

**1957**

TRANSACTIONS  
of the  
**American Otological Society**  
INC.

NINETIETH  
ANNUAL MEETING  
HOTEL STATLER  
Washington, D. C.

May 4, 1957

---

VOL. XLV

---

PUBLISHED BY THE SOCIETY  
ZIMMERMAN-PETTY  
ST. LOUIS  
1957

## CONTENTS

	PAGE
Officers of the American Otological Society, Inc.....	5
Registration:	
Members .....	7
Guests .....	8
Symposium on Neurophysiology:	
"Some Uses of Electronic Computers in the Study of Auditory Nervous System," Walter A. Rosenblith, M.D.....	12
"Microelectrode Studies on the Auditory Nervous System," Robert Galambos, M.D. ....	23
"Behavioral Studies of Auditory Discrimination," William D. Neff, Ph.D. ....	26
Discussion:	
Jerzy E. Rose, M.D.....	33
Hallowell Davis, Ph.D.....	34
Benjamin H. Shuster, M.D.....	35
"Adventures with the Stapes," Terence Cawthorne, M.D.....	37
Discussion:	
Stacy R. Guild, Ph.D.....	43
Samuel Rosen, M.D.....	44
Theodore E. Walsh, M.D.....	44
Prof. H. Wullstein.....	44
Benjamin H. Shuster, M.D.....	44

## Closing:

Terence Cawthorne, M.D..... 45

Address of the President, John R. Lindsay, M.D..... 46

"The Structures of the Stria Vascularis," Catherine A. Smith, Ph.D..... 50

"Experimental Obstruction of Venous Drainage and Arterial Supply of  
the Inner Ear," Henry B. Perlman, M.D. and Robert S. Kimura,  
B.A. .... 66

## Discussion:

Harry P. Schenck, M.D..... 75

Luzius Ruedi, M.D..... 76

William D. Neff, Ph.D..... 77

Moses H. Lurie, M.D..... 77

Edmund P. Fowler, M.D..... 78

## Closing:

Henry B. Perlman, M.D..... 78

"The Meatoantrotomy—A Special Approach for Plastic Procedures"  
(with moving picture demonstration), Fritz Zöllner, M.D..... 80

First Business Meeting..... 86

Election of New Members..... 86

Election of Nominating Committee..... 87

Announcement re Auditors..... 88

Second Business Meeting..... 88

Motion to Omit Reading of Minutes of Previous Annual Meeting..... 88

Report of Secretary-Treasurer as Secretary..... 89

In Memoriam ..... 89

Report of Secretary-Treasurer as Treasurer..... 90

Election to Senior Membership..... 92

Report of Board of Trustees of the Central Bureau of Research (E. P.  
Fowler, M.D.) ..... 92

Report of the Representative to the American Standards Association (E. P. Fowler, M.D.).....	97
Report of the Representative to the American Board of Otolaryngology (P. E. Meltzer, M.D.).....	99
Report of "Award of Merit" Committee (A. C. Furstenberg, M.D.).....	99
Report of the Nominating Committee.....	100
Third Business Meeting.....	100
Presentation of the New President, Dr. Dean M. Lierle (J. R. Lindsay, M.D.) .....	101
In Memoriam:	
William Sohler Bryant, M.D.....	102
Thomas Henry Halsted, M.D.....	104
Isaac H. Jones, M.D.....	105
Harold Irving Lillie, M.D.....	106
Lewis F. Morrison, M.D.....	108
George Howard Parker, M.D.....	109
Otto Carl Risch, M.D.....	111
Warren B. Shattuck, M.D.....	112
Frank Robert Spencer, M.D.....	113
George Hayes Willcutt, M.D.....	114
Past Officers of the American Otological Society, Inc.....	115
Members of the American Otological Society, Inc.	
Active .....	127
Senior .....	130
Associate .....	131
Honorary .....	131
Deceased .....	132
Index .....	137

OFFICERS

---

1957

PRESIDENT

JOHN R. LINDSAY, M.D.

950 East Fifty-Ninth Street, Chicago, Illinois

VICE-PRESIDENT

DEAN M. LIERLE, M.D.

University Hospital, Iowa City, Iowa

SECRETARY-TREASURER

LAWRENCE R. BOIES, M.D.

University Hospital, Minneapolis, Minnesota

EDITOR-LIBRARIAN

HENRY L. WILLIAMS, M.D.

Mayo Clinic, Rochester, Minnesota

COUNCIL

WILLIAM J. McNALLY, M.D.

D. E. STAUNTON WISHART, M.D.

ROBERT C. MARTIN, M.D.

HARRY P. SCHENCK, M.D.

AMERICAN OTOLOGICAL SOCIETY, INC.

REGISTRATION

Members and Guests attending the Ninetieth Annual Meeting of the American Otological Society, Inc., which was held at Hotel Statler, Washington, D.C., on May 4, 1957:

MEMBERS

*Active*

VICTOR R. ALFARO  
FRANZ ALTMANN  
SHIRLEY H. BARON  
CHARLES D. BLASSINGAME  
LAWRENCE R. BOIES  
JOHN E. BORDLEY  
GREYDON G. BOYD  
LESTER A. BROWN  
NORTON CANFIELD  
JAMES E. CROUSHORE  
DANIEL S. CUNNING  
FRANCIS W. DAVISON  
KENNETH M. DAY  
JOSEPH G. DRUSS  
BEN R. DYSART  
GLASSELL S. FITZ-HUGH  
EDMUND P. FOWLER, SR.  
EDMUND P. FOWLER, JR.  
ALBERT C. FURSTENBERG  
THOMAS C. GALLOWAY  
ARAM GLORIG  
VICTOR GOODHILL  
HENRY M. GOODYEAR  
JAMES S. HANLEY  
FRED HARBERT  
ANDERSON C. HILDING  
JEROME A. HILGER  
FREDERICK T. HILL  
HOWARD P. HOUSE

ROBERT J. HUNTER  
PERCY E. IRELAND  
RAYMOND E. JORDAN  
ARTHUR L. JUERS  
CHARLES E. KINNEY  
HEINRICH G. KOBRAK  
CLAIR M. KOS  
FRANCIS L. LEDERER  
DEAN M. LIERLE  
JOHN R. LINDSAY  
MOSES H. LURIE  
KENNETH McASKILE  
CARL H. McCASKEY  
HOLLIE E. McHUGH  
JAMES W. McLAURIN  
BERNARD J. McMAHON  
WILLIAM J. McNALLY  
ROBERT C. McNAUGHT  
RALPH J. McQUISTON  
JAMES HOYT MAXWELL  
PHILIP E. MELTZER  
M. VALENTINE MILLER  
JAMES A. MOORE  
PETER NICHOLAS PASTORE  
GEORGE PATTEE  
HENRY B. PERLMAN  
MAX E. POHLMAN  
LEROY M. POLVOGT  
ARTHUR W. PROETZ

## MEMBERS—Continued

JAMES M. ROBB	D. E. STAUNTON WISHART
SAMUEL ROSEN	EARL LeROY WOOD
HARRY ROSENWASSER	DeGRAAF WOODMAN
BEN H. SENTURIA	<i>Senior</i>
GEORGE SHAMBAUGH, JR.	GEORGE M. COATES
BENJAMIN H. SHUSTER	WILLIAM H. JOHNSTON
KINSEY M. SIMONTON	DOUGLAS MACFARLAN
JOHN DUDLEY SINGLETON	ERNEST M. SEYDELL
J. M. SUTHERLAND	<i>Associate</i>
LeROY ALLEN SCHALL	BARRY J. ANSON
HARRY P. SCHENCK	THEODORE BAST
LYLE M. SELLERS	HALLOWELL DAVIS
THOMAS L. TOLAN	S. RICHARD SILVERMAN
G. EDWARD TREMBLE	<i>Honorary</i>
EDWARD H. TRUEX, JR.	TERENCE CAWTHORNE
THEODORE E. WALSH	STACY R. GUILD
FRANCIS L. WEILLE	JULIUS LEMPert
JACOB S. WENDEL	LUAIUS RUEDI
HENRY L. WILLIAMS	GEORGE von BEKESY

## GUESTS

G. DONALD ALBERS	203 Paris S. E., Grand Rapids 3, Mich.
FRED W. ALEXANDER	10515 Carnegie Ave., Cleveland 6, O.
LUCIAN W. ALEXANDER	921 Canal St., New Orleans, La.
SAMUEL A. ALEXANDER	1830 - 1st St. N. W., Washington 6, D. C.
RALPH ARNOLD	Duke Hospital, Durham, N. C.
MICHELE ARSLAN	Padua, Italy
DANIEL C. BAKER	903 Park Ave., New York 21, N. Y.
JOHN J. BALLENGER	723 Elm St., Winnetka, Ill.
J. E. de REZENDE BARBOSA	R. Escocia 254, Sao Paulo, Brazil
CHARLES S. BLASE	5 W. 4th St., Cincinnati 2, O.
HAROLD M. E. BOYD	2010 Wilshire Blvd., Los Angeles 57, Calif.
SEYMOUR J. BROCKMAN	2007 Wilshire Blvd., Los Angeles 57, Calif.
FRANK BROGAN	USAF School of Aviat'n Medicine, Randolph, Tex.
WILLIAM T. K. BRYAN	3720 Washington St., St. Louis, Mo.
EDGAR P. CARDWELL	965 Broad St., Newark 2, N. J.
L. H. CLERF	St. Petersburg, Fla.
R. A. F. COOPER	Naosan Bldg., Hornby Rd., Bombay 1, India
RUSSELL M. DECKER	65 N. Madison St., Pasadena, Calif.
EUGENE L. DERLACKI	55 E. Washington St., Chicago 2, Ill.



## GUESTS—Continued

M. C. de SOUZA DIAS	Sao Paulo, Brazil
J. R. deVILLIERS	Havana, Cuba
FREDERICK W. DIXON	2060 E. 9th St., Cleveland 15, O.
ALFRED W. DOUST	109 S. Warren St., Syracuse, N. Y.
J. D. EVANS	899 Madison Ave., Memphis 3, Tenn.
VAN EYCK	Brussels, Belgium
J. BROWN FARRIOR	500 Bay Shore Blvd., Tampa, Fla.
STANTON A. FRIEDBERG	122 S. Mich. Ave., Chicago 3, Ill.
CHARLES F. FERGUSON	300 Longwood Ave., Boston 15, Mass.
GEORGE FERGUSON	1110 W. Main St., Durham, N. C.
MEYER FOX	208 E. Wisconsin, Milwaukee 2, Wis.
PAUL FUGERE	18 d'Youville Sq., Quebec 4, Que.
MITSUNOBU FURUYA	Tokyo, Japan
J. J. GOREN	Utrecht, Netherlands
ARTHUR J. GORNEY	14 Charlesgate West, Boston 15, Mass.
GLENN GREENWOOD	1033 Gayley, Los Angeles 24, Calif.
PAUL GUGGENHEIM	403 Bennett Bldg., Council Bluffs, Ia.
FREDERICK R. GUILFORD	6410 Fannin St., Houston 24, Tex.
TIERRY GARCIA	Manila, Philippines
JOSEPH L. GOLDMAN	1050 Park Ave., New York 28, N. Y.
FRENCH K. HANSEL	634 N. Grand Blvd., St. Louis 3, Mo.
IRVIN HANTMAN	900 - 17th St. N. W., Washington 6, D. C.
GORDON F. HARKNESS	213 Main St., Davenport, Ia.
H. JAMES HARA	436 Boyle Ave., Los Angeles 33, Calif.
JAMES A. HARRILL	Bowman Gray School of Medicine of Wake Forest College, Winston-Salem, N. C.
CLYDE A. HEATLY	11 N. Goodman St., Rochester 7, N. Y.
D. HENNEBERT	862 Merielis, Brussels, Belgium
DENIS HENNEBERT	24 av. du Fort Juco, Verle, Brussels, Belgium
ROBERT HENNER	55 E. Washington St., Chicago, Ill.
PEDRO HERNANDEZ	Havana, Cuba
G. A. HENRY	170 St. George St., Toronto 5, Ont.
VICTOR H. HILDYARD	Univer. of Minnesota Hospital, Minneapolis, Minn.
LUCIEN HIRSCH	160 E. 7th St., Plainfield, N. J.
PAUL H. HOLINGER	700 N. Mich. Blvd., Chicago 7, Ill.
JOHN B. HOLLINGSWORTH	1904 Franklin St., Oakland 12, Calif.
CONRAD J. HOLMBERG	202 Doctors Bldg., Minneapolis, Minn.
E. HUIZINGA	Nonderharen f. Grominger, Holland
HOSHISUGU ISHU	Yokohama, Japan
W. H. JENKINS	2024 R St., N. W., Washington 9, D. C.
WILLIAM H. JOHNSTON	205 E. Islay St., Santa Barbara, Calif.
EDLEY H. JONES	1301 Washington St., Vicksburg, Miss.

## GUESTS—Continued

GEORGE KELEMEN	20 Gloucester St., Boston 15, Mass.
ROBERT KIMURA	University of Chicago, Chicago 9, Ill.
CRAM R. KLINE	514 Cooper St., Camden, N. J.
JOHN S. KNIGHT	305 W. 43rd St., Kansas City 11, Mo.
RALPH N. KRAUS	School of Aviation Medicine, Randolph AFB, Tex.
H. KUDO	Tokyo, Japan
HERMAN J. LAFF	227 - 16th St., Denver 2, Colo.
FRANCIS LeJEUNE	3503 Prytania St., New Orleans 15, La.
SIDNEY S. LERNER	1915 Spruce St., Philadelphia 9, Pa.
ROBERT L. LEVINE	Graduate School of Medicine, Philadelphia, Pa.
DONALD K. LEWIS	243 Charles St., Boston 14, Mass.
CHARLES E. LONG	1092 Madison Ave., Memphis 4, Tenn.
ROMEO A. LUONGO	2054 Locust St., Philadelphia 3, Pa.
RICHARD E. MARCUS	575 Lincoln St., Winnetka, Ill.
ALDEN H. MILLER	500 S. Lucas Ave., Los Angeles 17, Calif.
TERENCE J. MOLONY	170 St. George St., Toronto 5, Ont.
LaFAYETTE P. MONSON	909 Hyde St., San Francisco 9, Calif.
FERNAND MONTREUIL	1123 St. Joseph Blvd. E., Montreal 24, Que.
PAUL M. MOORE	10515 Carnegie Ave., Cleveland 6, O.
LESLIE E. MORRISSETT	261 Lake Ave., Greenwich, Conn.
DAVID MYERS	3701 N. Broad St., Philadelphia, Pa.
MERVIN C. MYERSON	416 N. Bedford Dr., Beverly Hills, Calif.
FUMIO NAKAMURA	Kyoto, Japan
W. B. NEFF	University of Chicago, Chicago, Ill.
VICTOR NEGUS	London, England
SHOJI NIHO	Yokohama, Japan
TOSHIKAZU NISHIHATA	Tokyo, Japan
PAUL M. PEDERSON	2241 Central Ave., Alameda, Calif.
EMERY I. PICK	6317 Wilshire Blvd., Los Angeles 48, Calif.
WILL P. PIRKEY	2465 S. Downing, Denver, Colo.
ANTONIN PRECECHTEL	Prague, Czechoslovakia
P. M. PRUVOT	Liel, France
J. H. T. RAMBO	535 Park Ave., New York, N. Y.
GEORGE S. ROACH, JR.	144 Ponce de Leon Ave. N. E., Atlanta 8, Ga.
SAM E. ROBERTS	1103 Grand Ave., Kansas City 6E, Mo.
ROBERT F. ROH	111 S. Munn Ave., East Orange, N. J.
BERNARD J. RONIS	2106 Spruce St., Philadelphia 3, Pa.
WALTER A. ROSENBLITH	Mass. Instit'ute of Technology, Cambridge 39, Mass.
SAM H. SANDERS	1089 Madison Ave., Memphis 4, Tenn.
JACK SARNOFF	11 - 31st Ave., Long Island City 6, N. Y.
JEROME M. SATZ	7024 Seville Ave., Huntington Park, Calif.
HENRY M. SCHEER	522 West End Ave., New York 24, N. Y.

HENRY F. SCHUKNECHT	Henry Ford Hosp., Detroit 2, Mich.
EWING SELIGMAN	436 N. Roxbury Dr., Beverly Hills, Calif.
GEORGE A. SISSON	713 E. Genesee St., Syracuse 2, N. Y.
AUSTIN T. SMITH	1830 Spruce St., Philadelphia 3, Pa.
CATHERINE A. SMITH	Washington University, St. Louis, Mo.
T. T. SMITH	107 S. 17th St., Omaha 2, Neb.
JOHN N. STEIN	2170 N. Glebe Rd., Arlington 7, Va.
R. SCOTT STEVENSON	Gibraltar
S. TAKAHARA	Okayama Univ. Med. School, Okayama City, Japan
WALTER H. THEOBALD	307 N. Mich. Blvd., Chicago 1, Ill.
WILLIAM C. THORNELL	2508 Auburn Ave., Cincinnati 19, O.
JOHN F. TOLAN	1118 - 9th Ave., Seattle, Wash.
O. E. VAN ALYEA	135 S. La Salle St., Chicago 3, Ill.
R. WERTH	Tel Hashomer, Israel
EDWARD J. WHALEN	750 Main St., Hartford 3, Conn.
RUSSELL I. WILLIAMS	1604 Capitol, Cheyenne, Wyo.

## SCIENTIFIC SESSION

SATURDAY MORNING, MAY 4, 1957

The Opening Scientific Session of the 90th Annual Meeting of the American Otological Society, Inc., held at the Hotel Statler, Washington, D.C., on May 4, 1957, convened at 9:40 A.M., Dr. John R. Lindsay, President, presiding.

PRESIDENT LINDSAY: We will now open the scientific session of the 90th Annual Meeting of the American Otological Society.

### SYMPOSIUM ON NEUROPHYSIOLOGY

---

#### SOME USES OF ELECTRONIC COMPUTERS IN THE STUDY OF AUDITORY NERVOUS SYSTEM

WALTER A. ROSENBLITH, M.D.

CAMBRIDGE, MASS.

The last time I had the privilege of addressing the Otological Society I tried, perhaps overambitiously, to persuade you that it was not unreasonable to take a statistical view of the electrical behavior of the nervous system. I argued at that time that such a view led indeed not only to useful generalizations of a theoretical nature but could also lead any student of hearing, whatever his particular interest, to ask new questions that could not help but induce a deeper understanding of this field for him.

Today I shall not try to present another theoretical paper, as I have no new theory to propound. I still believe by and large what I told you several years ago, but I shall rather present to you evidence of instrumentation progress. Instrumentation usually helps us to "solve" both theoretical or practical problems. It perhaps would be

better to say that it helps us reconsider issues that have been lying quiescent for a while.

Progress in instrumentation does not occur in a vacuum but rather in the context of the technology of a period. However, while recognizing this dependency, it would be dangerous to overlook another fountainhead of progress in instrumentation. This is usually a particular theoretical bias that leads investigators to ask certain questions and in order to be able to answer these questions to get certain pieces of equipment built. Even those who claim that they hold no particular theoretical views are shown to hold them implicitly by the particular kind of problems that they are interested in in contrast to all other problems that they might be interested in. Secondly, their bias is shown perhaps more directly by the kinds of instruments that they use. These make it possible, in this limited world of ours, to only answer certain questions and not all questions about a given situation.

In the case that you have before you, these two fountainheads of instrumentation are obvious. We live in an age of electronic computers and your speaker was, even before he came to M.I.T., a protagonist, a man with a preconceived bias toward the kind of statistical evidence on the behavior of the nervous system that he would like to know.

In the past century the testing of hearing has made tremendous strides. Most of this progress has come from improvement in the systematic and controlled delivery of the stimulus, but the use of psychophysical techniques has permitted us to obtain a more consistent response behavior. For 30 years, however, we have known about stimulus induced electrical activity in animals and man and we have yet to make use of this knowledge in precisely those situations in which either the verbal or the behavioral responses of the organisms cannot be too well reproduced or conditioned. What has stopped us from making use of this knowledge?

1. The lack of adequate electronic equipment for the analysis of the electrical activity of the organism whose behavior we wish to study. Spontaneous and evoked activity were all mixed up.

2. The lack of appropriate mathematical and display techniques for the analysis of the data.

3. The use of stimuli that are not particularly appropriate to these kinds of studies.

4. Finally the lack of general knowledge in this area, since little study had been done.

I now propose to demonstrate that we are getting ready to overcome the three obstacles that I just named to you and that we are thereby laying the basis for overcoming the fourth, namely, the obstacle of our lack of basic knowledge.

This is perhaps the best place to acknowledge my debt to my colleagues whose names do not appear. They are, in alphabetical order, Dr. Barlow, Massachusetts General Hospital and M.I.T., Mr. Brown, Mr. Geisler and Drs. Freshkof, Goldstein and Kanal from M.I.T. They have checked most of the data that I am about to present and some of them have built the equipment that made these analyses possible. Let me say here that I am not acting as spokesman for them and that the opinions of this station are not necessarily the opinions of the forenamed gentlemen.

In this age the word "computer" has become a magic word, a science fiction term with a slight Madison Avenue gloss. Let me therefore briefly describe how we use the electronic computers that we have built. We, first of all, record the electrical activity of the nervous system from either animals or from men on to magnetic tape. Once we have this on magnetic tape we can play it back to the oscilloscope. We photograph those particular sections of the tape that we would like to deal with. We can also, if we want to, take the tape and actuate the pen-writing equipment of the E.E.G. machine. What we have on this tape are selected samples of electrical activity. A specialized kind of tape is necessary. It is necessary to frequency modulate activity in order to use this appropriately; but you will forgive me, I am sure—as a matter of fact you will enjoy it—if I don't tell you how that is done. Once all of this has been done there is no magic crank that can be turned so that the machine will spit out the answers that one was not bright enough to think of. One of the