Doane, J.A. Hopkins Marine Station, Stanford University, Pacific Grove, California. An apparatus for observing polarotaxis in Drosophila.

Measuring polarotaxis of any animal in the field is difficult, due to the usual presence of visual and other stimuli. The goal of any polarotaxis study should therefore be to eliminate all points of reference in an animal's environment, other than the plane of polarization.

We utilize a system depicted schematically (figure 1) that attempts to eliminate confounding environmental stimuli potentially affecting an animal's behavior. Two 6"x6" squares of glass sandwich a flat-blacked fiber board of identical dimensions, though the fiber-board section has a 5" diameter circle cut into its center. This arrangement, using tape or metal hinges for opening, serves as the walking chamber (here it may be assumed that this set-up is primarily interested in locomotor responses; postural or turning behavior polarotaxis demands entirely different approaches). The circular nature of the walking area provides a uniform environment without visual cues other shapes might present. Flat-blacked cylinders above and below this chamber (d=5") screen the tested flies from surrounding apparati and distractions. Below the lower cylinder lie two sheets of diffusing plastic, then two water-cooled light sources. The temperature is maintained at 20°C via water bath, and light impinging on the testing chamber is held at 12-15 FC. Background illumination in the testing room is generally below .03 FC.

Flies are tested at times of high circadian activity--the interfaces between subjective AM and PM--for 3-10 minutes. Trials are recorded on video camera recorded (VCR), played back on a fast-replay option, and fly-track data are transcribed onto clear plastic sheets clearly indicating the plane of polarization. The fly-track data are then analyzed on a cartesian coordinate digitizer. Preliminary data indicates that animals move randomly when the polaroid is removed, while strong polarotaxis is elicited in a variety of species. Dark adaption, food deprivation, and testing several animals simultaneously (as opposed to single animal assays) alter the degree of polarotaxis though effects vary with species, and indeed, strain.

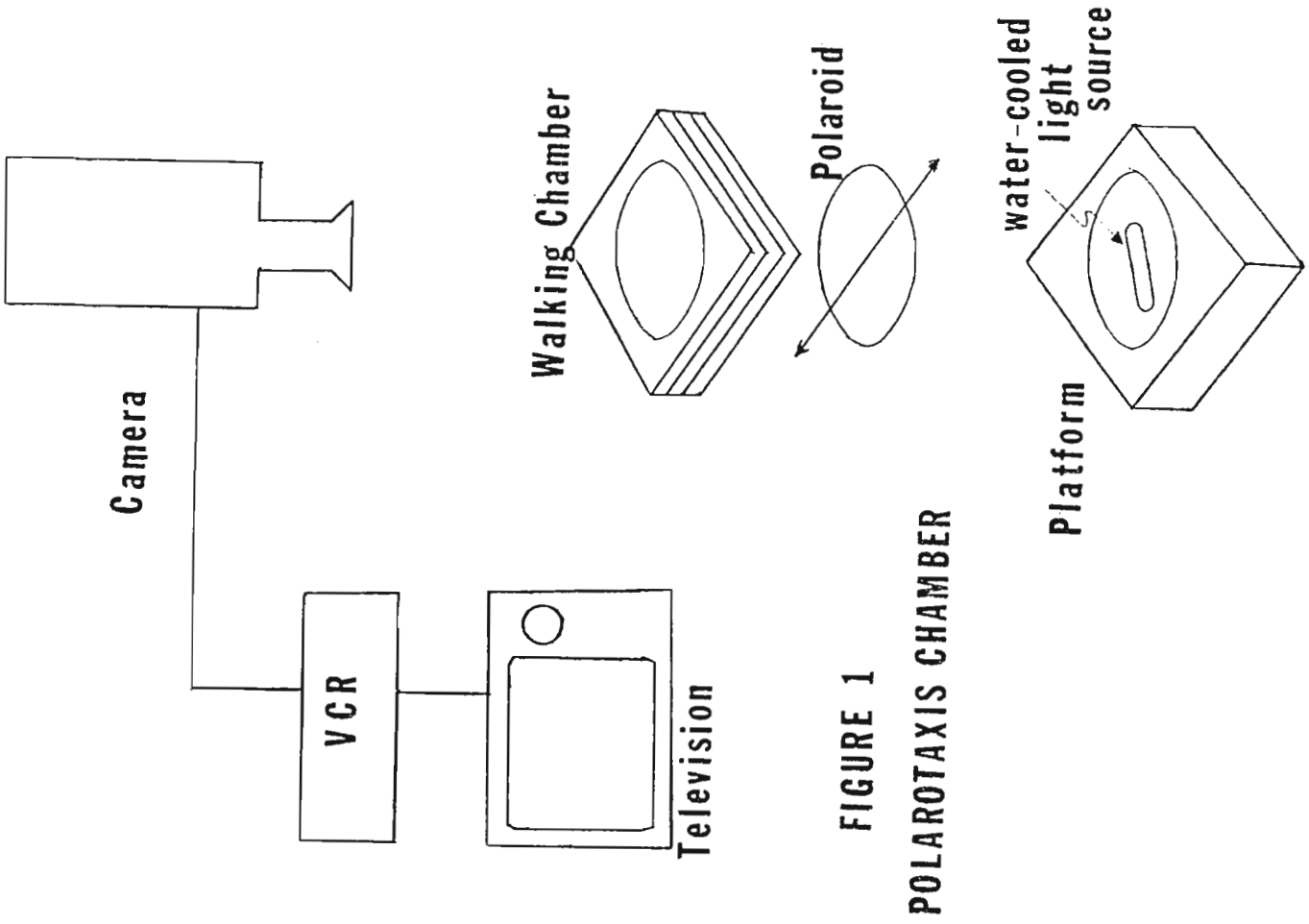

FIGURE 1
POLAROTAXIS CHAMBER