THE YEAR BOOK *of the* EAR, NOSE & THROAT

(1961-1962 YEAR BOOK *Series)*

EDITED BY

JOHN R. LINDSAY, M.D

Professor and Head of the Section of Otolaryngology
The University of Chicago, The School of Medicine

WITH A SECTION ON

MAXILLOFACIAL SURGERY

EDITED BY

DEAN M. LIERLE, M.D.

Professor and Head of the Department of Otolaryngology
and Maxillofacial Surgery
State University of Iowa College of Medicine

AND

WILLIAM C. HUFFMAN, M.D.

Professor of Otolaryngology and Maxillofacial Surgery
State University of Iowa College of Medicine

YEAR BOOK MEDICAL PUBLISHERS

INCORPORATED

200 EAST ILLINOIS STREET · CHICAGO 11

TABLE OF CONTENTS

The designation *1961-1962 Series* is used in this volume to indicate publication during the "series year," which begins in September, 1961.

THE EAR

THE NOSE AND THROAT

MAXILLOFACIAL SURGERY

THE YEAR BOOK *of the* EAR, NOSE & THROAT

(1961-1962 YEAR BOOK *Series)*

EDITED BY

JOHN R. LINDSAY, M.D.

Professor and Head of the Section of Otolaryngology
The University of Chicago, The School of Medicine

WITH A SECTION ON

MAXILLOFACIAL SURGERY

EDITED BY

DEAN M. LIERLE, M.D.

Professor and Head of the Department of Otolaryngology
and Maxillofacial Surgery
State University of Iowa College of Medicine

AND

WILLIAM C. HUFFMAN, M.D.

Professor of Otolaryngology and Maxillofacial Surgery
State University of Iowa College of Medicine

YEAR BOOK MEDICAL PUBLISHERS

INCORPORATED

200 EAST ILLINOIS STREET · CHICAGO 11

THE PRACTICAL MEDICINE YEAR BOOKS

► There are fifteen YEAR BOOKS in various fields of medicine and one in dentistry. Publication of these annual volumes has been continuous since the first one appeared in 1900. The YEAR BOOKS make available in detailed abstract form the working essence of the cream of recent international medicoscientific literature. Selection of this material on vital advances in clinical management and research is made by distinguished editors who critically review each year more than 120,000 articles published in the world's foremost journals. The source of each abstract is included, and all volumes are indexed, by subject and author. The YEAR BOOKS and their editors are:

Medicine: PAUL B. BEESON, M.D.; CARL MUSCHENHEIM, M.D.; WILLIAM B. CASTLE, M.D.; TINSLEY R. HARRISON, M.D.; FRANZ J. INGELFINGER, M.D.; PHILIP K. BONDY, M.D.

General Surgery: MICHAEL E. DE BAKEY, M.D., with a section on *Anesthesia*, by STUART C. CULLEN, M.D.

Drug Therapy: HARRY BECKMAN, M.D.

Obstetrics & Gynecology: J. P. GREENHILL. M.D.

Pediatrics: SYDNEY S. GELLIS, M.D.

Radiology: JOHN FLOYD HOLT, M.D.; WALTER M. WHITEHOUSE, M.D.; HAROLD W. JACOX, M.D.; MORTON M. KLIGERMAN, M.D.

Ophthalmology: WILLIAM F. HUGHES, M.D.

Ear, Nose & Throat: JOHN R. LINDSAY, M.D., with a section on *Maxillofacial Surgery*, by DEAN M. LIERLE, M.D., and WILLIAM C. HUFFMAN, M.D.

Neurology, Psychiatry & Neurosurgery: ROLAND P. MACKAY. M.D.; SAM BERNARD WORTIS, M.D.; OSCAR SUGAR, M.D.

Dermatology: RUDOLF L. BAER, M.D.; VICTOR H. WITTEN, M.D.

Urology: WILLIAM W. SCOTT, M.D.

Orthopedics & Traumatic Surgery: H. HERMAN YOUNG, M.D., with a section on *Plastic Surgery*, by NEAL OWENS, M.D.

Endocrinology: GILBERT S. GORDAN, M.D.

Pathology & Clinical Pathology: WILLIAM B. WARTMAN, M.D.

Cancer: RANDOLPH LEE CLARK, JR., M.D.; RUSSELL W. CUMLEY, Ph.D.

TABLE OF CONTENTS

The designation *1961-1962 Series* is used in this volume to indicate publication during the "series year," which begins in September, 1961.

THE EAR

THE NOSE AND THROAT

MAXILLOFACIAL SURGERY

THE EAR

VESTIBULAR FUNCTION AND VERTIGO

Studies on Efferent Innervation of Vestibular End Organs. Percy E. Ireland and Joseph Farkashidy[1] (Univ. of Toronto) investigated the existence and function of the vestibular cholinergic mechanism in cats and guinea pigs and its distribution in the end organs of the nonauditory membranous labyrinth. The histochemical method of Koelle-Friedenwald, which shows the areas of increased acetylcholine esterase activity, was used. It was thought that if the vestibular cholinergic innervation is efferent, section of the 8th nerve, leaving the blood supply of the labyrinth undisturbed, would cause only degeneration of this system of nerve fibers. The vestibular ganglions and neuroepithelial cells would remain intact.

Copper sulfide is precipitated in the final phase of the Koelle-Friedenwald method on the sites of acetylcholine esterase activity. This characteristic reaction occurred also in the vestibular end organs. When the outer bony wall of the vestibule was removed, dark brown precipitate became visible in the ampullae of all three semicircular canals and in the utricle. The reaction was less marked in the saccule, probably because its macula lies more hidden in the bony groove and the incubation medium reagents could not penetrate there to produce adequate concentration at the enzyme site. In both the ampullae and the utricle, the precipitate was localized to the receptor areas and thus in the vestibular cristae and macula. It appeared to be evenly distributed in both areas, forming a dark half-moon shape in the ampullae and a broad dark area under the white layer of otoconia in the utricle. No significant difference was found between the two sides of the cristae, i.e., toward and away from the utricle. In the specimens in which, through a counter opening

(1) Ann. Otol., Rhin. & Laryng. 70:490-503, June, 1961.

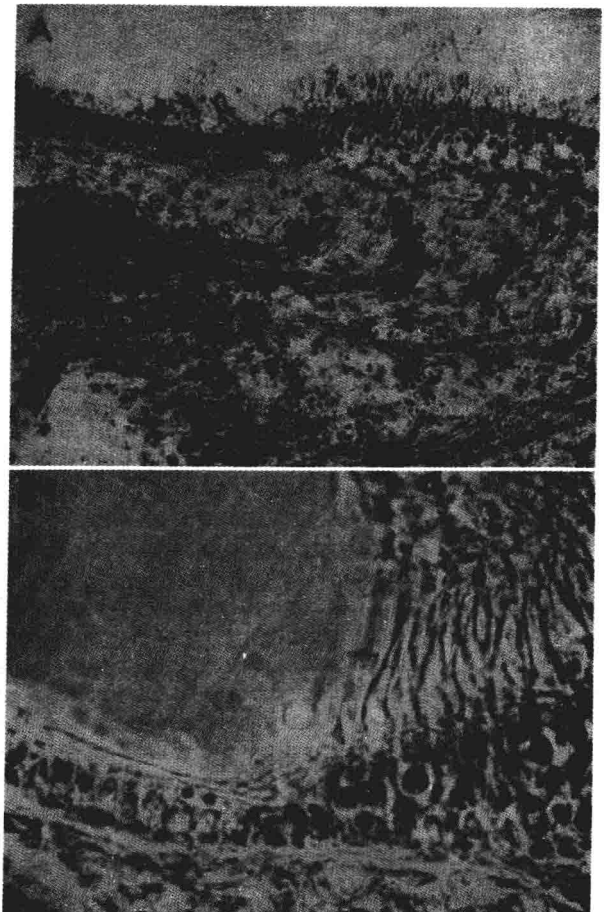

Fig. 1.—Cat killed 7 weeks after division of auditory nerve on one side. *A*, crista ampullaris; side not operated on. Copper sulfide precipitate seen in characteristic sites. *B*, crista ampullaris; side operated on. No precipitate is visible. No signs of end organ degeneration are apparent as blood supply was left intact. (Courtesy of Ireland, P. E., and Farkashidy, J.: Ann. Otol., Rhin. & Laryng. 70:490-503, June, 1961.)

on the apex, the cochlea was also perfused, deep dark stripes showed along the spiral osseous lamina in all the turns where the specific substrate came into contact with the organ of Corti. The controls did not show this precipitate on gross or microscopic examination.

Microscopic sections of the vestibular end organs showed that the precipitate, the acetylcholine esterase activity, was confined to the subepithelial region of the receptors, i.e., to the nerve endings and nerve fibers below and between the hair cells. Sometimes heavy sedimentation was visible a little farther from the receptor area in the vestibular nerve branches themselves, where the acetylthiocholine crystals were not quite transformed to copper sulfide in the last phase, indicating strong enzyme concentration along these fibers.

Two of 7 cats whose auditory nerve had been divided before the histochemical process showed complete degeneration of the cochlear and vestibular end organs due to involuntary division of the internal auditory artery. The other animals showed more or less markedly the characteristic histochemical reaction in the vestibular end organs of the side not operated on, whereas the side operated on was free from any precipitate (Fig. 1).

Recent Advances in Electronystagmographic Investigation of Neurologic Disorders of Ocular Movement are set forth by C. S. Hallpike, J. D. Hood and E. Trinder[2] (Nat'l Hosp., London). The "chopper" system of direct current amplification, with improvements in electrode design, makes it possible to construct an electronystagmographic system of high gain with remarkable stability and freedom from distortion. With such a system, eye deviations of 1 degree of angle can be recorded easily, and sustained deviations of gaze can be accurately recorded with the eyes open or closed or in darkness. With this variety of amplification, besides the recording of nystagmus, one can achieve something impossible with a.-c. amplification—relate nystagmus to sustained deviations of gaze.

One of the vital steps of a clinical otoneurologic examina-

(2) Proc. Roy. Soc. Med. 53:1059-1063, December, 1960.

tion is examination of the eyes for spontaneous nystagmus and assessment of its quality and magnitude. This is usually done by direct scrutiny of the eyes in the upright position of the head. With the chopper system of amplification, it is possible to make the whole examination nystagmographically.

A certain pattern of spontaneous nystagmus, observable with the eyes open, may show great changes when the eyes are closed or in darkness. The neurologic factors which determine these changes are not well understood, and for their detailed analysis electronystagmography is indispensable.

The authors found that in spontaneous nystagmus due to a labyrinthine lesion, elimination of visual fixation by darkness facilitates spontaneous nystagmus and marked deviation of the eyes in the direction of the slow component of nystagmus occurs. If eye closure is used instead of darkness to eliminate visual fixation, results are not quite the same. The cause of this difference is not clear.

Spontaneous vestibular nystagmus, as seen on direct inspection of the eyes, may be caused by organic lesions at a variety of points within the vestibular system, including the labyrinths, vestibular nuclei, cerebellum and even the cerebrum, as in certain patients after hemispherectomy. The possibility of differentiating between these lesions on the basis of differences in the characteristics of the nystagmus itself is important. Thus, although abolition of fixation by Frenzel's glasses is known to increase nystagmus with a peripheral lesion, Holmes has pointed out that it decreases nystagmus due to a cerebellar lesion.

Abolition of fixation, whether by Frenzel's glasses or otherwise, may be, and often is, accompanied by changes in deviation of the eyes, and it may well be to this rather than to abolition of retinal fixation that the effect on nystagmus is due. With electronystagmography, retinal fixation can be abolished by eye closure or darkness, and at the same time eye deviations can be controlled and recorded. In this way, it should be possible to obtain fuller analysis of the effect on nystagmus of these two variables and thus extend the diagnostic value of electronystagmography.

Case for Repeal of Ewald's Second Law: Some Introductory Remarks are presented by C. S. Hallpike[3] (Nat'l Hosp., London). Many of Ewald's ideas have been confirmed to a remarkable extent by results of recent electrophysiologic studies, which have shown, e.g., existence of canal tonus and its modulation by cupular movements. They have shown also that direction of action in the horizontal canal is opposed to that in the vertical canals. Nevertheless, there is undoubtedly good ground for questioning correctness of the thesis expressed in his Second Law of a directional preponderance in the reflex effects of cupular movements.

This arose from an artifact which has always been the bane of animal experimenters—operational disturbance of normal conditions. Ewald opened the canal and packed its lumen with amalgam and thus must inevitably have reduced the resting discharge. He then applied the hammer. The resting discharge, being already reduced, could not be reduced much further, but violent stimulation could still evoke a considerable increase, which it did. Hence, the directional preponderance of the tonus-increasing stimuli which Ewald observed.

Under the better physiologic conditions in which we can work with intact human beings, things are almost certainly different. Violent tonus-increasing stimuli may still be more effective than their opposites. Nevertheless, within the normal working range of the canal, this inequality does not exist and its responses then show a directional equality. To this extent, therefore, Ewald's Second Law needs to be repealed.

Caloric Test in the Cat. Nils G. Henriksson, Cesar Fernández and Robert I. Kohut[4] (Univ. of Chicago) designed a simple device for fixing both head and body of the cat so that nystagmic reaction to caloric stimulation could be investigated. Nystagmographic tracings of ordinary and derived nystagmus were obtained since artifacts induced by movements were reduced to a minimum. The technic can also be used advantageously for recording spontaneous, positional

(3) Acta oto-laryng., supp. 159, pp. 7-14, 1961.
(4) Ibid. 53·21-32, February, 1961.

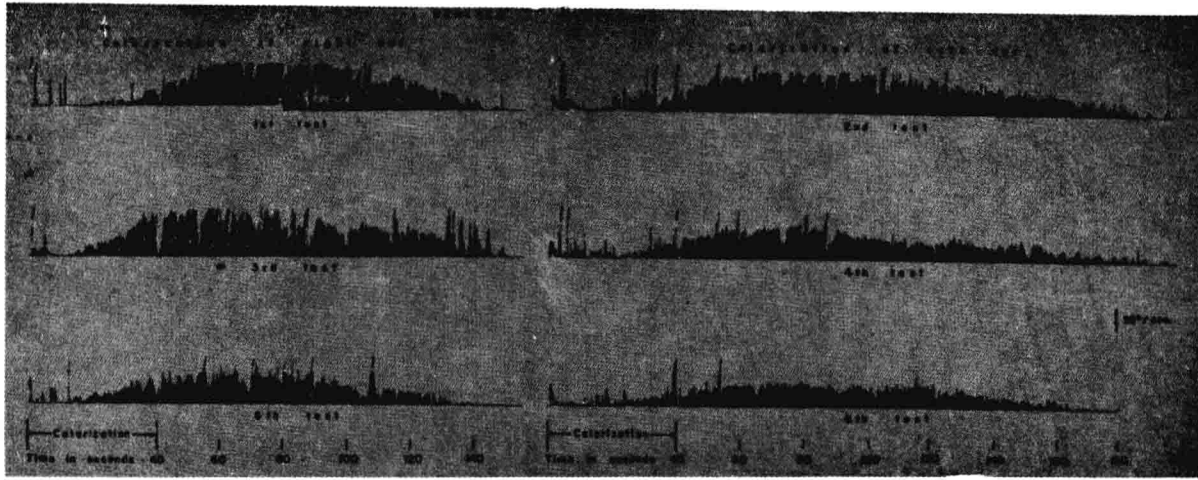

Fig. 2.—Nystagmographic records of six consecutive irrigations with water at 20 C. alternating between left and right ears. Order of irrigation indicated at bottom of each tracing. Note moderate response decline in speed of slow component when caloric test was repeated. Calibration, 52 degrees per second. Paper fed at 1.5 mm. per second. (Courtesy of Henriksson, N. G. *et al* Acta oto-laryng. 53:21-32, Feburary, 1961.)

and optokinetic nystagmus and that provoked by a rotatory test.

The technic of Fitzgerald and Hallpike (1942) for a caloric test in man provides an accurate measure of the receptor sensitivity. This method can now be applied to the cat for similar purposes, provided the temperature of the irrigating water is at least 10 C. over or 10 C. under the rectal temperature of the animal (38 C.). In the cat, a caloric test should not be repeated unless necessary because consecutive irrigations produce unmistakable decline in responsiveness. This decline is more apparent for maximum eye speed.

Repeated cold and hot water irrigations in the same ear indicated that although alternating ampullofugal and ampullopetal flow caused considerable variation in maximum eye speed, duration of nystagmus was little affected.

Repeated irrigations with cold or hot water in one or both ears had a decremental effect on the nystagmic reaction, particularly on maximum eye speed. The response decline became increasingly apparent as the sequence of irrigations was repeated (Fig. 2).

Studies on Habituation of Vestibular Reflexes: I. Effect of Repetitive Caloric Test was studied by N. G. Henriksson, R. Kohut and C. Fernández[5] (Univ. of Chicago) in cats. The study included acquisition, retention and transfer of the re-

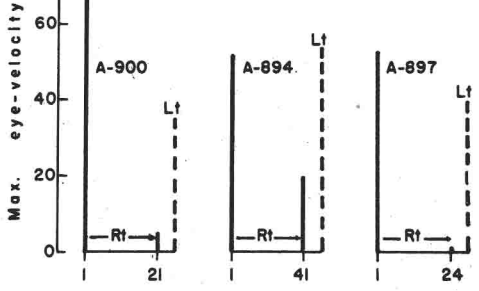

Fig. 3.—Transfer of habituation. Three cats received numerous irrigations as indicated with water at 20 C. in right ear, resulting in nystagmus toward the left. Reversing direction of nystagmus by irrigating left ear with water at 20 C. showed no transfer of habituation. (Courtesy of Henriksson, N. G., *et al.*: Acta oto-laryng. 53:333-349, May-June, 1961.)

(5) Acta oto-laryng. 53:333-349, May-June, 1961.

sponse decline in nystagmic reaction. Acquisition of habituation was obtained by repetitive calorization of right and/or left ears with hot and/or cold water. The rate of response decline was rapid with the initial irrigations and then

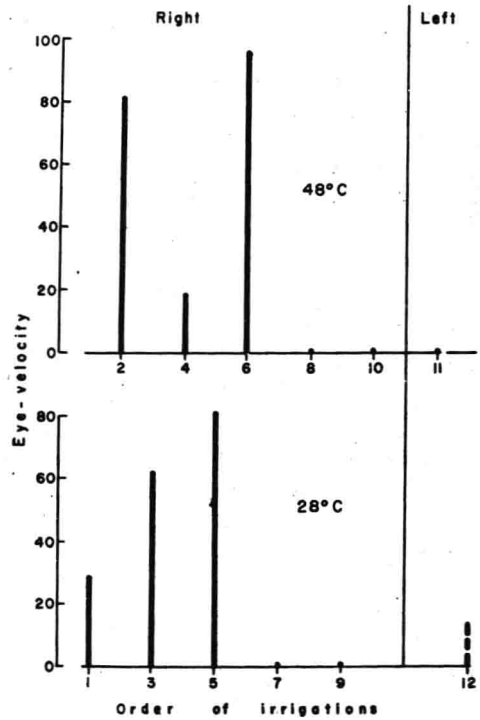

Fig. 4.—Transfer of habituation. Right ear was irrigated with water at 28 C. (lower part of figure) alternating with water at 48 C. (upper part). Extinction of responses was obtained to both cold and hot calorization. Irrigation of left ear with either hot or cold water revealed transfer of habituation. (Courtesy of Henriksson, N. G., *et al.*: Acta oto-laryng. 53:333-349, May-June, 1961.)

tended to level off. The extent of response decline differed among animals, ranging from moderate reduction to complete extinction. In the cat, habituation may be retained after 3 weeks of rest; however, in several animals, recovery of normal caloric responses occurred after a few days.

Three animals received, at intervals of 3 or more days, trials with water at 20 C. in the right ear. Tests for retention

of habituation were often given between trials. When extinction or pronounced response decline was obtained, then the left ear was tested for transfer with water at 20 C. The results (Fig. 3) demonstrated that no transfer occurred.

Transfer is demonstrated mainly when the nonexposed ear is irrigated with equivalent stimuli. The response decline of this ear indicates that the neural mechanism responsible for habituation of nystagmus is a central process. The evidence suggests strongly that neither adaptation nor fatigue of the vestibular receptor is the cause of acquisition of response decline. The fact that transfer of habituation is demonstrated in the nonexposed ear when it is properly stimulated, i.e., with an equivalent stimulus, indicates that the neural mechanism responsible for the direction of the nystagmus is probably the locus of the phenomenon.

Several animals were habituated with nonequivalent stimuli by two procedures. In one, the right ear received one trial consisting of cold water irrigations alternating with hot water and the left ear was tested for transfer with both hot and cold water. In the other, the right and left ears were irrigated alternately with cold water. Testing for transfer was done with hot water in both ears. The results with either procedure revealed complete transfer of habituation (Fig. 4).

Vertigo and Nystagmic Responses to Caloric Stimuli Repeated at Short Intervals were studied by Hans F. Lidvall[6] (Serafimer Hosp., Stockholm) in 25 healthy persons, aged 19-31.

METHOD.—In the routine caloric tests, four stimuli were applied: cold water to the right ear, cold water to the left ear, warm water to the right ear and warm water to the left ear. In the experiments, a series of four to six stimuli was applied to the same ear with water of the same temperature. Usually, two series of stimuli were applied during an experimental session and paired in one of the following ways: (1) first series to one ear and the second to opposite ear, both with water of the same temperature (type 1); (2) first series with cold water and the second with warm water, or vice versa, both to the same ear (type 2) and (3) first series with cold water to one ear and the second with warm water to the other ear, or vice versa (type 3). In the total series, types 2 and 3 were begun as often with warm as with cold water. Ten minutes was allowed between the two series. Vertigo was assessed as to latency, duration and

(6) Acta oto-laryng. 53:33-44, February, 1961.