Visual Cognition & Visual Awareness III:
Marr's Approach to Visual Cognition, Some Extensions

1. Perception as Unconscious Inference
There is a long tradition of thinking vision as involving hypotheses and inferences from 2D to a description of the 3D world around us.
(A) We infer the properties of distal objects from a two-dimensional array of colours and shapes; *that is*, the evidence we have for the description offered of the world underdetermines the perceptual 'hypothesis' we arrive at;
(B) Such inference is sensitive to the knowledge we possess about the world around us;
This is consistent with such knowledge being innate or acquired
(C) Such inference is generally unnoticed or unconscious
Cf. James versus Helmholtz

(1) What is the force of saying that these are *inferences* if they are unconscious?
Outputs are representational in form – descriptions of the environment; we can explain differences in hypothesis through different assumptions in play
(2) What assumptions are we supposed to use to derive our visual hypotheses? (The problem of theory-ladenness or lack of theory-ladenness.)
This is a matter of empirical investigation – given belief-independence unlikely to be acquired knowledge
(3) What propositions act as premisses of these inferences? Should we assume a colour-mosaic, that we are aware of?
Depends on the description of the stimuli on which visual processing depends

2. Modularity of Psychological Capacities
The definition of a cognitive module – domain specific; innately specified; hardwired; autonomous; and not assembled.

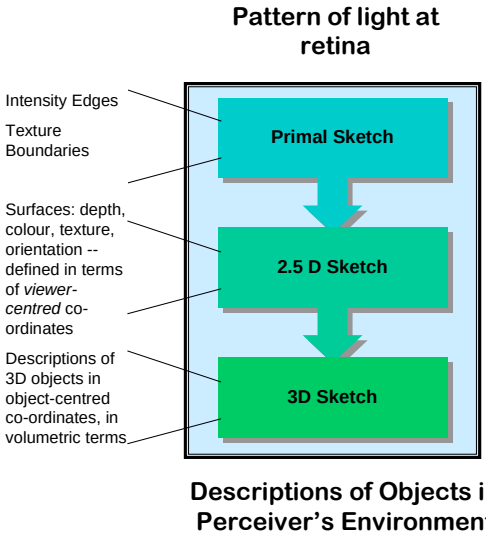
Fodor's five marks:
a.) Domain specificity
b.) Informationally encapsulated
c.) Cognitively impenetrable
d.) Mandatory operation
e.) Fast in operation

For many psychologists evidence for modularity comes from:
a.) brain-localisation of function as revealed through:
i.) pathology – *double dissociation*
ii.) functional dissociation in normals
iii.) mapping of normal brain activity

3. Marr's 3 Levels of Explanation
Computational Level
Representation & Algorithm
Mechanism—implementation within the brain
Marr claimed that these are autonomous levels of explanation, present in all adequate psychological theories. They are autonomous since in general the same computational problems can be solved by different algorithms, and algorithms can be implemented in different ways; the same mechanisms can be part of the implementation of different algorithms; one can't determine from either mechanism or algorithm alone what computational problem the system solves. This why Marr claims that one needs to focus on the computational level for an adequate account of psychological function. Note, though, that evidence at any level can impact on an account at any other—autonomy here does not imply evidential priority of one over another.

4. The bare outline of Marr's approach to Vision

Vision is a process that produces from images of the external world a description that is useful to the viewer and not cluttered with irrelevant information' (David Marr, *Vision* p. 31)

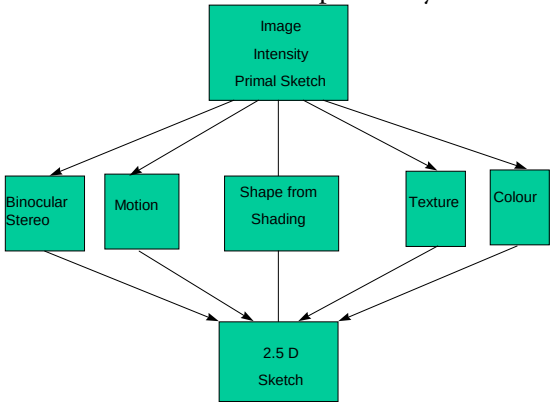


At one time it was standard to contrast *early* and *late* vision; and also to contrast *pre-attentive* and *attentive* vision. The early/late contrast picks up on both a temporal and processing priority—early visual areas receive input first, and their output acts as input to later visual processing—and as indicating the alleged sophistication of the content, to what extent it relates to non-retinocentric (i.e. relating to activity at the retina) information about the environment.

Marr conceives of vision as involving not just an image of light intensity at the retina from which a representation of objects in the environment is constructed, but also two intermediate images whose role is to explain how properties of objects in the environment can be computed from those light intensities.

Within the picture of early *versus* late vision, processes leading to the construction of the primal sketch and some of those leading to the 2.5D sketch can be thought of as early-visual processes.

The picture offered here suggests that it we have a monolithic flow from one image to the next, but Marr certainly does not believe that. Much of his discussion of the various stages of processing looks at functions which can occur independently of each other in parallel:



Still on this picture, one is under a temptation to suppose that there is a *single* function that these various processes all sub-serve—that of extracting descriptions of 3D objects in one's environment. How does this map on to what we know of the visual areas of the brain?

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