and also for the diagrams which are given to demonstrate the best positions of the head for radioscopic purposes.

The Bárány Reactions.—The more elaborate Bárány tests for labyrinthine function have not proved, in the author's experience, much more than confirmatory evidence of what may be determined without them. The main thing to determine in the case of an acoustic tumour is whether the vestibular as well as the cochlear branch of the nerve is only partly or is completely thrown out of function. As regards the vestibular function, Bárány's caloric tests give the most accurate information through their liberation of vertigo and nystagmus.

The response of the caloric test in the case of a true tumour of the eighth nerve is very characteristic, and is in the direction of a much-reduced excitability of the vestibular division of the nerve.

Summary.—In the absence of a clinical history of primary involvement of the acusticus but with definite cerebello-pontine angle symptoms, the diagnosis of an acoustic tumour is probable if characteristic vestibular responses to caloric tests are abolished, if deafness is complete when the contra-lateral ear is irrigated, and if the porus shows a radioscopic enlargement. Moreover, recess tumours which originate from another source than the acusticus are apt to show some symptom which from the point of view of the typical acoustic tumour syndrome is incongruous.

The final chapter is devoted to giving in some detail the technical steps of the type of suboccipital exploration for tumours of the posterior fossa which is favoured in his clinic.

The operation is referred to as the bilateral cerebellar exposure through a cross-bow incision in the occipital region. It is advocated for all subtentorial growths whether or not they occupy the cerebello-pontine angle.

For the detailed steps of the preferential operative procedure preferred by Prof. Cushing we refer the reader to the monograph.

Briefly, they consist in the wide bilateral exposure of the posterior surface of the cerebellum, combined with the early evacuation of cerebro-spinal fluid, which serves to promptly relieve the intra-cranial tension, which in turn permits of sufficient dislocation of the hemisphere to expose the recess without endangering the medullary centres or damaging the adjacent cerebellar lobe.

Among the imperfections of the operation must be remembered its magnitude, the length of time required for its performance, and the fact that only a partial intracapsular enucleation can be advocated at the present time, and not an attempt at complete extirpation.

An essential fact with regard to statistical results is that the case-mortality has been 20·7 per cent.; the operative mortality based on the number of suboccipital operations, 39 in all, has been 15·4 per cent.

The great importance of this subject renders Prof. Cushing's monograph indispensable to all otologists. It is a worthy companion to the same author's work on "Pituitary Tumours" reviewed at length in this journal some years ago. *Archer Ryland.*

CORRESPONDENCE.

To the Editor of The Journal of Laryngology, Rhinology, and Otology.

Sir,—With regard to the book of Sir Th. Wrightson, "An Enquiry into the Analytical Mechanism of the Internal Ear," recently reviewed in this Journal, allow me to express the following important considerations:

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In the first place it is to be noted that Wrightson proposes a new theory, because he thinks that the theory of resonance cannot be sustained because of the supposed impossibility of vibration by resonance of the fibres of the *tectorial* or *basilar* membranes because immersed in a liquid. Now I have demonstrated that this objection is of no value, because the model of the basilar membrane constructed by me vibrates in water as in air, and precisely by resonance.

Since the theory of resonance explains all the known facts, there would not be any reason to substitute another for it, unless the new theory should be more simple and more clearly demonstrated to be true. Let us see if the theory of Wrightson satisfies us in these respects.

Above all, he holds that for all sounds, whether simple or compound, all the organs of Corti vibrate. How is it possible to reconcile with this theory the gaps which can exist in pathological cases, exactly circumscribed to certain regions of the tone scale? Here is the same defect that is found in Ewald's theory.

Entering now into the particulars of the new hypothesis, we see that Wrightson holds that the cochlear liquid vibrates as an incompressible whole, and reproducing exactly the vibrations of the stapes (while also the liquids are compressible, and it is through this that the sounds are propagated in it).

He maintains that there is a stimulus corresponding with each crest, hollow and node of the acoustic wave (simple or compound), and that the brain recognises the sounds by the number of stimuli which it receives per second through the rubbing of the acoustic hairs against the *tectoria*. By means of diagrams (some of which are not exact, as he himself recognises) he shows that in the wave resulting from the fusion of two or more sinusoidal waves, one can identify the stimuli with the component periods of the single wave. Then he says that all the nerve-fibres of the whole cochlea are stimulated in such a way that the brain can find in the complex vibrations the elementary periods of the wave, and hence can thus make the analysis of the sounds without having need of the 15,000 resonators of Helmholtz.

First of all it is to be observed that in order to find in the resulting wave all the periods of those components, Wrightson looks for them in a mode quite arbitrary, making occur an identical stimulus for different notes. This does not seem right. Besides, the facts which are suitable to the theory of Wrightson result—and not always exactly—from the curves which he has drawn in the hypothesis that the amplitudes of the elementary waves are all equal. If, on the contrary, the amplitudes are different, all that is no longer true.

The main basis of the hypothesis is then lacking, according to which the analysis of the sounds would be made. Also the author alludes to the fact that in changing the amplitudes and the phases of the component sounds the resulting wave changes in form, but says (p. 34) that in the greater number of cases drawn by him these characteristics recur. For the validity of a theory it is not enough, however, that it should be true in the greater number of cases; it must be always true.

But, granted that in the resulting wave one finds the periods of all the component sounds, this would serve very well to sustain the theory of resonance. With this difference, however, that if all the nervous elements of the whole cochlea should vibrate together exactly in the same way (except for the amplitude) for all sounds, would it be necessary that they should be distributed along the basilar membrane and have different dimensions in the different positions of the basilar

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membrane? It would have been more simple to abolish the cochlea and place in front of the oval window that number of nerve-cells sufficient to receive the acoustic stimuli transmitted by the stapes. If nature, which resorts always to the most simple means, has not used this method, but has chosen a system more complicated, there must be a reason for it. This is easily understood in the theory of resonance, but not in that of Wrightson.

Keith, in support of the theory of Wrightson, cites the analogy with sight, and says that in the eye there are only three sorts of nerves But these, in the theory of Young, serve to appreciate the colours and are excited also by resonance. But as the brain appreciates the form of an object from that of an image which is formed of it on the retina, and hence from the different positions in space of the nervous elements excited on the retina, thus it judges the height of the sounds from the position in space on the tectorial or basilar membranes of the nervous filaments which are excited, as the theory of resonance demands. If this estimation must be made, as Wrightson supposes, the brain must calculate in a single instance the vibrations of all the acoustic cells. One cannot say whether the brain would be able or not to do this, and if it would be more easy for it to count the vibrations or to recognise the peripheral situation in space of the filament which transmits this stimulus to it. But if analogies are worth anything, visual sensation (form of objects) and tactile sensations support the theory of resonance. Also for touch the brain can judge the peripheral positions of the filaments which send it the stimulus. There would be probably more likelihood in the theory of *Ewald*, namely, that the brain recognises the sound from the form which the basilar membrane assumes—that is, from the form of the so-called *acoustic image*.

The other reasons of anatomical and physiological nature which Keith brings to the support of the new theory do not seem to me convincing, but it would be too long to examine them here separately.

Yours, etc.,

PISA, ITALY; *July* 6, 1919.

Prof. A. STEFANINI.
(J. K. MILNE DICKIE (*trans.*).)

OBITUARY.

BARCLAY JOSIAH BARON, Knight.

SIR BARCLAY BARON'S death on June 7, 1919, at 61 years of age, was a wholly unexpected calamity following a slight accident on May 25. He was pulling down a dead branch from a tree in his garden when it broke off, and he fell on to a large stone, fracturing some ribs. Though distressed at the time he was soon relieved by strapping. His temperature rose to 102° F. the following day and the pyrexia continued for a few days, and he himself came to the conclusion he must have contracted influenza. After the pyrexial condition had subsided he had severe pains in his lumbo-sacral region, but he had suffered from similar lumbago attacks on several previous occasions, and therefore this last attack, which persisted up to the day prior to his death, caused no anxiety though grave inconvenience. The next morning at 1 a.m. he woke complaining of headache; at 3 a.m. he sat up in bed, but felt faint and his breathing became laboured and an hour later he died, the immediate cause of death being apparently a hæmorrhage into the spleen.

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