representations one always specifies mental computations as well. Given any pair of

representations and computations one can always introduce conjugate variations in the two constituents so that different representational structures may fit the same data. Empirical data therefore cannot settle the issue as to what the representation is.

42. A SYSTEMIC MODEL OF CONSTITUENTS OF MIND AND THEIR EVOLUTION

Henri Wermus
Geneva, Switserland

I intend to present several examples of cognitive representations as described in experimental psychology, mainly in the work of the "Piagetian School" in Geneva. These experiments exhibit some striking properties of mind procedures such as egocentrism, systemic rigidity, abductive thinking etc.; in particular they show a use of peculiar logical links belonging to so called "natural protocologics". The "degree of discernability" of a protologic determines the level of inferential competences of the mind.
It is also most important to consider the role of "subcognitive elements" (like beliefs, attitudes, desires etc.) in the flow of cognitive processes.
These ideas have led to a model of mind and its subsystems such as semantic representations, protological links, transformation functors etc. which I aim to comment upon.

43 VENTILATION NOISE AND COGNITIVE PERFORMANCE

Staffan Hygge
The National Swedish Institute for Building Research,
Gavle, Sweden

A total of 47 subjects took part in two experimental sessions 24h apart and starting at 3 o'clock p.m. Subjects were run in groups of 5-8 persons. During the first session, which lasted for a little more than 2h, the subjects worked with cognitive tasks under a noise level of approximately 35 dBA (50 dBC, 64 dB lin.). The tasks were in order: serial recall in short term memory, proof-reading, an embedded figures task, Baddeley's grammatical reasoning task, and a test of clustering in free recall. During the second session 23 of the subjects worked under identical noise conditions as during the first day (low noise group), and 24 of the subjects in the high noise group had a noise level of 58 dBA (64 dBC, 67 dB lin, maximum energy content in the octave band around 125 Hz). The noise in both conditions was generated by a commercial heat-exchanger. The serial recall task and the grammatical reasoning task were identical in sessions 1 and 2, and the other tasks were highly similar. For all the tasks the changes in performance from session 1 to 2 were entered in analyses of variance. For the serial recall task and the grammatical reasoning task, the performance in the first and second part within the two sessions were calculated separately. The results showed a significantly higher increase in number of embedded figures in the low noise group than in the high noise group. The results also indicated a difference between the two noise groups on the grammatical reasoning task to the effect that initially in the second session, the high noise group performed worse than the low noise group, while the reverse was true for the second part of the second session.