

On the other hand blood serum of snake shows some activity while that of mammals is practically inactive.

*Summary.* Spreading factor and venom are found only in negligible amounts in the secreting cells of the venom gland of snakes. As both the factors appear together in the secretion they either act together as a unit or are the same substance. The spreading factor in moderate amounts exists in most tissues from both poisonous and harmless snakes.

### 10009 P

#### Cerebral Mechanisms in Auditory Localization.\*

EDWARD GIRDEN. (Introduced by Carney Landis.)

*From the Psychological Laboratory, Brooklyn College.*

Bikov<sup>1</sup> has reported that following complete transection of the corpus callosum it was possible to condition a dog to salivate to the sound of a whistle placed at the level of, and some distance from, the left ear. He was unable to subsequently develop a discrimination so that the animal did not salivate to the same stimulus sounded from its right side. Pavlov<sup>2</sup> concluded from this study that "a differentiation of the direction of a sound required a united activity of both hemispheres."

Bikov's data and Pavlov's interpretation are consistent with the view that hearing is crossed. That is, impulses produced in the left cochlea end in the right hemisphere, while those impulses originating in the right cochlea terminate in the left hemisphere. Since both ears are essential for the correct localization of sounds in space (L-R habit), destruction of the corpus callosum would prevent the integration of the impulses produced in the peripheral mechanisms. From this logic, it would also follow that extirpation of the auditory cortex of one hemisphere (temporal lobe) would have the same effect as does the destruction of one cochlea.

Recent studies, however, indicate that this view is incorrect. Results procured in the dog<sup>3</sup> and the cat<sup>4</sup> support the contention that

---

\* This study was made possible by grants from the American Philosophical Society and the Elizabeth Thompson Science Fund.

<sup>1</sup> Bikov, K. M., and Speransky, A. D., *Col. Papers, Physiol. Labs. of I. P. Pavlov*, 1924, **1**, 150.

<sup>2</sup> Pavlov, I. P., *Conditioned Reflexes*, Oxford University Press, 1927, p. 150.

<sup>3</sup> Mettler, F. A., Finch, G., Girden, E., and Culler, E., *Brain*, 1934, **57**, 475.

<sup>4</sup> Brogden, W. J., Girden, E., Mettler, F. A., and Culler, E. A., *Am. J. Physiol.*, 1936, **116**, 252.

hearing involves uncrossed as well as crossed components. Impulses from each cochlea reach both cortices. There is also some question as to the reliability of the salivary conditioning technic when it is employed in studies involving cerebral extirpation. Zeliony,<sup>5</sup> using this method failed to establish conditioned reflexes in a totally decorticate dog, whereas positive results have been reported both by Culler<sup>6</sup> and Girden<sup>7</sup> who made use of the motor conditioning technic. In the light of these facts, a retest of the question was made with the latter method. The L-R habit<sup>8</sup> was established by training the dogs to flex a forepaw upon the presentation of an auditory stimulus (buzzer or pure tone) from its right side, but to inhibit this response if the stimulus was sounded from the left side. All surgical operations were made under aseptic conditions and general, injection, anesthesia.

Although the histological examination of the brains is now in progress, the following results are clearly indicated. The L-R habit persists following complete transection of the corpus callosum, removal of the temporal lobe, with varying amounts of adjacent occipital and parietal tissue, of one hemisphere. The L-R habit is disrupted only if both temporal lobes are extirpated. If the 2 auditory areas are removed in successive stages (one month apart), the auditory conditioned reflexes still persist; the dog will still flex its paw to the auditory stimulus, regardless of its locus in space. If the bi-temporal operation is performed in one stage, then not only is the L-R habit disrupted but all auditory conditioned reflexes disappear. The cortical area essential for the L-R habit lies within the limits of the sylvian gyrus (78-78b<sup>9</sup>).

These results, contrary to the Pavlovian interpretation, are in agreement with the more recently established beliefs concerning the distribution of the auditory pathways in the brain. Support is given to the contention that the motor conditioning technic is more reliable than the salivary method in studies which involve cerebral extirpations. The investigation is now being extended to determine what part of the sylvian gyrus is essential for the L-R habit, and whether particular areas within it function in the perception of specific frequencies or tones.

---

<sup>5</sup> Zeliony, G., *Trans. Soc. Rus. Phy. of St. Petersburg*, 1911-12, **50**, 147.

<sup>6</sup> Culler, E., and Mettler, F. A., *J. Comp. Psychol.*, 1934, **18**, 291.

<sup>7</sup> Girden, E., Mettler, F. A., Finch, G., and Culler, E., *J. Comp. Psych.*, 1936, **21**, 367.

<sup>8</sup> Girden, E., *Am. J. Psych.*, in press.

<sup>9</sup> Papez, J. W., *Comparative Neurology*, Crowell, 1929.