

it would be unreasonable to cavil at details. Inevitably, the selection of experiments will not be approved by all physiological psychologists. Similarly, neuropsychologists may find the functional maps of the brain oversimplified and note that the concept of hemispheric asymmetry of function and the special rôle of the right cerebral hemisphere for *certain* aspects of visual and spatial perception were established long before the study of a small group of patients with callosal sections (p53). Linguists may well be startled by the view that "the remarkable power to speak foreign languages . . . can be explained on the basis of conditioned reflexes" (p 96); and those concerned with brain mechanisms may consider that too much stress has been placed on brain weight at the expense of circuitry and the complexities of modular organisation. The account of physiological

mechanisms and biochemical changes that may underlie the processing and storage of information in the brain is necessarily speculative; and the section on memory and learning is limited to the notion of a "hippocampal taperecorder" (p90), omitting much recent clinical and experimental work in this field.

As a general introduction to the topic, however, the book is a useful, well written and stimulating guide, remarkably free from jargon and pitched at the right level for the readers for whom it was designed. Few would do better or even have the courage to attempt it. □

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Representation of meaning

John Morton

Language and Perception. By George A. Miller and Philip N. Johnson-Laird. Pp. viii+760. (Cambridge University: Cambridge, London and Melbourne, August 1976.) £12.50.

THIS book is about the representation of meaning. Tired of waiting for linguists to produce a usable semantic theory the authors have started to build a psychological one. The starting point is the perceptual world and its representation in memory. A conceptual theory of memory links this with language. On the one hand we have words and on the other we have ways of testing the perceptual world to find what concepts are appropriate to describe it. In this way we can learn and put what we see or remember into words, or take appropriate action when someone addresses us. In the latter case the sentence is translated into a program which can then be executed appropriately.

Miller and Johnson-Laird illustrate their position with the sentence "Did Lucy bring the dessert?" This is translated into a program which they represent as: find (M(EP), $F(x, y)$). This program will be interpreted as an instruction to search for a particular event in a particular (episodic) memory store. F is a pointer to a particular operator which characterised the meaning of the verb 'BRING'. x and y point to the concepts corresponding to 'LUCY' and 'DESSERT'

respectively. This translation procedure is automatic for the listener who knows English well. He then has the option of answering. This is organised by an executor, which must find the episode and apply the various tests which define BRING: (i) find (domain, COME (agent)) and call it e ; (ii) test (during e , HOLD (agent, object)).

These tests can be interpreted in this situation (after the various arguments have been assigned their values) as: (i) find (and label as e) the episode when Lucy came; (ii) find out whether Lucy was then holding the dessert. The operator COME involves further tests which include various perceptual predicates concerning the motion of Lucy; HOLD is itself such a perceptual predicate.

The procedures may fail in a number of ways: the relevant episode may not be found; Lucy might have been carrying something other than dessert. These failures would be interpretable by the executor, who could try alternative ways of answering the question or organise a reply—including that of "Don't know".

They discuss some of the ways in which syntax might influence the translation program, including control instructions such as 'ACHIEVE', which result from commands. And they outline ways in which factors such as intonation, context and intent would influence the processing.

The next problem was that of exploring of lexicon in more detail, having established the kind of machinery the lexicon would be involved in. Initially they attempted to do this using purely perceptual tests in the lexical entries. But that soon became inadequate and they introduced functional information. Thus a table must have a WORK

TOP which is defined not just as being flat—readily testable perceptually—but also it must be "large enough, and rigid enough, so that, if it is supported horizontally at an appropriate height, it will support objects for a person to manipulate with his hands." Such a definition incorporates sensorimotor predicates in its evaluation and the need for analogic prediction. Consideration of speaker as well as hearer necessitated a more flexible approach to the lexicon, and the need to include in the theory some acknowledgement of the relationships between Lexical items led to the idea of core concepts in semantic fields.

The core of FURNITURE is that it assists in accommodating people's bodies and the objects and instruments they use as they engage in eating, sleeping, working, or playing. This core motivates the conditions in a decision table. The conditions are tests with YES/NO answers and the pattern of answers to the conditions leads to particular lexical concepts. Thus for SEAT there are conditions which ask whether the object (1) is for one person only, (2) has a backrest, (3) is upholstered and (4) has legs. If the first two answers are YES then the object must be a CHAIR; with the pattern YNYN it could be a footstool or an ottoman, and a further test or specification would have to be made. The advantage of the decision tables is that they can be used in both ways—from properties to lexical concepts or *vice versa*. Verbs are related together in a slightly different way in this theory; there are core concepts such as TRAVEL, POSSESS, SEE which are then refined in various ways, such as by specifying the manner—to give verbs such as LURCH, OWN and GLIMPSE.

The semantics is not just of language but of the real world as we perceive it: objects, spatial relations, actions, time; and the use of psychological data is more apparent on the perceptual side of their theory than on the language side. The authors seem to make the Whorfian decision to base perception on language—in this case English. All words are related to the perceptual world and all aspects of the perceptual world are related directly to the lexicon-based conceptual structure. What they do not do is create an intermediate level. The decision tables seem to be language specific, and it is not clear how we can think other than verbally. To take a simple example: I feel I can conceptualise separately: we (me, you and him); we (me and you); and we (me and him). The decision table, however, produces only the conditions—the tests of who is included—and the words. The three versions of *we* are separated only in the columns

of the decision table, which are not the right kinds of things to serve as cognitive units. Their decision may have been the right one but I would have liked to see their motivation.

I expect there are going to be lots of flaws in the routines they suggest. I didn't specially look for them but some jumped out at me—such as the requirement, in the definition of LOOK AT, that the back of the eyes, the pupil and the object looked at have to be in line. Not only can you look at someone through a mirror but also out of the corner of one's eye. The former objection may be trivial but the latter looks as though it will require a distinction to be made between the routines used by the looker and by the looked at. This is a game the authors couldn't hope to win first time out. Either they analyse a few concepts into the ground and produce something lacking generality or they attempt to cover enough ground to justify general principles with the risk of getting details wrong.

While their local arguments are coherent, the book as a mass is rather heavy. I get the feeling that they were looking over their shoulders at linguists and philosophers, and in so doing blurred their psychological position. Their final 'Conclusions' chapter, which might have clarified this, reflects rather the "thank god that's over" feeling of the Preface. One little thing which made the book more difficult to read than it need be is the idiosyncratic indexing. They construct lexical entries for scores of words but don't include the words explicitly in the index. As it is, PERSUADE can be found through 'Communication verbs: perlocutionary'; and core concepts in their model, such as 'core concept', have no entry at all.

To obtain a rounded and more leisurely evaluation of this book (without actually reading it, that is) you will have to watch out for reviews in linguistic, philosophical and psychological journals. Each will have different objectives, requirements and criteria, and together they will pick it over as thoroughly as it deserves. At the moment I have no idea how many of the authors' ideas will survive, but I am certain that it will provide a fresh impetus to work in the area. For whatever its technical weaknesses may be, the outstanding merit of the book is to show how difficult the task is by submersion rather than dipping in the big toe. People really interested in the area have no option but to look at it.

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