qualitative results like those indicated by Dr. Inman and myself; I am grateful for permission to include this statement herein.

Comparison of the differential susceptibility of thresholds to this current with the results of other types of interference with nerves (*e.g.*, pressure, local anesthetics, section and recovery) suggests itself, as do explanations in terms of the work of Ranson, Erlanger, Adrian and others; to these matters we shall presently address ourselves.

The local "benumbing" effects of various electric currents have been known for a very long time, electric local anesthesia figuring prominently in the medical literature of 1858, and appearing sporadically since then. In spite of occasional reports of success, it has not proved consistently satisfactory for clinical purposes, which does not surprise us, in view of our experience as exemplified in Fig. 1.

Robert[5] used the phrase "anesthésie de diversion," expressing the idea that there is no reduction of physiological sensibility (as in true anesthesia), but diversion or occupation of attention, with diminished perception. We think that it is confusing to call this anesthesia, and prefer Robert's other term "masking." At present our interest is centered upon the strikingly differential quality of this phenomenon, to which, so far as we know, we first drew attention.[3]

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FUNCTION OF THE ROUND WINDOW[1]

SOME time ago, Hughson and Crowe, of Baltimore, reported[2] that when the membrane, which closes the round window of the cochlea, is "made rigid by pressing on it with a plug of moist cotton, the perception of spoken words and practically all tones is increased at least 50 per cent." Later it was suggested that if a fascial graft were implanted in contact with the round-window membrane, thus reducing its normal mobility, the impaired hearing of those who are partially deaf could be distinctly ameliorated. These statements, by virtue of their scientific and clinical implications, have aroused the keen interest of all who are concerned with problems of hearing.

The first question seems to be: Will an animal, whose round-window membrane is thus blocked with a plug, actually *hear better* (respond to fainter sounds) than normally?

The subject (dog) is placed in a stock with right fore-paw resting on a metal grid (which can be charged with electricity). A stimulus-tone (1,000 cycles) is sounded for two seconds, directly followed with a charge just strong enough to effect hasty withdrawal of the foot. The animal soon learns to withdraw his paw as soon as tone begins, thereby avoiding the imminent shock. When the tone is made fainter and fainter, he continues to react as long as he hears it; when it becomes inaudible, he no longer responds. Auditory acuity in a dog may thus be measured with great precision and consistency. The normal limen having been established, each bulla is exposed on its ventral aspect through which a circular hole is reamed; the round-window recess appears directly opposite. A plug is gently pressed into the fossula and brought into snug contact with the round-window membrane. (Plug consists of moderately soft gum enveloped in gauze, the whole forming an elongated saccule of mesh filled with gum). The bulla-opening is closed with a rubber stopper to protect middle ear from extraneous fluids. Within five hours animal's hearing is tested; the plug is then immediately withdrawn by an attached thread and hearing again tested. The change in performance from plug *in* to plug *out* is regularly (ten animals) positive: hearing is impaired whenever plug is in contact with the membrane and again improves when plug is withdrawn. In the first five cases, while our technique was still developing, the gain = 8.0 decibels, standard deviation = 4.11; in the second five, after procedure was perfected, the gain comes out far more sharply and consistently (10.0 db, s.d. = .84). The operation itself (merely entering the bulla) was found, by test, to have no appreciable effect upon the limen.

The second question is: How do these plugs affect electrical pick-up from the auditory nerve? Animal is prepared by entering one bulla, as before, and also exposing the homolateral nerve. A whistle of 1,000 cycles, operated by an interrupted air-stream, provides an ideal stimulus-sound. The electric pulses thus evoked in the nerve are led off by an electrode into ear-phones, where they can be reduced by means of an attenuator until they become just inaudible to the observer. The pick-up with plug *in* and plug *out* can thus be readily measured and compared. The same effect appears with every animal tested (thirteen in number): plug in, sound is reduced; plug out, sound is increased. (First half of cases, mean gain = 4.4 decibels, s.d. = 1.46; second half, mean gain = 9.9 decibels, s.d. = 2.52.) The following relation is thereby established: plugging the round-window fossule reduces both the animal's ability to hear and also the electrical pulses over the auditory nerve. Despite wide-spread discussion of the "Wever-Bray effect," little or no evidence has hitherto been submitted to show whether the effect does, or does not, correlate with actual hearing.

[5] Robert, *L'Union Médicale*, 12: 487, 1858.

[1] Communication No. 1 from the Alpha Research Laboratory. A generous grant in aid of this work by the Trustees of the Research Fund, American Otological Society, is gratefully acknowledged.

[2] *Jour. Am. Med. Assn.*, 96: 2027, 1931.

Our findings clearly support the "classical" theory of hearing in relation to the round-window's function. There being certain differences between the Hopkins procedure and our own, however, no factual contradiction need be inferred.

Our working conclusions are: (1) that our gum-plugs, which meet the round window in direct apposition but with no pressure, impede its normal oscillation and thereby impair acuity of hearing, as the accepted theory of cochlear function would lead one to expect; (2) that actual hearing is affected in the same sense by our procedure as are the electric pulses which can be picked up from cochlea and auditory nerve.

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FREQUENCY-DISTRIBUTION OF VOLUME OF ISLANDS OF LANGERHANS IN THE PANCREAS OF MAN, MONKEY AND DOG

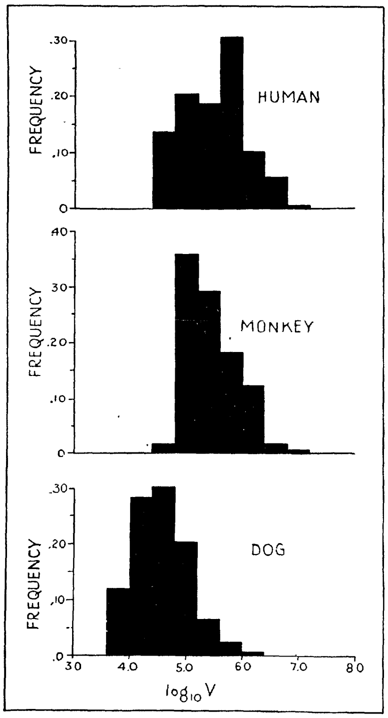
A METHOD of estimation of the volume (V) of Islands of Langerhans has been described elsewhere[1,2] and measurements of 100 islets from a monkey's pancreas presented. The construction of class-frequency diagrams, however, is not as simple as usual, because the selection of samples was necessarily not random; but methods of dealing with such samples with equal effectiveness have been given.[1,2] Relation (3) of the first paper may be used for the calculation of any of the moments, and in particular for the estimation of the frequency of occurrence of a volume within a given interval.

Islets were chosen for measurement by selecting from a cross-section one of the total number, Z, of islet particles. If α be the number of these belonging to the same islet and η be the number of serial sections containing some part of the islet, then the system of weights adopted is given by the respective values of $\frac{Z}{\alpha \cdot \eta}$, the justification for which has been discussed in the second paper.[2] Thus the estimated frequency (F) of occurrence of volumes within a given interval (I) is given by

$$(1) \qquad F = \frac{\sum_{I} \frac{Z}{\alpha \cdot \eta}}{\sum \frac{Z}{\alpha \cdot \eta}}$$

where the summation in the numerator is over values obtained when V is in I and that in the denominator is over the whole sample.

Frequency-distribution diagrams have been obtained in this manner from the data mentioned above as well as from similar data from the pancreas of a man and that of a dog. As these were all strikingly skewed we have presented instead the corresponding diagrams for the logarithm of volume in the text figure, where the unit of volume is the cubic micron (μ^3).



The lack of a prolonged tail to the left in each of the diagrams is worthy of note. According to the hypothesis that no islets are formed after a certain stage in life (possibly prenatally) we might expect to obtain diagrams of this sort, whereas just the opposite would be the case were islets formed throughout life. Furthermore, if the so-called geometric (or logarithmic) character of cell proliferation be maintained or at least that at all times for any two islets of the same pancreas the ratio of their rates of proliferation be equal to the ratio of their volumes, then we should find the same form of distribution of the logarithms of their volumes (as given in the diagrams) at all times with merely a possible shift in position of the whole along the axis of abscissae. It is interesting to note the equality of range in the figures given.

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[1] W. R. Thompson, *Biometrika*, 24: pp. 21–26, 1932.
[2] W. R. Thompson, R. Hussey, *et al.*, *Biometrika*, 24: pp. 27–38, 1932.