able to recover the respective viruses from plants treated with gibberellic acid as readily as from untreated controls. Further studies will be directed to explain the mechanism of action of gibberellic acid in the reversal of virus-caused stunting.

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References and Notes

1. P. W. Brian and H. G. Henning, *Physiol. Plantarum* 8, 669 (1955); B. O. Phinney, *Proc. Natl. Acad. Sci. U.S.* 42, 185 (1956).
2. L. V. Barton, *Contrib. Boyce Thompson Inst.* 18, 311 (1956).
3. K. Maramorosch, *Plant Disease Reptr.* 39, 896 (1955).
4. The gibberellic acid was kindly supplied by Curt Leben, Agricultural Research Center, Eli Lilly & Co., Greenfield, Ind.

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Weber's Law and the Difference Threshold for the Velocity of a Seen Object

Although a fairly extensive literature exists concerning the visual perception of stimulus movement (*1*), only one experiment has been reported (*2*) which deals directly with the measurement of difference thresholds for the velocity of a seen object. According to that report: "An approximate correspondence with Weber's Law was found, the divergence from it appearing, in general, as an increase of the threshold at both ends of the range of initial velocities. The Mean Threshold (0.5 probability of perception, corrected for guessing) was, in favourable conditions, about 12 per cent of the initial velocity. Whether the stimulus was an increase or a decrease of velocity made no marked difference."

It is found, however, that when Hick's data are plotted (Fig. 1, broken curve), the resulting function may be interpreted as passing through an optimal $\Delta V/V$ value, rather than being a generally straight line of zero slope, which approximate correspondence with Weber's law would require. Because of this interesting alternative interpretation, a partial replication of Hick's experiment was undertaken.

Hick obtained thresholds for instantaneous increments and decrements in velocity for a pip horizontally deflected across the face of a cathode-ray tube. The total excursion of the pip seems to have been about 3.5 in., the velocity increment (or decrement) being introduced at the mid-point. For the replication, the total excursion of the pip (in inches) and the initial velocities of the pip (in inches per second) closely matched Hick's values (*2*). However, since it proved convenient to use a scope hood giving a viewing distance of 10 in., the viewing distance was approximately one-half of the 21-in. distance used by Hick. The chief consequences of this difference in viewing distance were the yield of a range of initial velocities higher than those of Hick when velocity is measured in terms of visual angle per second and the doubling, approximately, of the total angular excursion of the pip. Since Hick found no marked difference between incremental and decremental thresholds, it was decided to restrict this replication to incremental velocities only.

The remaining curves of Fig. 1 compare the incremental data obtained in the present experiment with those of Hick. In the new data, each point is based on 300 values—30 judgments for each of ten subjects; similar information is not reported in the earlier work. The thresholds in the present study were determined by average z-score computations (*3*); other methods were tried and yielded similar over-all functions.

In general, the findings of the two experiments agree fairly well, showing that as initial velocity increases, $\Delta V/V$ at first decreases and then increases. Of interest is the fact that when the upper limit of initial velocities is extended, as in the present experiment, it becomes evident that if Weber's law holds at all, it does so for a very small portion of the usable range only. It may, indeed, be safe to conclude that the Weber fraction passes through a minimum in the 1-to-3-degrees-per-second region of the range of initial velocities.

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References

1. C. H. Graham, in *Handbook of Experimental Psychology*, S. S. Stevens, Ed. (Wiley, New York, 1951).
2. W. E. Hick, *Quart. J. Exptl. Psychol.* 2, 33 (1950).
3. R. S. Woodworth and H. Schlosberg, *Experimental Psychology* (Holt, New York, 1954).

10 July 1957

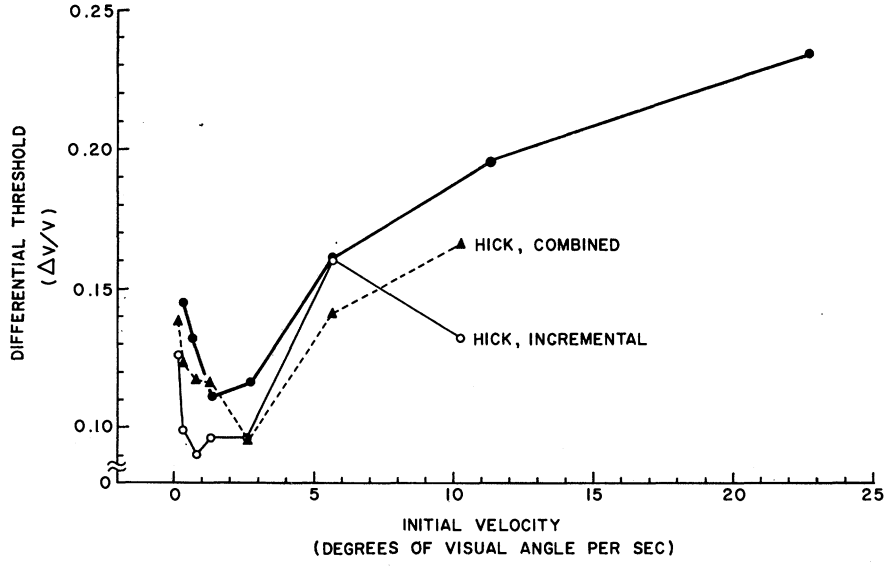

Fig. 1. Difference thresholds for the velocity of a seen object as a function of initial velocity. The uppermost curve is for data gathered in the study here reported; the other curves were plotted from tables presented by Hick (*2*).

Evidence for an Accessory Pathway of Galactose Metabolism in Mammalian Liver

Recent studies on the disease galactosemia have revealed it to be the result of the congenital deficiency of a specific enzyme important in the conversion of ingested galactose to glucose derivatives (*1*). Normally, ingested galactose is first converted by means of adenosine triphosphate and galactokinase to α-galactose-1-phosphate (Gal-1-P), which can then be transformed to α-glucose-1-phosphate (G-1-P) through a series of reactions involving uridine diphosphate glucose (UDPG) and uridine diphosphate galactose (UDPGal). Thus (*2*):

$$\text{Gal*-1-P} + \text{UDPG} \underset{\text{P-Gal transferase}}{\rightleftharpoons} \text{UDPGal*} + \text{G-1-P} \quad (1)$$

$$\text{UDPGal*} \underset{\text{UDPGal-4-epimerase}}{\rightleftharpoons} \text{UDPG*} \quad (2)$$

$$\text{UDPG*} + \text{PP} \underset{\text{UDPG pyrophosphorylase}}{\rightleftharpoons} \text{UTP} + \text{G*-1-P} \quad (3)$$

The asterisk traces the galactose moiety through its conversion to glucose-1-phosphate. In galactosemia, the enzyme catalyzing reaction 1 (P-Gal transferase) is