debatable. Some forest entomologists believe that the initial attack is a random process—when one beetle is successful, a secondary sexual attractant is produced that lures in more beetles (*3*)—but other forest entomologists believe that the beetles are initially attracted to the trees (*4, 5*). Directed responses of the Douglas-fir beetle to freshly killed trees have been reported (*4, 5*), and the stimuli creating this response are most likely olfactory. Visual response is not involved, as beetles can be lured into nonhost species adjacent to the preferred host species (*5*).

Our tests indicate that the ratios and concentrations of the volatile oils of Douglas fir influence the motor response of the Douglas-fir beetle; α-pinene attracts the insect, whereas β-pinene may repel it. This insect usually feeds within the inner bark of mature Douglas-fir trees, which is low in β-pinene and high in α-pinene. The beetle usually does not attack the crown, the bark on young trees, or the area around wounds of mature trees. These parts of the Douglas fir and the wound areas are relatively high in β-pinene, a suspected repellent.

The possible mechanism whereby a tree releases volatile oils may be associated with the tree's water regime. Trees transpiring normally may emit from the needles oils that are repellent to the beetle (low ratio of α- to β-pinene). When the coolant properties of transpiration fail, the absorption of radiant energy may permit rapid volatilization of attractive concentrations of oils (high ratio of α- to β-pinene) from the main stem. The functioning of stomata and lenticels would also be contributing factors.

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Microsaccades and the Velocity-Amplitude Relationship for Saccadic Eye Movements

Abstract. *The maximum velocities of microsaccades (flicks) are an increasing function of amplitude of movement. Measured velocities fall on the extrapolation of the curve of maximum velocity versus amplitude for voluntary saccades and involuntary corrective saccades. Hence all these movements are produced by a common physiological system, or the characteristics of the movements are determined by a single dynamically limiting element.*

It has been known for some time that the velocity of a saccadic eye movement is a nonlinearly increasing function of its amplitude (*1–3*). This relationship is one of the nonlinearities encountered in a study of the versional eye-movement system as a servomechanism (*3*). Westheimer (*1*) has studied the relationship of maximum velocity to amplitude for voluntary saccades ranging from 2 to 30 degrees. His curve shows a curvilinear relationship over the entire range, with a tendency to saturation for larger amplitudes. Gurevich (*4*), in studying average velocity, found a similar relationship, although his velocities are naturally much lower than Westheimer's. Gurevich also found that average velocity measurements for any given size movement were fairly constant under the following conditions: horizontal, diagonal, or vertical move-

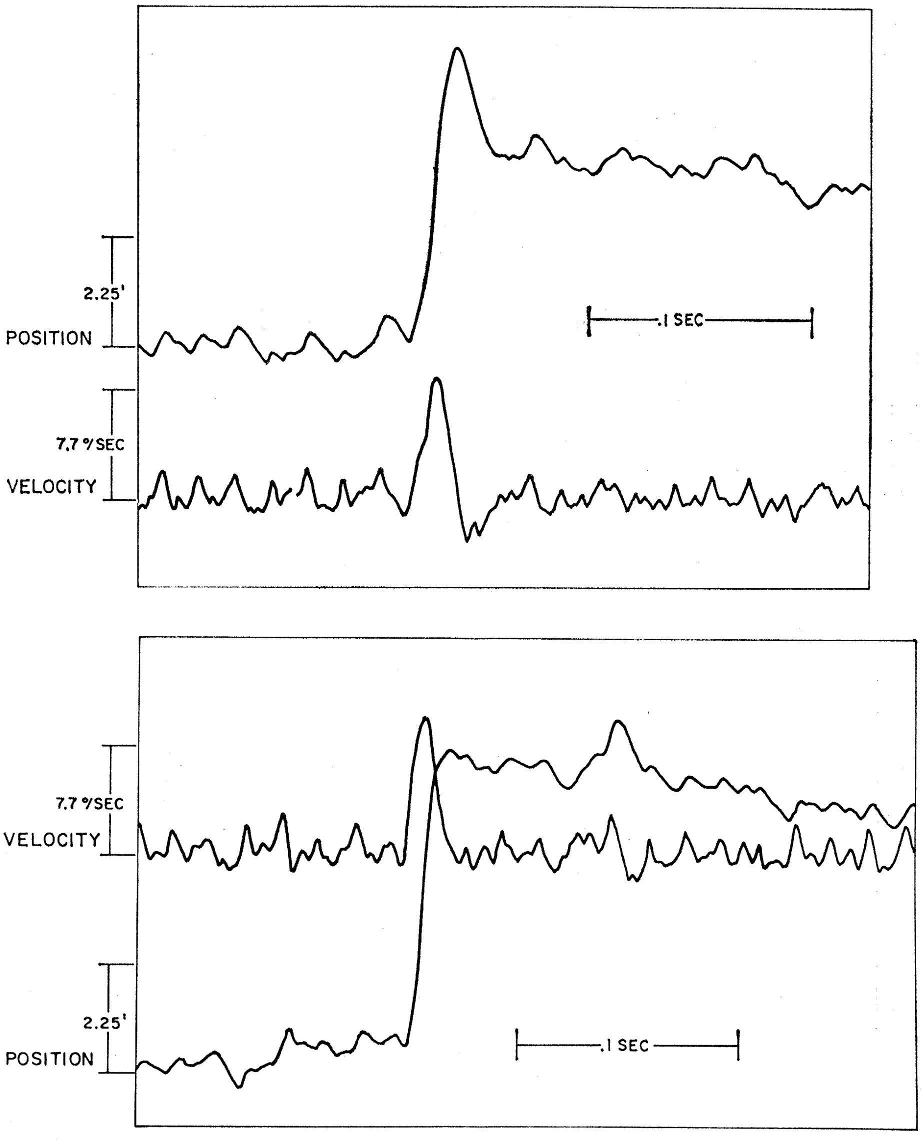

Fig. 1. Two typical microsaccades and their velocity traces. Although both movements are about the same size, only one has overshoot.

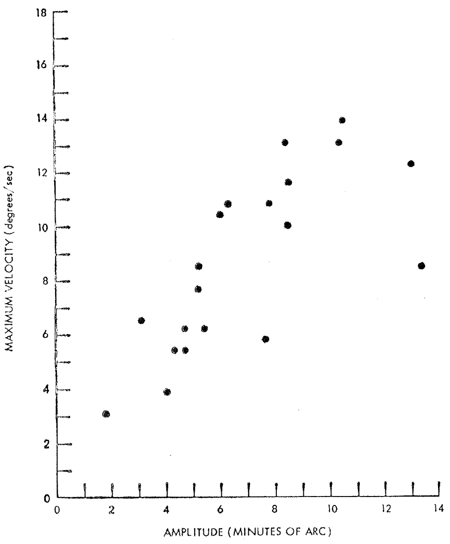

Fig. 2. Maximum velocity versus amplitude for microsaccades.

ment; variation of starting position and direction of movement; for movements between visible fixation points or in total darkness with conditioned eye movements. He further found that average velocities of secondary saccadic corrections fell on the same curve obtained for the types of movements described above. The range of amplitudes used in his study was from 1 to 35 degrees.

The data of Gurevich indicate that a single physiological system is responsible for a wide variety of saccadic eye movements. In an attempt to determine whether microsaccades (flicks), the small (1 to 30 minutes of arc) involuntary saccades observed during fixation, are the output of this same system, we have studied the maximum velocity of such movements.

The subject viewed a grid composed of three vertical wires and one horizontal wire (0.13 mm in diameter) superimposed on a circular, 4-degree, transilluminated field at optical infinity. The three vertical wires were 1 degree apart and were used for position calibration. The intersection of the central vertical wire and the horizontal wire served as a fixation cross. Viewing was monocular with the left eye, the right eye being occluded. Eye position was monitored by the previously described method (5) of differential reflection of infrared light from the iris and sclera. Only horizontal movements were recorded. The signal proportional to eye position was recorded on one channel of a recorder (Sanborn, model 320). This signal was also electronically differentiated, and the derivative was recorded on the other channel of the recorder. Further amplification (by a factor of about 5) was provided by recording signals proportional to the pen positions on the eye-position and velocity channels on a second recorder (Visicorder, model 1508). Thus, two recorders were used, the first being used primarily to keep both signals on scale and to provide an immediate check on the linearity of calibrations. Records from the second instrument were used in all analyses.

Calibration of the velocity channel was accomplished by recording a triangular wave on the eye-position channel and its derivative on the velocity channel. All recorder gains and calibrations were unchanged for this procedure. Thus, given the amplitude of the triangular wave on the eye-position channel and the frequency of the wave, a velocity in degrees per second could be related to a given deflection on the velocity channel. Such calibrations were made for at least three frequencies within the range of velocities observed in the experiment.

Figure 1 shows some typical microsaccades and their velocity traces. These are two movements of roughly the same size, one with a great deal more overshoot than the other. Note that the overshoot is proportionately much greater than that normally seen with larger saccades. Figure 2 is a plot of maximum velocity in degrees per second (ordinate) as a function of amplitudes in minutes of arc (abscissa). It is clear that velocity is an increasing function of amplitude for these movements.

In Fig. 3 the data from Fig. 2 are replotted, and data points from larger voluntary saccades and secondary corrective saccades are added. The latter data, which are in agreement with those of Westheimer (*1*) and Hyde (*2*), were obtained in the same manner as those for the microsaccades, except that, of course, the stimulus conditions were different. The points are plotted on logarithmic scales because of the large ranges involved. A smooth, continuous curve through all data points is clearly justified, indicating, indeed, that microsaccades, voluntary saccades, and involuntary corrective saccades are produced by the same physiological system, or that a single motor element serves to limit the dynamics of all three types of saccades. Since the data in Fig. 3 are plotted on logarithmic coordinates, the curvilinearity of the velocity-amplitude relationship is deemphasized, because of scale compression. It is still clear, however, that saturation of peak velocity sets in at high amplitudes.

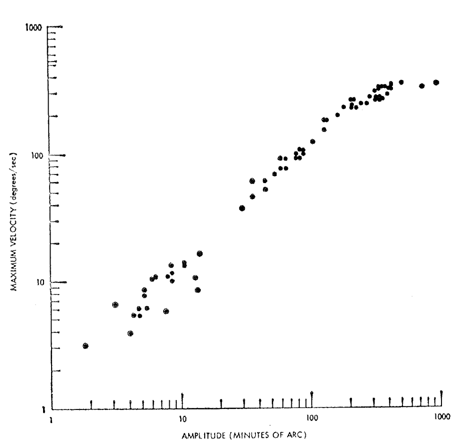

Fig. 3. Maximum velocity versus amplitude for microsaccades, involuntary corrective saccades, and voluntary saccades.

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Mitosis: Induction by Cultures of Human Peripheral Lymphocytes

Abstract. *Ribosomal RNA extracted from peripheral lymphocytes, which had been recently stimulated by specific antigens to which the donor was sensitized, is capable of promoting transformation and mitosis when added to cultures of autologous unstimulated lymphocytes.*

In cultures of peripheral lymphocytes containing a specific antigen to which the donor has been sensitized, a variable proportion of the cells undergoes transformation to large lymphocytes and blast cells, some of