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LOCOMOTION AND MANIPULATION

The theory of affordances implies that to see things is to see how to get about among them and what to do or not do with them. If this is true, visual perception serves behavior, and behavior is controlled by perception. The observer who does not move but only stands and looks is not behaving at the moment, it is true, but he cannot help seeing the affordances for behavior in whatever he looks at.

Moving from place to place is supposed to be “physical” whereas perceiving is supposed to be “mental,” but this dichotomy is misleading. Locomotion is guided by visual perception. Not only does it depend on perception but perception depends on locomotion inasmuch as a moving point of observation is necessary for any adequate acquaintance with the environment. So we must perceive in order to move, but we must also move in order to perceive.

Manipulation is another kind of behavior that depends on perception and also facilitates perception. Let us consider in this chapter how vision enters into these two kinds of behavior.

The Evolution of Locomotion and Manipulation

Support

Animals, no less than other bodies, are pulled downward by the force of

gravity. They fall unless supported. In water the animal is supported by the medium, which has about the same density as its body. But in air the animal must have a substantial surface below if it is not to become a Newtonian falling body.

Locomotion has evolved from swimming in the sea to crawling and walking on land to clinging and climbing on the protuberances that clutter up the land and, finally, to flying through the air, the most rapid kind of locomotion but the most risky. Fish are supported by the medium, terrestrial animals by a substantial surface on the underside, and birds (when they are not at rest) by airflow, the aerodynamic force called *lift*. Zoologists sometimes classify animals as aquatic, terrestrial, or aerial, having in mind the different ways of getting about in water, on land, or in the air.

Visual Perception of Support

A terrestrial animal must have a surface that pushes up on its feet, or its underside. The experiments reported in [Chapter 4](#) with the glass floor apparatus suggest that many terrestrial animals cannot maintain normal posture unless they can see their feet on the ground. With optical information to specify their feet *off* the ground, they act as if they were falling freely, crouching and showing signs of fear. But when a textured surface is brought up under the glass floor, the animals stand and walk normally (E. J. Gibson, 1969, pp. 267–270).

This result implies that contact of the feet with the surface of support as against separation of the feet from the surface is specified optically, at the occluding edges of the feet. The animal who moves its head or uses two eyes can perceive either *no* separation in depth between its feet and the floor or the kind of separation it would see if it were suspended in air. Contact is specified both optically and mechanically.

Note that a rigid surface of earth can be distinguished from a nonrigid surface of water by its color, texture, and the absence or presence of ripples. A surface of water does not afford support for chicks, but it does for ducklings. The latter take to the water immediately after hatching; the former do not.

Manipulation

Manipulation presumably evolved in primates, along with bipedal

locomotion and the upright posture, by the conversion of the forelimbs from legs into arms and of the forepaws into what we call hands. Walking on two legs, it is sometimes said, leaves the hands free for other acts. The hands are specified by “five-pronged squirming protrusions” into the field of view from below ([Chapter 7](#)). They belong to the self, but they are constantly touching the objects of the outer world by reaching and grasping. The shapes and sizes of objects, in fact, are perceived in *relation* to the hands, as graspable or not graspable, in terms of their affordances for manipulation. Infant primates learn to see objects and their hands in conjunction. The perception is constrained by manipulation, and the manipulation is constrained by perception.