histological changes within the cochlea are not necessarily indicative of a loss of hearing.

A second, more direct method consists of the study of auditory responses both before and after prolonged exposure to sound. A few investigators have incorporated this method with histological studies, but they have determined sensitivity only by such crude means as the pinna reflex or general bodily movements. Recently, however, development of the conditioned response technique has provided a more reliable means of determining sensitivity in animals.[1] The conditioned response technique is now being used in a study of stimulation deafness by one of the writers.[2]

A third method approaches the problem through a study of auditory nerve responses. The electrical effects obtained from the auditory nerve are investigated to determine whether they are significantly affected by prolonged stimulation. This method has been used by the writers in the preliminary study here reported.

Three young cats were stimulated, the first with a Galton whistle tone of 3,350~/sec. maintained 15 hours each day for 10 days (150 hours), the second with the same tone 15 hours daily for 25 days (375 hours), and the third with a tone of 980~/sec. continuously for 45 days (1,080 hours). The intensities of the tones were not measured, but we estimate them as about 80 to 90 decibels above the human threshold. At the end of the stimulation period, the animals were prepared and tested by the auditory nerve method.[3] In these tests no attempt was made to distinguish between electrical effects from the nerve fibers and from the sensory or nervous cells of the cochlea, for previous investigations have indicated that both effects reveal the essential activity of the end-organ.[4] Various tones were used in the tests, with especially careful exploration of the region of the stimulating frequency.

The results showed no significant variation from those obtained with control animals. In one experimental animal (the third) a depression of sensitivity to the amount of 6 decibels was found, extending from 745~/sec. to 765~/sec., but, since this region is remote from the stimulating tone of 980~/sec., we attach no significance to its presence, so far as the present experiment is concerned. Regional depressions of sensitivity are not unusual in the general run of animals, and even tonal gaps are sometimes encountered.[5]

Conclusions from so few results as these must necessarily be tentative. The absence of any noticeable depression of response at the stimulating frequency argues against any specific effect of the stimulation. On the basis of the majority of histological studies of this problem one would expect depression of responses in the general region of the stimulating frequency, but no such effect was observed. We are not able to state that no effect at all occurred as a result of the stimulation, for a general depression involving all frequencies to a relatively small extent, say 5 decibels or so, might not have been observable under our conditions.

The above results, tentative though they are, provide a basis for questioning the inferences for auditory theory that have been drawn from the histological studies and emphasize the need of further investigation. To solve the problems in this field, the three methods described above should be combined, with tests of auditory sensitivity before and after stimulation, followed by a study of auditory nerve responses, and finally by histological examination of the cochleas. A study of this kind has been going on for some time and will be reported soon.

ERNEST GLEN WEVER
CHARLES W. BRAY
GEORGE PLANT HORTON
PSYCHOLOGICAL LABORATORY
PRINCETON UNIVERSITY

[1] M. Upton, "The Auditory Sensitivity of Guinea Pigs," *Amer. Jour. Psychol.*, 41: 412–421, 1929; G. P. Horton, "A Quantitative Study of Hearing in the Guinea Pig (Cavia Cobaya)," *Jour. Comp. Psychol.*, 15: 59–73, 1933.

[2] G. P. Horton, "Preliminary Report on the Study of the Effect of Prolonged Sound Stimulation on the Auditory Sensitivity of the Guinea Pig," *Psychol. Bull.*, 30: 548, 1933. See also M. Upton, "Functional Disturbances of Hearing in Guinea Pigs after Long Exposure to an Intense Tone," *Jour. General Psychol.*, 2: 397–412, 1929.

[3] E. G. Wever and C. W. Bray, "The Nature of Acoustic Response," *Jour. Exper. Psychol.*, 13: 373–387, 1930.

[4] E. D. Adrian, D. W. Bronk and G. Phillips, "The Nervous Origin of the Wever and Bray Effect," *Jour. Physiol.*, 73: 2P–3P, 1931; G. Finch, E. A. Culler and E. S. Girden, "Relation of the Wever-Bray Effect to Auditory Acuity in Dogs," *Psychol. Bull.*, 30: 581, 1933.

[5] See Horton, cited in note 1.

IS THE HIGH BASAL METABOLIC RATE IN "HYPERTHYROIDISM" DUE TO THYROXINE?

THE most abundant source of an internal secretion has been the gland producing it, although in the case of insulin and cortin post-mortem changes cause a loss. *Thyroxine has never been isolated from any other part of the body except the thyroid,* and Prescott (Thesis, Minnesota, 1931) has shown that all the detectable thyroxine is in the *thyroglobulin.* Notwithstanding these facts, the thyroids of persons who have been universally called "hyperthyroid" or by some name in which hyperthyroidism was implied may be shown to be very poor in thyroxine. The basis of this assumption of hyperthyroidism in these persons has been their high basal metabolic rate, but Rice and Cavett read a paper on "The Effect of Feeding Thy-

roid on Basal Metabolic Rate and Pulse Rate of Hyperthyroid Individuals" before the Society of Experimental Biology and Medicine on May 16, in which they reported that the administration of 2 grains of thyroid a day to persons with "hyperthyroidism" lowered their basal metabolic rates. In this connection the following data may be of interest.

Five persons with "hyperthyroidism" were given 190 mg iodine per day for 2 weeks, assuring that there was no iodine shortage in the glands. A large part of the thyroid of each person was removed and the thyroglobulin separated and purified.[1] The total iodine and thyroxine iodine were then determined. The results compared with the normal were as follows:

Basal metabolic rate at time of removal of thyroid	Normal	+14 per cent.	+15 per cent.	+33 per cent.	+45 per cent.	+66 per cent.
Per cent. thyroglobulin in thyroid	20	15	19	8	12	6
Per cent. iodine in thyroglobulin	0.57	0.577	0.534	0.4	0.4	0.20
Per cent. thyroxine-iodine in thyroglobulin	0.25	0.162	0.156	0.115	0.1	0.04
Ratio $\frac{\text{Thyroxine-iodine}}{\text{Total iodine}}$	0.44	0.28	0.29	0.29	0.25	0.20

Hektoen and his collaborators have detected thyroglobulin in the thyroid vein and lymph by serological methods, and it has been assumed that the high metabolic rate is due to more rapid passage of thyroglobulin into the blood. These data show that it would require an unusually large amount of this thyroglobulin to account for the observed rise in basal metabolic rate as it is low in thyroxine, the case of highest basal metabolic rate being in a person whose thyroglobulin contained only 0.2 per cent. thyroxine (0.04 per cent. thyroxine-iodine).

J. W. CAVETT
CARL O. RICE
J. F. MCCLENDON

UNIVERSITY OF MINNESOTA
MEDICAL SCHOOL, MINNEAPOLIS
MAY 25, 1934

DISSOCIATION IN ERWINIA AMYLOVORA (BURRILL) COMM. S.A.B.[1]

IN a study of morphological, cultural and pathogenic variability in the fire blight organism the phenomenon of dissociation was observed.

[1] Cavett and Seljeskog, "The Preparation of Thyroglobulin," *Proc. Soc. Biol. Chem., Jour. Biol. Chem.*, 100: xxvi, 1933.

[1] Contribution from the Division of Plant Pathology, University of California, Berkeley, Calif.

The "rough" type was obtained by growing the "smooth" form in common nutrient broth of pH 6.9 for twenty days at temperatures from 12 to 25° C. Some isolates yielded 100 per cent. roughs in response to this treatment, while many showed the presence of a large number of intermediates. Many bouillon cultures stored from four to nine months at room temperature showed abundance of rough types upon streaking on nutrient agar plates. Another method of inducing dissociation consisted in daily transferring (at intervals of 18 hours) into bouillon of pH 6.9 and incubating at 28° C. With some isolates this method produced almost 100 per cent. roughs after 20 to 25 transfers.

The rough colonies appeared large, flat, wrinkled and dull. They were firm when touched with the needle and formed clumps when suspended in 0.85 per cent. NaCl solution. The individual bacteria of the rough type were motile but less so than those of the smooth type. The rough type showed a slight pathogenicity to pear shoots and avirulence to certain shrubs, which were very susceptible to the smooth type.

Rough and intermediate types were isolated from old natural infections of pear, apple and some shrubs.

Reversion of R to S was found to take place in 2 per cent. sucrose or 1 per cent. dextrose bouillon after four to six transfers. On the other hand, the organism was attenuated by sucrose concentrations of 10 per cent. or higher.

The comparatively easy reversibility of R into virulent S type, and the fact that the nectars of species susceptible to the fire blight disease may reach concentrations of sugars of from 2 to 5 per cent. in air of high relative humidity[2,3,4] may be suggested to have some bearing on epiphytotics of the fire blight disease.

P. A. ARK

UNIVERSITY OF CALIFORNIA, BERKELEY

[2] Ruth Beutler, "Biologisch-chemische Untersuchungen am Nektar von Immenblumen," *Zeitschr. f. vergl. Physiol.*, 12: 72–176. 1930.

[3] H. E. Thomas and P. A. Ark, "Nectar and Rain in Relation to the Fire Blight Disease." In press.

[4] George H. Vansell, "Bee Behavior as Affecting Pollination." In manuscript.

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