junctions of the frog endplate the synaptic sites are small discrete patches (*20*). Removal of all Na from the deeper-lying synaptic clefts therefore may be quite slow. Application of glutamate was made at one spot along the crayfish muscle fiber, and, since the spots chosen for the measurements were the most strongly responsive (*6*), it is likely that these synaptic regions were relatively superficial, subject to rapid depletion of Na when this ion was eliminated from the bathing medium.

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Visual Reaction Times on a Circle about the Fovea

Abstract. *Reaction times to a dim photopic stimulus were measured on a circle about the fovea, 15° from the line of direct vision. Large variations in reaction time were found on various half meridians and were interpreted as reflecting the distribution of retinal receptors.*

Visual reaction time (RT) to a light stimulus is related to the subjective brightness of the flash. Bright flashes yield short RT's and dim flashes long RT's. Small changes in light intensity produce large changes in RT only for a low-intensity photopic stimulus. Thus RT provides a sensitive measure of suprathreshold visibility for dim visual stimuli.

Sensitivity of the retina has been mapped along the horizontal meridian (passing through the fovea and blind spot along the line from 0° to 180°, seen in Fig. 1) with both RT and thresholds (*1–3*). The profiles of the sensitivity curves for both RT and thresholds are the same, both measures reflect the distribution of rods and cones as counted and averaged 30° on either side of the horizontal meridian. There is histological evidence that the distribution of rods and cones along the horizontal meridian is not representative of their distribution along other meridians. In particular, the density of rods falls off most rapidly along the meridian from 45° to 225° (*4*). Also, a spot of increased sensitivity on a retina which compensates for the insensitivity of the blind spot of the other eye has been identified by measurements of both RT and threshold (*2, 5*).

Visual reaction time is faster on the nasal side than on the temporal side of the retina with the exception of the spot of increased sensitivity on the temporal retina corresponding to the blind spot of the other eye (*2, 3*). Further, the upper retina yields faster RT's than the lower retina (*6*).

The purpose of this study was to plot in detail a suprathreshold visibility curve measured by RT on a circle about the fovea. The stimulus was a light spot of a 15-minute visual angle produced by a gas-discharge lamp and passed through an American Optical LGM-5 152-cm fiber optic. The stimulus was viewed at 15° from the line of direct vision. This angle was chosen so that the image of the stimulus would

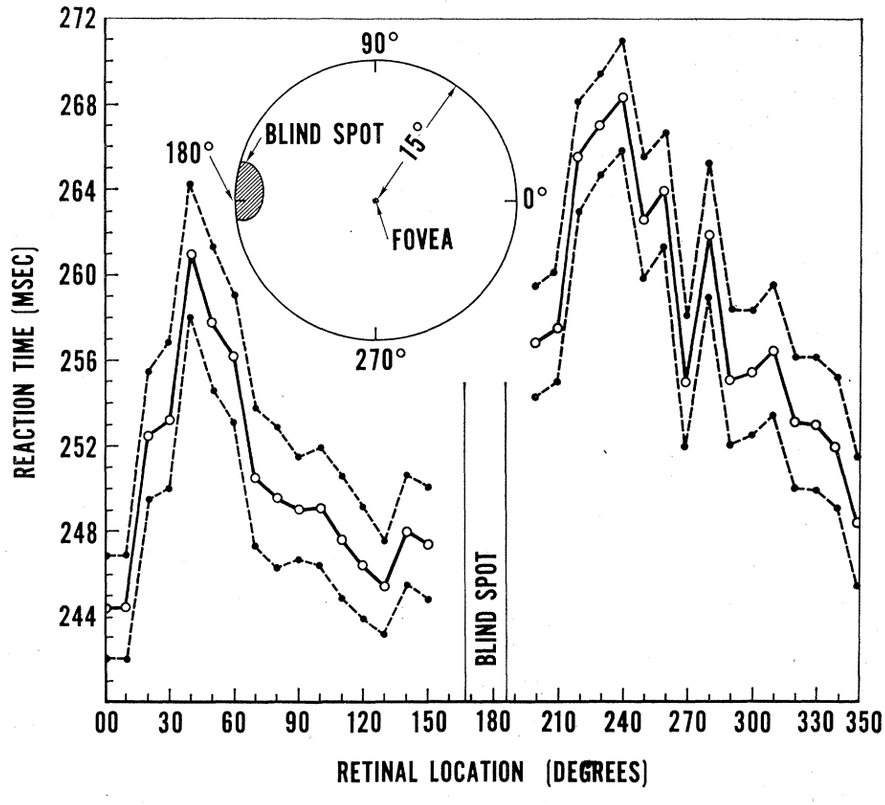

Fig. 1. Average reaction time to a dim visual stimulus plotted as a function of retinal location on circle 15° eccentric from the line of direct vision. The dashed lines define plus or minus two standard errors of the mean. Each average is based on 480 reaction times made on both eyes of two observers.

pass through the blind spot and the spot corresponding to the blind spot of the other eye.

The intensity of the stimulus light may be set for purposes of replication by adjustment so that the average reaction time is, for example, 144 msec at 15° on the temporal retina on the horizontal meridian. When RT is plotted against retinal location a curve can be obtained throughout a wide range of intensities, but the stimulus must be neither excessively bright nor very dim (*2, 3*).

Two observers, WP, 29 years, and JA, 24 years, reacted to the stimulus by initiating a fixed 2-second foreperiod and then by lifting a stylus as soon as the stimulus appeared. Visual reaction time was measured in milliseconds and automatically recorded on printed paper tape. The observer was given access to a switch which enabled him to nullify any error of response which he felt he may have made. The observer was seated in a black room with a background illumination of 0.03 millilambert. His head was held steady by a combination chin and cheek rest. The two observers using each eye made 30 RT's on each of four running orders at each of 32 retinal locations (Fig. 1).

The data obtained from the two eyes were so similar that averaging was warranted. Approximately 95 percent of the means would be expected to fall within these limits if the experiment were repeated.

The lowest RT's are found on the spot corresponding to the blind spot of the other eye and on the upper retina (where objects on the ground are seen). Long RT's are found about the 50° and 240° half-meridian. This is interesting since the count of rods and cones in the human eye, as judged by the count on one eye of a teenage boy in 1935, disclosed that the number of rods decrease most rapidly along the meridian from 45° to 225° (*4*). The average of the RT's at the 270° half-meridian is significantly shorter than the average of the surrounding RT's. Increased sensitivity along this half-meridian might be helpful in protecting the human head from objects above. Retinal locations along the meridian from 90° to 270° are serviced by both lobes of the brain, but no decrease in RT at 90° is noted.

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Depression of Circulating Interferon Response in Balb/c Mice after Urethan Treatment

Abstract. *Urethan, when given to female Balb/c mice, impaired the capacity of these animals to produce circulating interferon. The effect appeared rapidly after a single injection of either 1 or 1.5 milligrams of urethan per gram of body weight and was of short duration. The possibility that this inhibition of the production of interferon plays a role in the enhancement of viral leukemia by urethan should now be considered.*

The resistance of mice to some viral infections can be decreased significantly by treating the animals with urethan (ethylcarbamate). For example, by administering urethan, Mirick *et al.* (*1*) could increase the severity of infection with mouse pneumonia virus in Swiss albino mice, while Braunsteiner and Friend (*2*) increased the susceptibility of mice of different strains to infection with mouse hepatitis virus. Similar results have been obtained with leukemia viruses. Induction of leukemia by Graffi virus in adult C57Bl mice was greatly enhanced if the animals were injected intraperitoneally with urethan after having received the virus (*3*); and treatment with urethan also increased the susceptibility of C57Bl mice to radiation leukemia virus (*4*).

There are no indications as to the mechanism by which urethan can influence the host-virus relation in favor of the latter. The phenomenon is an important one, since urethan is also a carcinogen (*5*) and, in our opinion, the possibility exists that its properties of inducing (*6*) or promoting (*7*) leukemia are related to its capacity to impair defense mechanisms against virus infection. We investigated the possibility that urethan decreases interferon production in mice; interferon is an antiviral protein appearing in animals during virus infection (*8*), and other carcinogens, such as polycyclic aromatic hydrocarbons, decrease the synthesis of this virus inhibitor in tissue culture (*9*).

Mice for our experiments belonged to the inbred Balb/c strain. The capacity of these animals to produce interferon was determined by injecting 0.2 ml of a suspension of either Newcastle disease virus (NDV) or Sindbis virus intravenously, by way of the orbital sinus (*10*). Between 0.4 to 0.6 ml of blood was withdrawn 5 hours later from the orbital sinus of each animal. The samples were left in the syringes and were allowed to coagulate overnight in the icebox; they were then centrifuged for 30 minutes at 3000 rev/min in the sealed cylinders of the plastic syringes. Individual serums were collected and stored at –20°C until the time of titration for interferon. Titration was carried out as follows: serial fivefold dilutions of either each serum separately or of pooled serums were made in tissue culture medium and put on monolayers of L cells (*11*) grown in plastic petri dishes. Two or three cultures were incubated overnight with each serum dilution. The challenge virus, consisting of approximately 80 plaque-forming units of vesicular stomatitis virus (VSV), Indiana strain, was then added. Cultures were covered with a nutrient starch gel (*12*) 1 hour after the addition of the challenge virus; 48 hours later VSV plaques were counted. The interferon titer of the serum was expressed in units, one unit corresponding to the amount of inhibitor necessary to decrease the number of challenge plaques by 50 percent. Viral inhibitory activity of these serums could be destroyed by trypsin; it was not diminished when high-titered antiserums, made against the interferon-inducing virus, were added to the test system. Furthermore, antiviral activity was species specific, since no activity was found when serums were assayed against VSV in chick embryo fibroblast cultures. These properties indicate that the inhibitor we were measuring belonged to the class of interferons (*8*).

Adult Balb/c females, weighing between 20 and 25 g, were injected intraperitoneally with urethan (*13*) dissolved in phosphate buffered saline (PBS). Four groups of mice received a dose corresponding to 1 mg per