## SENSORY MASKING—A PERIPHERAL OR A CENTRAL PHENOMENON?

DAVIS and Derbyshire[1] have recently reported that "Auditory masking is the diminution of audibility of one sound caused by the presence of a second sound. Study of the electrical responses of the cochlea and of the auditory nerve of the cat shows that this phenomenon depends primarily on the refractory period of the nerve fibers." In other words, nerve impulses initiated by one sound fail to reach the sensorium because blocked by the refractory periods following the passage of impulses generated by another sound; the phenomenon is *peripheral,* depends upon the physiological properties of the nerve fiber and is of the nature of a functional block.

It has been observed in this laboratory[2,3,4] that if, in a conscious person, a cutaneous nerve be stimulated through the skin with a suitable alternating current, a characteristic tingling is felt in the cutaneous area supplied by the nerve, and perception of touch, pressure and pain in that area is dulled. Possibly here, similarly, impulses initiated by the stimuli applied to the skin may be blocked by the refractory periods set up by the electrical stimuli applied to the nerve. But we have come to favor the suggestion offered many years ago by Robert,[5] in explanation of the local benumbing effect of certain electric currents, that the diminished perception results not from anesthesia or blocking, but from diversion of attention or confusion of consciousness; this supposed *central* phenomenon Robert termed "anesthésie de diversion," or "masking." In the spring of 1934 Lorin W. Denny, James C. Luce and I tested this matter upon ourselves; I described the experiments before the Association for Research in Nervous and Mental Disease in New York on December 27, 1934, and a detailed account is almost ready for publication; in view of the interesting work of Davis and Derbyshire, the following brief summary seems timely.

A cutaneous nerve, such as the radial, being completely blocked with procaine,[6] its cutaneous area was quite insensible to all forms of sensation; but the sense of deep pressure remained beneath the anesthetized skin, the impulses ascending from muscles, etc., through other nerves, *e.g.,* the ulnar (Fig. 1). The threshold for this deep pressure was measured

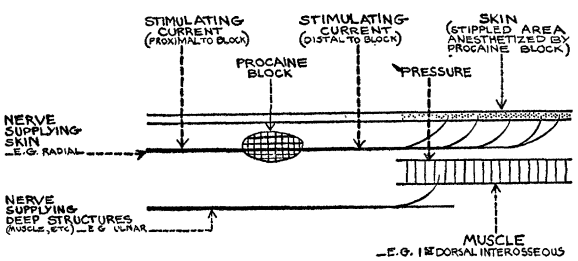


FIG. 1. Diagram illustrating the procaine block experiments described in the text.

(through the unfeeling skin) by the method described by Thompson *et al.*[4] Stimulation of the cutaneous nerve *distal* to the block evoked no sensation, and did not substantially alter the deep pressure threshold. Stimulation *proximal* to the block, however, not only aroused a normal tingling sensation projected into the anesthetized cutaneous area, but significantly elevated the threshold for deep pressure beneath that area, even though the nerves conducting impulses from the deep structures were affected neither by the anesthetic nor by the stimulating current. Moreover, in this type of experiment, stimulation of any nerve in the forearm or hand similarly raised the threshold for deep pressure beneath the anesthetized skin. It seems that perception of deep pressure (free from touch and superficial pressure) may be reduced, without interfering with the end-organs or the nerve involved, by suitably stimulating another nerve, if the impulses flowing from this stimulation succeed in reaching the sensorium and arousing a *sufficiently intense* sensation. We infer that the diminished perception in these experiments depends upon a central effect: to this we have applied Robert's term "masking," using it in his sense.

The important investigation of Davis and Derbyshire indicates that the difficulty in hearing a click simultaneously with a tone depends upon a peripheral effect—a physiological block. To call this "masking" introduces confusion into the literature, "masking" having already been preempted[2,3,5] to designate a *central* phenomenon, postulated by Robert, and demonstrated (we think) by us. It is to be hoped that some other term will be applied to the *peripheral* phenomenon elucidated by Davis and Derbyshire.

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[1] H. Davis and A. J. Derbyshire, *Proc. Amer. Physiol. Soc.,* April 10–13, 1935, p. 34; also reported in SCIENCE (Suppl.), 81: 6, 1935.
[2] I. M. Thompson and V. T. Inman, SCIENCE, 77: 216, 1933.
[3] I. M. Thompson, *ibid.,* 78: 268, 1933.
[4] I. M. Thompson, G. F. Banks, A. Barron, A. M. Fratis, Jr., and B. F. Mattison, *Univ. Calif. Publ. Anat.,* 1: 167, 1934.
[5] Robert, *L'Union Médicale,* 12: 487, 1858.
[6] Kindly donated by Eli Lilly and Company.

## DRINKER RESPIRATOR PATENTS HELD INVALID

THE District Court of Massachusetts has recently held invalid three patents numbered 1,834,580, 1,906,453 and 1,906,844, granted to Philip Drinker and Louis A. Shaw in an infringement suit brought