

difference in the quantity of bromides in the blood and cerebrospinal fluid had gone down very appreciably. Thus, a case showing a distribution ratio of 3.15 to 1.0 had gone down to 1.21; another one of 3.37 went down to 1.27; a third of 3.52 went down to 1.2, etc. The last two experiments have just been started and are being carried on further.

## 4813

**Studies of Action Currents in Laryngeal Nerves.**

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In order to increase the information about the neurophysiological mechanism of phonation, action currents were recorded from the inferior and superior laryngeal nerves during voice production in dogs. The whining or barking sound produced when the animal was just coming out of ether anesthesia was picked up by a condensor-microphone and amplified by a one-stage amplifier. Simultaneously with the voice the action currents appearing in the inferior and superior laryngeal nerves were picked up by platinum electrodes (in some experiments as a check-up by non-polarizable electrodes) and amplified by a 3-stage resistance coupled amplifier. The recording of both the voice and the action currents was done by means of a 3-element Westinghouse oscillograph.

The inferior laryngeal nerve was exposed just below the thyroid cartilage and the superior laryngeal nerve a few millimeters towards the entrance into the crico-thyroid membrane.

The records show that when no voice is produced the action current line is practically at rest. During voice production the action current line of the inferior laryngeal nerve shows regular oscillations having the same frequency as the voice line. The frequency of these action current oscillations changes with the pitch of the voice. In order to exclude any influence of a non-physiological source the experiment was frequently repeated with different forms of electrodes and after removing the amplifier completely from the operating room. Furthermore, if one electrode was removed from the nerve and placed upon nearby muscle tissue the regular frequencies disappeared.

In order to determine the direction in which the potential changes were traveling, the inferior laryngeal nerve was transsected and rec-

ords taken from both the central and the peripheral end. Those from the central end still presented regular oscillations of a frequency equalling the pitch of the recorded voice sound. The range of frequencies observed so far lies between 380 and 1800 oscillations per second. We, therefore, assume that the observed potential changes are travelling from the central organ to the larynx.

We do not feel justified in considering these regular action-potentials as originating in the higher centers of coordination. We studied the superior laryngeal nerve as the possible afferent branch for a proprioceptive reflex mechanism containing the inferior laryngeal nerve as efferent branch. Records taken from the superior laryngeal nerve do not show the observed regular oscillations but irregular potential changes of small amplitude and low frequency, which indicates that this nerve is largely sensory.

Transsection of the superior laryngeal nerve leads to a definite change in the action current picture recorded for the inferior laryngeal nerve. It seems that the regular oscillations described above disappear after this procedure on the side of the transected nerve. Although this does not prove that the superior laryngeal nerve serves as the afferent branch in the reflex arc, it favors the explanation offered for the regular oscillations observed in the inferior laryngeal nerve. Preisendorfer<sup>1</sup> has described action current records obtained from the calf musculature while the subject is pressing his toes against a vibrating object. The usual irregular grouping of large and small oscillations was replaced by regular oscillations corresponding in frequency to the vibration of the object. He considers his picture as a series of proprioceptive reflexes. We believe that a similar mechanism is responsible for the regular oscillation observed in the laryngeal nerve. Further research will be necessary to study the suggested proprioceptive control of the action of the vocal chords.

#### 4814

#### The Micro Determination of Blood Sugar.

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A technically simple and rapid procedure for the determination of the blood sugar which gives results which are little, if at all,

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<sup>1</sup> Preisendorfer, *Z. f. Biologie*, 1919, lxx, 505.