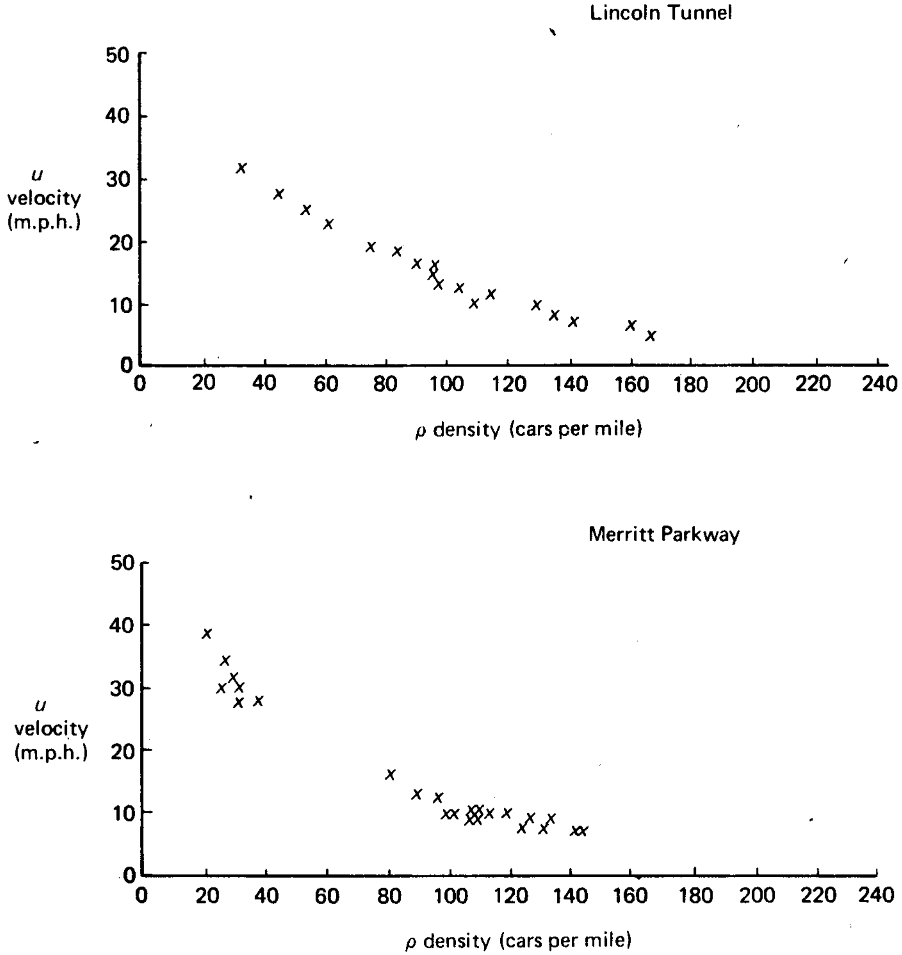

Figure 62-1 Actual velocity-density data.

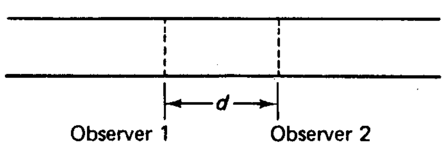

Figure 62-2.

in velocity existed between drivers driving under approximately the same density conditions.

The Merritt Parkway data was accumulated in a different manner. There, velocities and densities were obtained in five-minute intervals and averaged (yielding an average velocity as a function of an average density).

In the work to follow $u(\rho)$ is assumed to be obtained by any similiar type of observation. We will postpone any attempts to explain in more detail the processes by which drivers travel. Such a theory might result in some explanations of the specific shape of the velocity-density curve.

EXERCISES

62.1. (a) Briefly explain the two different experimental methods to obtain a velocity-density curve.
(b) With the help of a friend, do an experiment on a road during light and heavy traffic situations. Calculate a velocity-density curve.

63. *Traffic Flow*

A traffic engineer might well request traffic-control mechanisms (traffic lights, stop signs, lane width, number of toll booths, speed limit, and so on) in order to maximize the flow on a given roadway. The largest flow $q = \rho u$ would occur if cars were bumper to bumper ($\rho = \rho_{max}$) moving at the speed limit ($u = u_{max}$). Clearly this is not safe (is that clear?), but furthermore, we have hypothesized (based on many observations) that man's driving habits are such that if $\rho = \rho_{max}$, then cars would be bumper to bumper and would not move, yielding a minimum traffic flow, namely zero.

We will assume that the road is homogeneous such that the car velocity depends on traffic density and not on the time or position along the road; see Fig. 63-1. Since the traffic flow (number of cars per hour) equals density times velocity, the flow also only depends on the density,

$$\boxed{q = \rho u(\rho).} \tag{63.1}$$

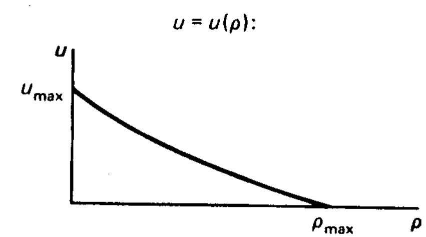

Figure 63-1 Car velocity depends only on traffic density.