DISORDERS OF PATTERN RECOGNITION

A. Visual agnosia
- inability to identify objects by sight

- Types
  (1) apperceptive agnosia
  - unable to form stable [presemantic] representations of objects

  (2) associative agnosia
  - can form "percept" of object but cannot identify [cannot achieve a correct semantic description]

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B1. Apperceptive agnosia

- can fail in different ways
  (1) may be okay with objects themselves, but performance suffers with pictures of objects. Since this is not true of intact subjects, implies some early deficit

  (2) prototypical (canonical) vs. unconventional views. Poor performance associated with RH posterior lesions

  (3) copying may be poor, or, if intact, may still be odd

  (4) shadows test: poor performance again associated with RH posterior lesions

  (5) overlapping figures: HJA
  - (simultagnosia) Humphreys & Riddoch

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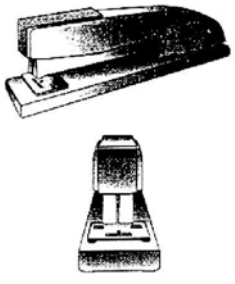
(a) Unusual views test



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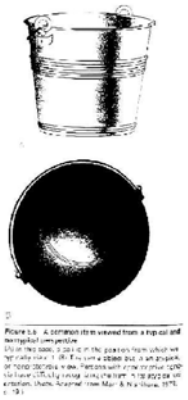

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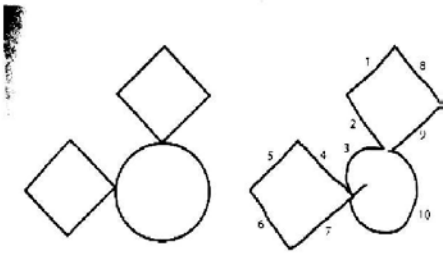

Figure 5.33 Patient C.K. was asked to copy the figure shown at the left. As can be seen at the right, his overall performance was quite good: One can readily identify the two diamonds and the circle. However, the numbers indicate the order in which he produced the segments. Unlike healthy subjects, C.K. did not draw each object in its entirety, but followed the outer boundary, even if this meant switching between objects. Adapted from Behrmann et al. (1994).

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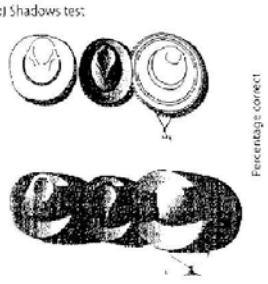
Figure 5.23 Tests used to identify apperceptive agnosia. **(a)** The unusual-views test. The subject must judge if the two pictures are of the same object. **(b)** The shadows test. Subjects must identify the object when seen under normal or shadowed illumination. In both tests, patients with right-hemisphere lesions, especially in the posterior area, performed much more poorly than did control subjects (not shown) or patients with left hemisphere lesions. Adapted from Warrington (1982).



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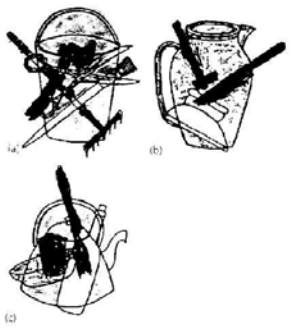

Figure 5.24 The drawings of patient F.R.A. Despite her inability to name visually presented objects, F.R.A. was quite successful in coloring in the components of these complex drawings. She clearly had succeeded in part in the stimuli, but still was unable to identify the objects.

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An important point here is that a diagnosis of associative agnosia depends on having excluded the possibility that there are problems earlier in the system. Thus, such a diagnosis is more believable the wider the range of "apperceptive" tests that have been done.

- Framework for object recognition

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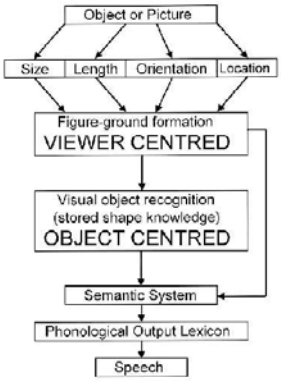

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B2. Optic aphasia (a pseudo-agnosia)

- mislabels an object, but mimes it correctly
- deficit not in semantics, but in mapping from semantics to output phonology (e.g., given a picture of a saw, mimes sawing motion, but says "hammer")

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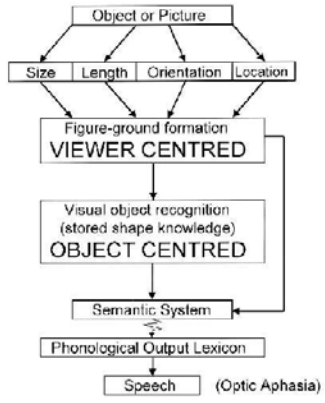

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B 3. Associative agnosia (visual)

- fails to identify objects presented visually (either confuses them with other objects, or has no idea what the object is)
- semantics intact given testing in another modality
- therefore, problem must lie in activation of semantics from visual description

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B 4. Visual agnosia but spared imagery

• CK (Behrmann, Winocur & Moscovitch) is severely agnosic, but produces beautiful drawings… and cannot later recognize the identity of his own drawings!

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Figure 8 The ability to draw objects from memory may be spared in agnosia. Patient C.K.'s drawings of a map of the United Kingdom and an electric guitar. His ability to generate an internal visual representation would appear to be intact. However, C.K. was unable to recognize the objects in his own drawings on a subsequent visit.

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B 5. *Category specific* visual agnosia

• commonly noted that patients are often better at recognizing objects from the general category of non-living things as opposed to living things (Warrington, Caramazza, Damasio)

• 3 stories about this:

(1) Warrington: separate regions of semantic memory given over to storing representations of different kinds (living vs. nonliving)

• a problem here is that this interpretation doesn't go much beyond re-describing the original observation

(2) Damasio: supposes that some classes of objects evoke representations not evoked by another. So, living objects evoke kinesthetic and motoric representations not evoked by non-living things.

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(3) Gaffan & Haywood: propose that living things are often simply more similar to each other than non-living things (experiment on intact subjects with reduced exposure duration; monkey experiment)

- Dixon and colleagues elegantly show that this seems to be a sufficient account of ELM's data (visual AND semantic similarity)

- High semantic similarity:
  - e.g., robin, crow, blue jay, cardinal
  - e.g., mustang, camaro, corvette, firebird
- Low semantic similarity:
  - e.g., plate, door, stapler, kite
  - e.g., humming bird, shark, rose, apple

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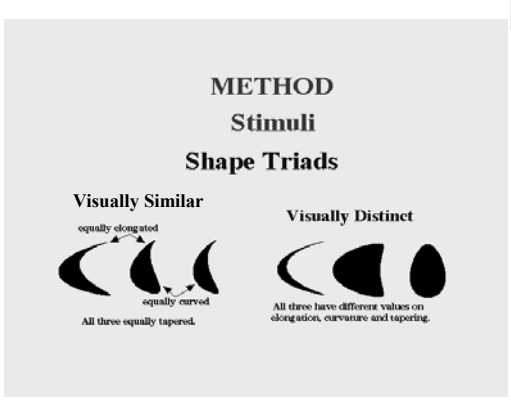

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- It doesn't matter whether semantic similarity is high or low, provided that visual similarity is LOW. However, if visual similarity is high, then ELM has terrible trouble learning to pair the blobs with labels that are high in semantic similarity (after 190 trials, ELM is still making 60% errors)
  - see visual description

- A sufficient account is that there is a deficit getting from the presemantic representation to semantics. This deficit doesn't much matter so long as targets are not close to one another in semantic space.

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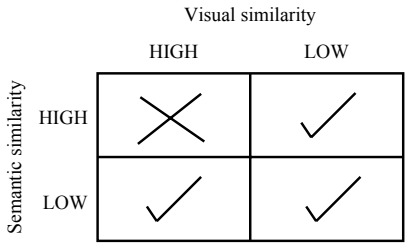

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C. Is face recognition special?

- lots of patients present with a deficit called "prosopagnosia"
- the big debate here concerns whether face recognition is simply a more difficult discrimination than object recognition…
- … because the standard finding is that IF the patient is agnosic, then they are ALSO prosopagnosic

- LOGIC: the standard "argument by association"
  - the logical difficulty here is that a thousand associations does not prove that a dissociation could not occur. The next patent may produce the dissociation.
    - C.K. provides the second half of the dissociation (CLASS: which is what?…)

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"Summer"
- Giueseppe Arcimbaldo

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"Fall"
- Giueseppe Arcimbaldo

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"The Forest Has Eyes"
- Bev Doolittle

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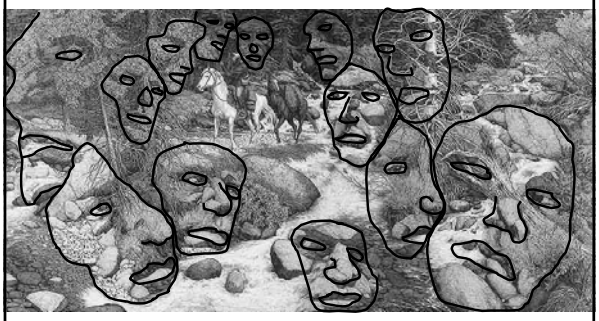
"The Forest Has Eyes"
- Bev Doolittle



24 Let me see that again!

• The What (Ventral) -- Where / How (Dorsal) distinction: Another double dissociation

  • Lesion studies in animals support the idea that information about an object's IDENTITY is processed in a different location in the brain from information about WHERE the object is located in space (Mishkin & Ungerleider)

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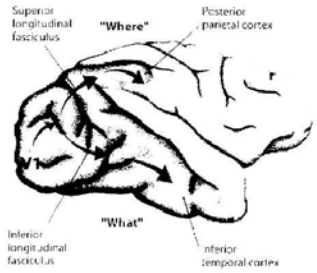

Figure 5.3 The what-where pathways for object recognition. The outputs from the primary visual cortex (V1) follow two general pathways. The superior longitudinal fasciculus includes axons terminating in the posterior parietal cortex, a region associated with identifying the location of the object (where). The inferior longitudinal fasciculus contains axons terminating in the inferior temporal cortex, a region implicated in object recognition (what).

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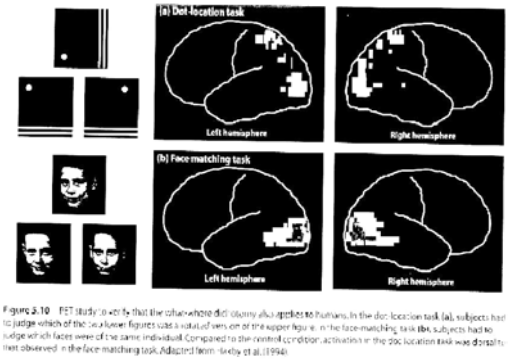

Figure 5.10 PET study to verify that the what-where distinction also applies to humans. In the dot-location task (a), subjects had to judge which of the two lower figures was a mirror version of the upper figure. In the face-matching task (b), subjects had to judge which faces were of the same individual. Compared to the control condition, activation in the dot-location task was dorsal to that observed in the face-matching task. Adapted from Haxby et al. (1994).

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Goodale & Milner:

- D.F. is a visual agnosic following carbon monoxide poisoning…
- However, when asked to:
  (1) pick up a disc that varies in size, she scales her fingers in flight so as to "pinch" the disc appropriately
  (2) put a shape in a slot in the distance, she can orient her hand correctly, despite the fact that, when at rest, she can not orient the shape properly
- Optic ataxia
  - these kinds of patients are not agnosic, but they have difficulty locating objects in space and reaching appropriately
- Summary

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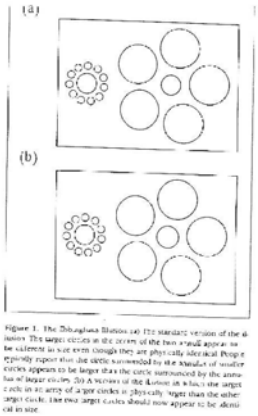

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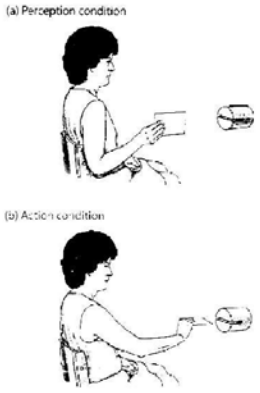

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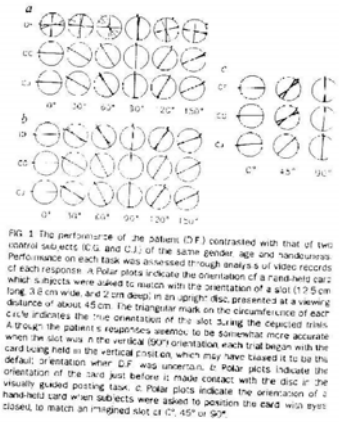

FIG. 1. The performance of the patient (D.F.) contrasted with that of two control subjects (C.G. and C.J.) of the same gender, age and handedness. Performance on each task was assessed through analysis of video records of each response. *A*. Polar plots indicate the orientation of a hand-held card which subjects were asked to match with the orientation of a slot (12.5 cm long, 3.8 cm wide, and 2 cm deep) in an upright disc, presented at a viewing distance of about 45 cm. The triangular mark on the circumference of each circle indicates the true orientation of the slot. During the depicted trials, although the patient's responses seemed to be somewhat more accurate when the slot was in the vertical (90°) orientation, each trial began with the card being held in the vertical position, which may have biased it to be the default orientation when D.F. was uncertain. *B*. Polar plots indicate the orientation of the card just before it made contact with the disc in the visually guided posting task. *C*. Polar plots indicate the orientation of a hand-held card when subjects were asked to position the card with eyes closed, to match an imagined slot at 0°, 45° or 90°.

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Ventral Stream	Dorsal Stream
Scene-parsing and object identification	Visual control of motor output
Scene-based frame of reference	Effector-based frames of reference
Relational metrics	Absolute metrics
Propositional	Isomorphic
Long-term representations	Moment-to-moment computations
"Conscious"	"Automatic"

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More about Prosopagnosia:

Overt vs. Covert recognition

- When patients are densely prosopagnosic, there can still be evidence of COVERT (unconscious) face recognition, because, sometimes, GSRs discriminate between familiar and unfamiliar faces.
- One story is that the pathway (the dorsal stream) mediates unconscious face recognition, whereas the ventral stream mediates face recognition that gives rise to the conscious experience of recognizing the face
- CAPGRAS syndrome
  - these patients are NOT prosopagnosic; their face recognition abilities are intact
  - however, they fail to show a GSR response that discriminates between familiar and unfamiliar faces

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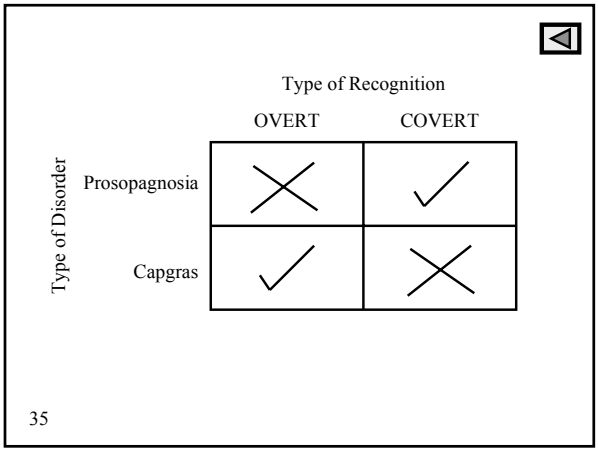
• What is most fascinating about these patients is that they claim that their spouses are imposters!

  • There are several different accounts of these patients (including psycho-dynamic)

    • perhaps the most interesting: their claim that their spouse is an imposter can be understood as an attempt to reconcile the fact that there is no (unconscious) feeling of familiarity (as indexed by the failure of GSRs to discriminate between familiar and unfamiliar faces), with the fact that they do agree that the person they believe to be an imposter LOOKS identical to their spouse.

  • It seems to be clear that there is a deficit in whatever underlying processes give rise to GSRs (likely somewhere in the dorsal stream), in addition to a deficit in their reasoning (hence the term: pathology of belief)

34 • Summary



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THE END

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