

## Cognitive neuropsychology

# A fruit by any other name

from John C. Marshall

ADULTS who sustain damage to the left hemisphere of the brain frequently experience gross problems in the comprehension and expression of language, shown, for example, in a study reported on page 439 of this issue<sup>1</sup>. Expressive deficits can often be demonstrated by quite simple means. When testing neurological patients at the bedside, it is customary for the clinician to point to or hold up objects for the patient to name: a chair, a watch, a pen, the lapel of a coat or collar of a shirt, the flowers and fruit on the bedside table. The patient may grope and struggle for the correct word not only in this formal situation of naming-to-confrontation but also in spontaneous conversational speech. Sometimes a word will be uttered that is related to the intended target in sound ("hair" for chair) or meaning ("table" for chair); sometimes a circumlocution will be produced which indicates that the patient, in some sense, knows the word he is searching for ("Oh, you know, it's got four legs ..... you sit on it") but cannot retrieve its pronunciation. In yet other patients, neologistic jargon will predominate ("That's a gair").

Such word-finding difficulty is a ubiquitous aspect of 'aphasia' that follows cerebro-vascular accident ('stroke'), brain tumour, penetrating missile injury or closed head injury. The deficit is often extreme in the acute phase of the illness, and a mild residual 'anomia' is frequently the outstanding symptom of chronic aphasia after the remission of other language difficulties. How specific or restricted can such a naming deficit be? This question has both theoretical and practical significance. The precise patterns of cognitive loss and retention seen after cerebral insult should help us discover the principles of brain organization responsible for the storage and retrieval of the vocabulary of some 75,000 words that an educated adult commands<sup>2</sup>; an accurate description of the individual patient's impaired and preserved performance is an essential prerequisite of rational remediation.

The case reported by John Hart, Rita Berndt and Alfonso Caramazza<sup>1</sup> suggests very considerable semantic specificity in the functional and anatomical organization of the 'internal lexicon'<sup>3</sup>. Their patient, M.D., recovered well from brain infarction that initially rendered him globally aphasic for both speaking and understanding speech. The sole language impairment that persisted some 18 months post-injury was a residual anomia. But this anomia did not affect equally all classes of words; rather, it was particularly severe for the categories of fruit and vegetables. M.D. could name to visual

confrontation such comparatively rare items as an abacus and a sphinx, yet he was unable to name correctly such common fruits as peach and orange. The same deficit was also apparent on naming to tactile palpation and on naming from a verbal definition. When the patient had to sort pictures from different conceptual classes into appropriate piles, difficulty was again experienced with fruits and vegetables.

This constant pattern of category-specific impairment across different tasks might suggest that the patient has 'lost' not only the generic names of peaches and oranges, of carrots and cabbages, but also the conceptual principles whereby such natural kinds are grouped together into the superordinate categories of fruits and vegetables.

The story must, however, be more subtle than this: when the patient was given the name of a fruit or vegetable he could correctly match the word to its appropriate picture; he could similarly classify these words into their appropriate semantic categories, and could correctly judge and describe the size, colour, texture and shape of the fruits and vegetables that the words refer to. Conceptual and semantic knowledge of these categories and their exemplars thus seem to be intact. But this knowledge could only be accessed by the names of exemplars, names that the patient cannot himself elicit with normal facility. It is as if the name is the key to knowledge of fruits and vegetables; the patient cannot find the key for himself (that is, he cannot spontaneously name fruits and vegetables), neither, in the absence of the keys (that is, names) can he group exemplars into appropriate conceptual classes. But, given the name key by the examiner, the patient has no problem in unlocking his apparently intact store of information about fruits and vegetables.

## Vaccines

# Leprosy bacillus outwitted

from Philip Draper

AFTER more than a century of frustration at being unable to obtain sufficient material, people studying the leprosy bacillus (*Mycobacterium leprae*) and developing methods to detect and immunize against leprosy should soon have access to essentially unlimited amounts of the bacterial antigens. R.A. Young and his colleagues on page 450 of this issue describe the cloning of genes that specify five highly antigenic proteins of *M. leprae* and the production in *Escherichia coli* of fragments of the

By contrast, his direct perceptual experience of fruits and vegetables does not suffice to support conceptual categorization (or naming).

In 1770, Johann Gesner first observed that in aphasia certain classes of words were more liable to be lost than others<sup>3</sup>. Yet he was deeply suspicious of the notion that different semantic classes are located in different parts of the cerebrum, as if anatomy could mirror the spatial organization of Roget's *Thesaurus*. "The vessels of the brain", Gesner wrote, "are surely not arranged in accordance with categories of ideas, and therefore it is incomprehensible that these categories should correspond to areas of destruction." Gesner's qualms may well be justified, but, if they are, the exciting results of Hart, Berndt and Caramazza nonetheless suggest that focal damage can impair a sub-space within a thesaurus-like indexing system of names that give access to the knowledge base represented in the brain.

The presence of word-finding difficulties *per se* has little localizing significance; anomias have been reported after damage to many left-sided cortical and subcortical structures<sup>4,5</sup>. The fact that 'naming' is not a unitary function<sup>6</sup> does, however, leave open the possibility that different subcomponents of lexical processing are associated with specialized neuronal substrates. M.D.'s lesion involved the left frontal lobe of the cortex and the basal ganglia. Could a major re-entrant circuit between these structures be implicated in the semantic indexing of the mental lexicon? □

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2. Oldfield, R.C. *Quart. J. exp. Psychol.* **18**, 340 (1966).
3. Gesner, J.A.P. *Die Sprachamnesie* (Beck, Nördlingen, 1770).
4. Lecours, A.R., Lhermitte, F. & Bryans, B. *Aphasiology* (Baillière Tindall, London, 1983).
5. Damasio, H., Eslinger, P. & Adams, H.P. *Seminars Neurol.* **4**, 151 (1984).
6. Marshall, J.C. in *Psycholinguistics Series*, Vol. 1 (eds Morton, J. & Marshall, J.C.) 125 (Elek, London, 1977).

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proteins that are recognized by all 13 *M. leprae*-specific monoclonal antibodies that have been tested.

This encouraging result is the outcome of a programme begun over a decade ago by the IMMLEP (Immunology of Leprosy) Steering Committee of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. The object of IMMLEP is to produce a vaccine against leprosy, in pursuit of which it has sponsored the production