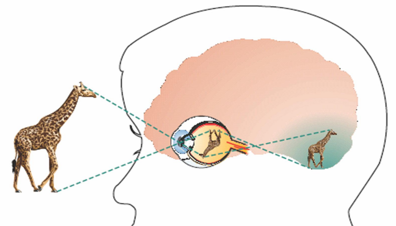
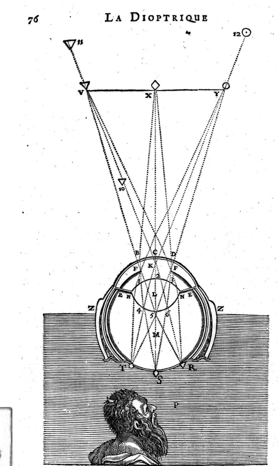
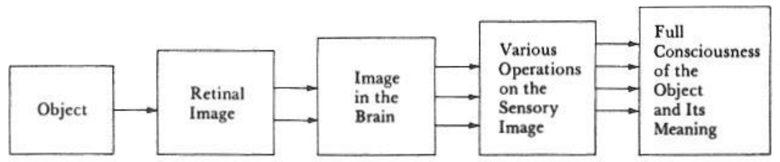
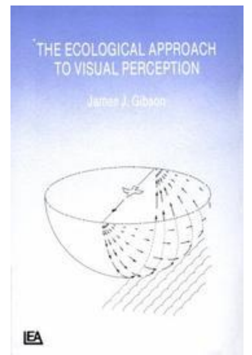
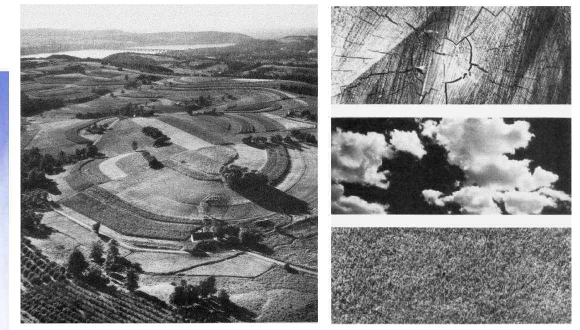


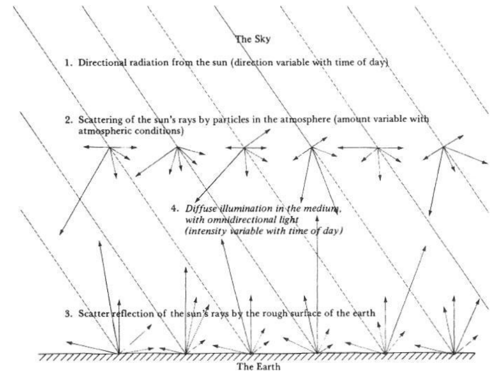


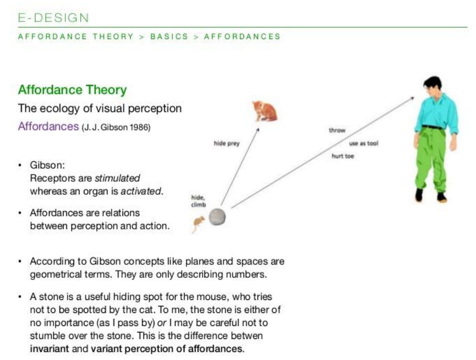


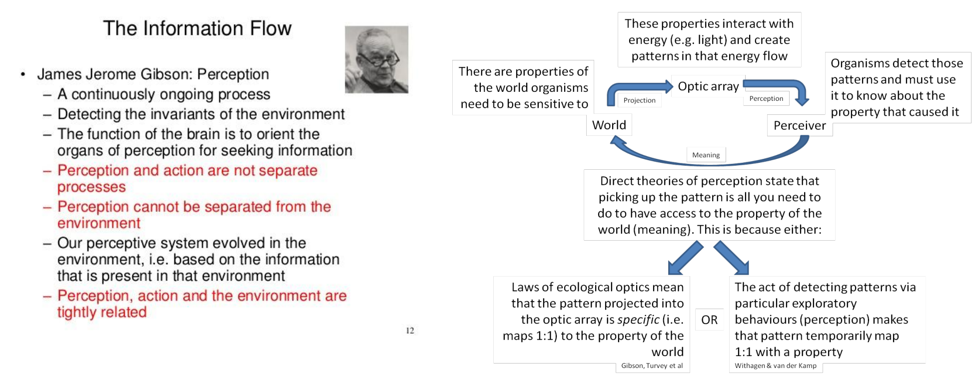


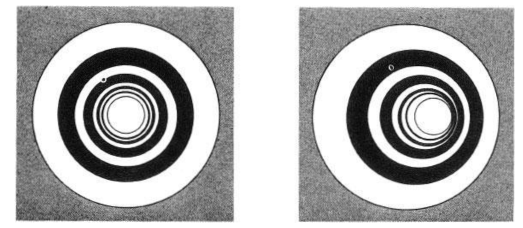


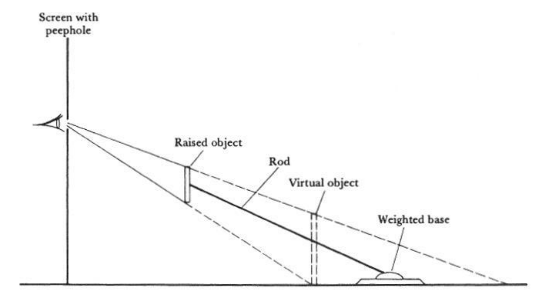
The conception of the ambient optic array as a set of solid angles corresponding to objects is thus a continuation of ancient and medieval optics.

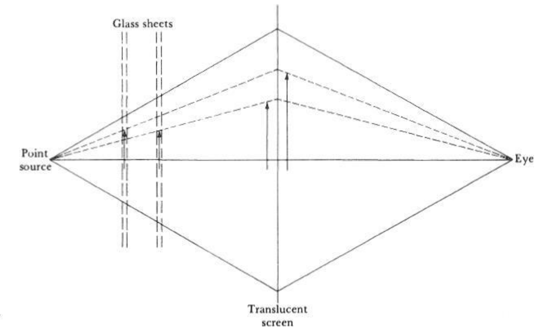


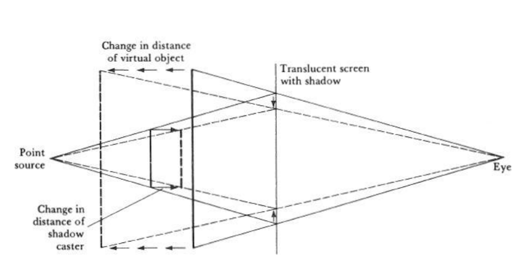


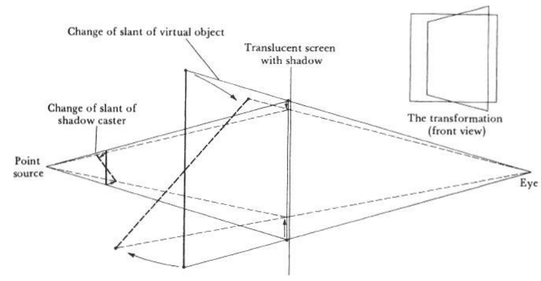












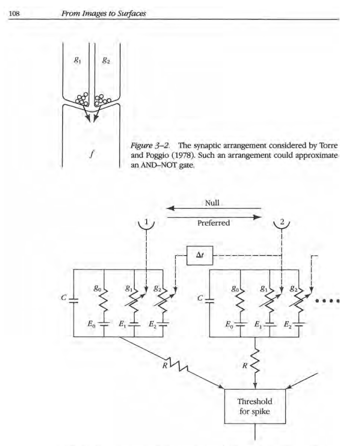
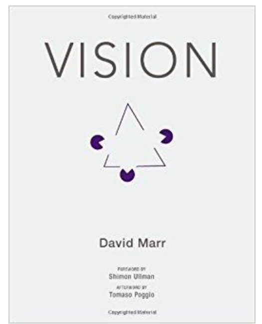
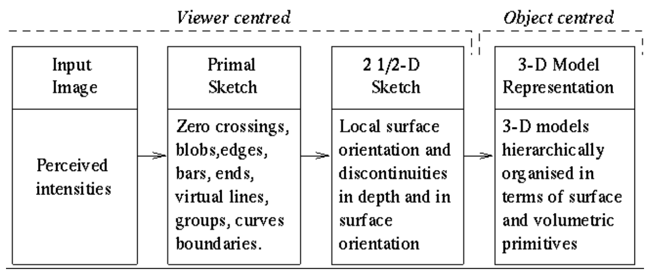
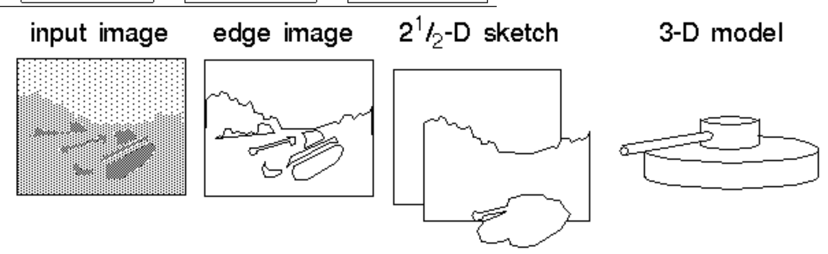


Figure 3–3. The electrical circuit equivalent of the synaptic arrangement shown in Figure 3–2 in the configuration suggested by Torre and Poggio (1978) for implementing directional selectivity. The interaction implemented by the circuit has the form $g_1 - \alpha g_1 g_2$, which approximates a logical AND–NOT gate. A logical AND gate can be implemented by a similar circuit.







Computational theory	Representation and algorithm	Hardware implementation
What is the goal of the computation, why is it appropriate, and what is the logic of the strategy by which it can be carried out?	How can this computational theory be implemented? In particular, what is the representation for the input and output, and what is the algorithm for the transformation?	How can the representation and algorithm be realized physically?

Figure 1–4. The three levels at which any machine carrying out an information-processing task must be understood.

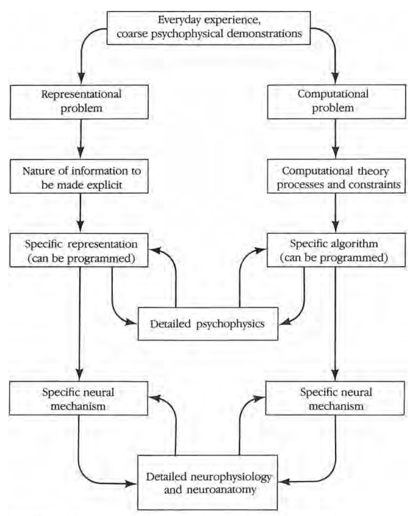
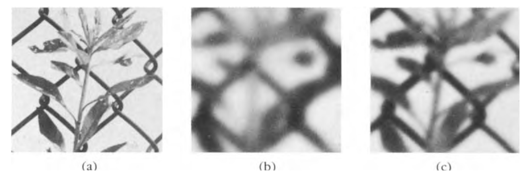
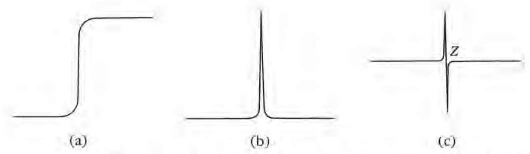


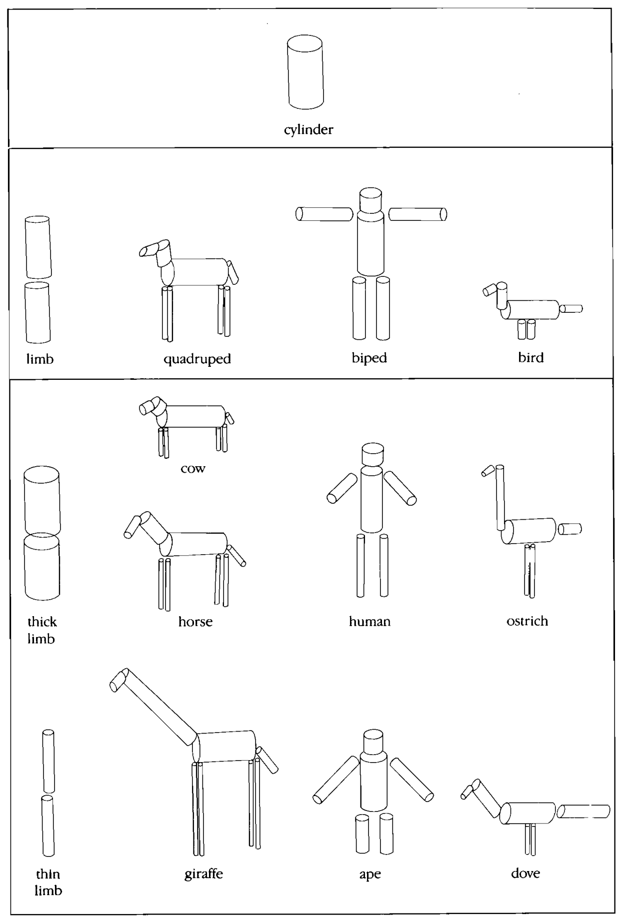
Figure 6–1. Relationships between representations and processes.





(a) (b) (c)

Figure 2–8. The notion of a zero-crossing. The intensity change (a) gives rise to a peak (b) in its first derivative and to a (steep) zero-crossing Z (c) in its second derivative.



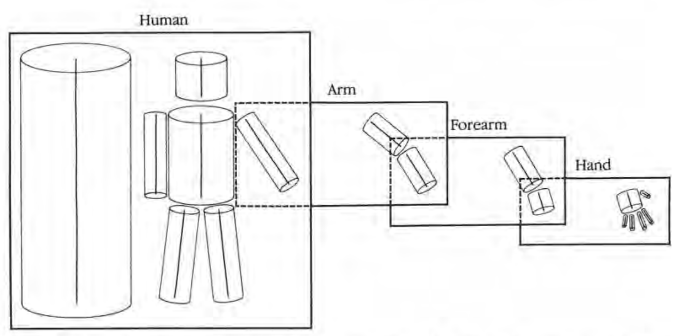
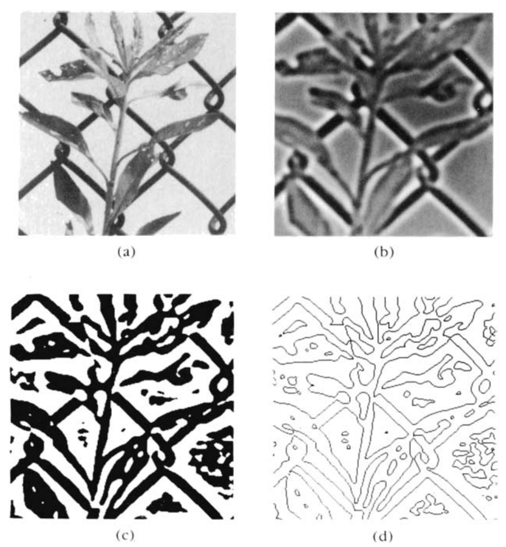


Figure 5–3. This diagram illustrates the organization of shape information in a 3-D model description. Each box corresponds to a 3-D model, with its model axis on the left side of the box and the arrangement of its component axes on the right. In addition, some component axes have 3-D models associated with them, as indicated by the way the boxes overlap. The relative arrangement of each model's component axes, however, is shown improperly, since it should be in an object-centered system rather than the viewer-centered projection used here (a more correct 3-D model is given by the table shown in Figure 5–5c). The important characteristics of this type of organization are: (1) Each 3-D model is a self-contained unit of shape information and has a limited complexity; (2) information appears in shape contexts appropriate for recognition (the disposition of a finger is most stable when specified relative to the hand that contains it); and (3) the representation can be manipulated flexibly. This approach limits the representation's scope, however, since it is only useful for shapes that have well-defined 3-D model decompositions. (Reprinted by permission from D. Marr and H. K. Nishihara, "Representation and recognition of the spatial organization of three-dimensional shapes," *Proc. R. Soc. Lond. B* 200, 269–294.)



Figures 2–12, 13, 14. These three figures show examples of zero-crossing detection using $\nabla^2 G$. In each figure, (a) shows the image (320 × 320 pixels); (b) shows the image's convolution with $\nabla^2 G$, with $w_{2-D} = 8$ (zero is represented by gray); (c) shows the positive values in white and the negative in black; (d) shows only the zero-crossings.

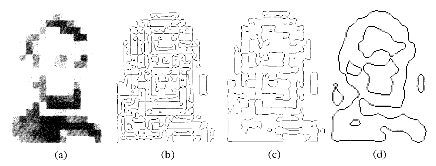


Figure 2–23. We cannot sense the primitive zero-crossings, only the description to which they give rise in the raw primal sketch. This can be seen in L. D. Harmon's discretely sampled and quantized image of Abraham Lincoln (a). No amount of voluntary effort allows us to see Lincoln without defocusing the image or squinting the eyes, despite the fact that the zero-crossings in the larger channels are producing an approximate representation of Lincoln's face. (b), (c), (d) The zero-crossings from the three sizes of the $\nabla^2 G$ operator used in Figure 2–20.

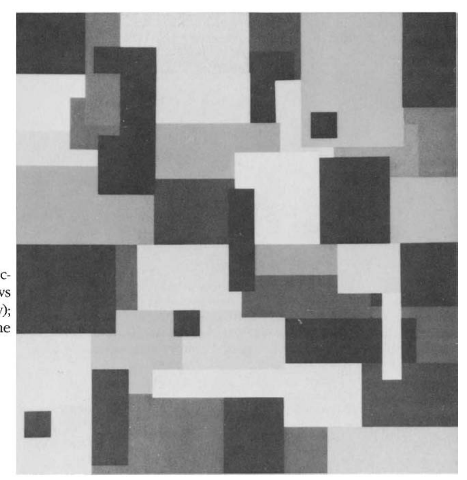


Figure 2–30. A Mondrian stimulus of the sort introduced by Land and McCann and used by Ullman in his study of fluorescence.

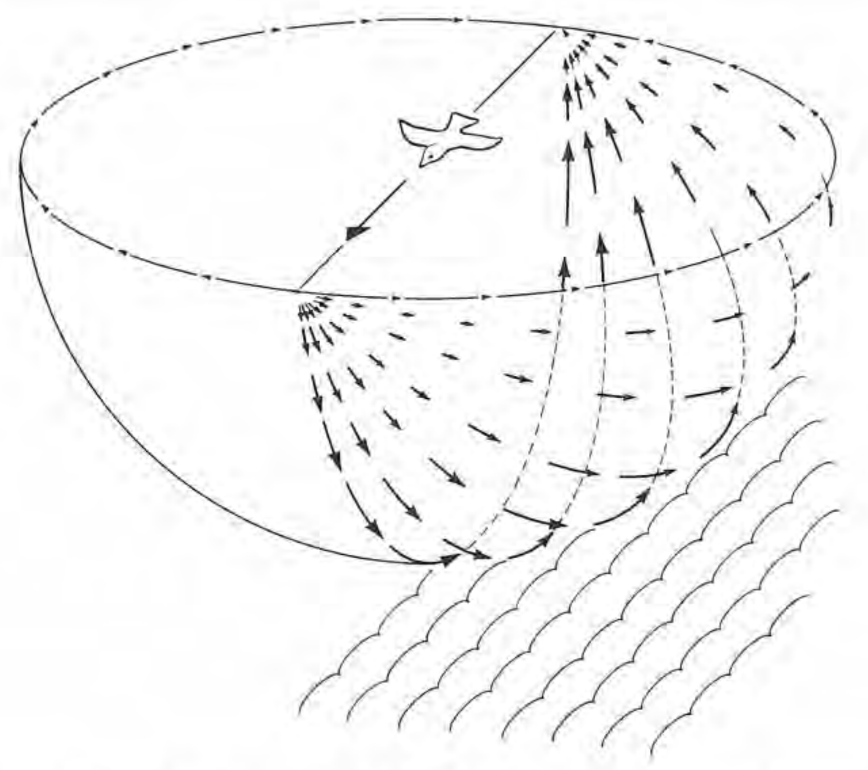


Figure 3–55. Gibson's example of flow induced by motion. The arrows represent angular velocities, which are zero directly ahead and behind. (Reprinted from J. J. Gibson, *The Senses Considered as Perceptual Systems*, Houghton Mifflin, Boston, 1966, fig. 9.3.)