



*Barry J. Anson, Ph.D. (Med. Sc.)*

Research Professor, Department of Otolaryngology  
and Maxillofacial Surgery, College of Medicine,  
The University of Iowa, Iowa City, Iowa;  
Robert Laughlin Rea Professor Emeritus of Anatomy,  
Northwestern University Medical School, Chicago

*James A. Donaldson, M.D., F.A.C.S.*

Professor and Chairman, Department of Otolaryngology,  
School of Medicine, The University of Washington,  
Seattle, Washington

# SURGICAL ANATOMY OF THE TEMPORAL BONE AND EAR

*Second Edition*

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*The size of the membranous labyrinth shown in comparison with that of a ten-cent piece. This reconstruction was prepared by the Born wax-plate method.*



*Dedication to*

THEODORE H. BAST, PH.D.<sup>1</sup>

*September 1, 1890–January 23, 1959*

Theodore Hieronymus Bast was an active member of the faculty of the University of Wisconsin for thirty-nine years. He was a native son of the State of Wisconsin. The formative years on the farm engendered a love of nature and a disciplined respect for hard work which characterized him as a man. He received the A.B. degree from Ripon College in 1912, and the Ph.D. degree in anatomy from the University of Chicago in 1921.

Dr. Bast was a teacher of the biological sciences throughout his professional life. In the early years of his career he taught science at Tillotson College (1913–1915) and biology at Piedmont College (1915–1919).

Dr. Bast came to the University of Wisconsin in 1920 as assistant professor of anatomy and attained the rank of professor in 1933. In the years at Wisconsin he demonstrated an unusual capacity as a teacher, investigator and counselor of students. His success as a teacher is attested to by the large number of students who returned to his laboratory for advanced study.

Dr. Bast published seventy-eight scientific papers on a variety of subjects, often jointly with students and colleagues. For more than thirty years he studied intensively the development and the detailed structure of the ear. He was joined in this work by the senior author. Dr. Bast's collection of anatomical material for the study of the human ear is unmatched anywhere in the world and it will remain a legacy for future scholars. The accurate large scale models of the ear which Dr. Bast reconstructed from histological sections exemplify an innate manual dexterity which was also expressed in his wood carving and furniture making.

Dr. Bast's achievements won him an international reputation and honorary memberships in the American Otological Society, the Chicago Laryngological and Otological Society, and the Triological Society. In 1947 he was given the "Citation Award" from Ripon College for outstanding work in anatomy. He was "Honorary Medalist" of the American Otological Society in 1951.

Medical history was his true avocation. As a member and leader in the William Snow Miller Medical History Seminar, Dr. Bast published nineteen papers on historical subjects. Biographical sketches predominated, but the history of the University and other cognate subjects were recorded by his pen.

An account of the contributions of Dr. Bast to the University and Medical School would not be complete without reference to his final major extra-curricular activity, which was the design and construction of the Bardeen Medical Laboratories. He had drawn many sets of preliminary plans before the opportunity for their realization came.

Dr. Bast was an active participant in community life. He served as trustee of the Village of Shorewood Hills, as Sunday School teacher and deacon of the Congregational Church, and always as a good neighbor.

BARRY J. ANSON

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<sup>1</sup>Adapted from Document 1368 of April 6, 1959, Memorial Resolutions of the Faculty of the University of Wisconsin on the Death of Professor Theodore Hieronymus Bast. Memorial Committee: Maxine E. Bennett, O. A. Mortensen (Chairman), H. W. Mossman, H. H. Reese.

## THE TRAGEDIE OF HAMLET

*The Ghost speaks:*

Sleeping within mine Orchard,  
My custome always in the afternoone;  
Upon my secure hower thy Uncle stole  
With iuyce of cursed Hebenon in a Violl,  
And in the Porches of mine eares did poure  
The leaperous Distilment; whose effect  
Holds such an enmity with blood of Man,  
That swift as Quick-silver, it courses through  
The naturall Gates and Allies of the Body;  
And with a sodaine vigour it doth posset  
And curd, like Aygre droppings into Milke,  
The thin and wholesome blood: so did it mine;

. . . . .  
Thus was I, sleeping, by a Brothers hand,  
Of Life, of Crowne, and Queene at once dispatcht . . .

*From the Norton Facsimile of the First Folio  
Special Collections Department  
The University of Iowa Libraries*

In the concept of bodily fabric and function held in Elizabethan and Caroline England, and in centuries backward in time to Graeco-Roman culture, man was an ambulatory sponge, through whose body coursed the humors and the spiritus—by way of thoracic and abdominal organs and cutaneous spiracular pores which both exuded sweat and admitted noxious vapors or elements. When lost inordinately, or depauperated in sustaining quality, the way was open to disease or death; from one body to the other the infectious irradiations could be passed to work their subtle malignity—especially in time of plague.

Thus, “like eager droppings into milk,” the poison did curdle the King’s once uncontaminated blood.

The way to each organ was open through every aperture, whether pore, meatus or maw. Even in our day, the movement of otologic fluids (in their restricted labyrinthine excursion) still offers problems of exchange whose solutions tend to elude our diligent searching.

# PREFACE TO THE SECOND EDITION

An initial plan merely to revise the first edition of this book was supplanted by one more mature that called for the extension of sets of illustrations depicting the adult anatomy of the ear and the addition of a totally new part on development.

In the six-year period since the earlier edition left the press, several pertinent studies in morphology have been completed and reported in part at meetings of the Triological Society and of the American Otolological Society, of the American Academy of Ophthalmology and Otolaryngology; these and other, unpublished, phases of the inclusive investigation are represented by picture and text in the present edition.

It has been the continuing experience of the authors that there exists an inalienable cousinage between the content of courses given to residents and the topics in a textbook designed, in part, to direct the professional hand. The purposes are in unity; the only difference lies in chronology.

The senior author has been privileged to use, uninterruptedly, the serially sectioned temporal bones in the Wisconsin Collection brought together by the late Professor Theodore H. Bast. Virtually all of the 117 photomicrographs comprising Part II of the present edition have been taken from sections in this monumental collection. Others from the same source appear in Part III. Dr. Otto A. Mortensen and Dr. James H. Brandenburg have fostered the project in every helpful way. To the list of Project Assistants working in Dr. Mortensen's department, for whose collaboration thanks have been previously expressed, we would now add the name of Michael J. Rensink, M.D.

For this edition and for its predecessor, the drawings, with a few exceptions, were prepared by George Buckley.

The authors, in every one of the variegated phases in the preparation of this edition, have been, as before, dependent upon the talents and zeal of Mrs. Patricia Edberg, Editorial Secretary. While possessing full comprehension of the research-purpose of the inclusive project of which publication of this book is one element, even the minutiae of syntax have

never escaped her acute perception. On countless occasions her ability to act as knowledgeable intermediary between author and publisher has proved to be of the greatest aid.

A vote of thanks is due, and is gladly given, to the staff of the W. B. Saunders Company, whose clear-sighted guidance and perennial encouragement have made the preparation of this edition a stimulating endeavor.

The senior author wishes to pay special tribute to the memory of the late J. Gordon Wilson, M.D., Professor of Otolaryngology at Northwestern University Medical School. Dr. Wilson guided the conjoint program at Wisconsin and at Northwestern and secured vital financial aid from the American Otological Society at a time when there was no other source of supportive funds. The present study has been supported by the continuing aid of the Research Fund of the American Otological Society and the National Institutes of Health of the United States Public Health Service Grant No. NS 03855-10.

*Iowa City, Iowa*

BARRY J. ANSON, PH.D. (MED. SC.)

*Seattle, Washington*

JAMES A. DONALDSON, M.D.



# PREFACE

## TO THE FIRST EDITION

The obligation of imparting requisite knowledge of man's anatomy has fallen to the courses in the basic sciences presented at postgraduate level. In the opinion of the present authors, the need for such instruction is nowhere more urgent than in the field of otology. This volume represents an effort to provide information in surgical anatomy needed in residency training and, later, in the practice of this specialty.

Whether offered in a book or as part of a curriculum for residency training, the fundamental purpose is the same. Therefore, the general pattern for the book is related to that of the Basic Science Course in the Department of Otolaryngology and Maxillofacial Surgery planned by Dr. Lierle and administered by Dr. Brain F. McCabe, Chairman of the Department of Otolaryngology and Maxillofacial Surgery. Dr. McCabe has read the proof of the text and examined the illustrations, especially in relation to service in the capacities named. The authors are grateful to him for critical appraisal of their undertaking.

It may be taken as established that a modern textbook of anatomy in a specialty must be preponderantly pictorial. In the present instance new illustrations were prepared from gross specimens and from serially sectioned temporal bones, the latter available in the collection of the late Professor Theodore H. Bast.

Since Dr. Bast's untimely death in 1959, it has been the senior author's privilege to continue the studies pursued in congenial and rewarding cooperation at Madison. Gratitude for this rare opportunity is due, and is hereby happily expressed, to Otto A. Mortensen, M.D., Chairman of the Department of Anatomy and Associate Dean at the University of Wisconsin. In every way possible Dr. Mortensen has aided in the extension of the collaborative program. Five graduate students in Dr. Mortensen's department have served in succession as Project Assistants in the course of this investigation: Shafik F. Richany, M.D.; Gerald P. Stelter, M.D.; Jerome R. Hanson, M.D.; David G. Harper, M.D.; and Thomas R. Winch, the present appointee, now in his fourth year in the College of Medicine.

For many years the senior author and his associates have benefited in their investigation by grants generously provided by the Central Bureau of Research of the American Otological Society. When the Committee on Neurological Diseases and Blindness expanded the initial program to include otological problems, funds were allocated by the U.S. Public Health Service.

The authors wish to express their thanks to Mrs. Patricia Edberg for her meticulous secretarial aid, both in work on the manuscript and in the arranging of engraver's proofs for the guidance of the Production Department at Saunders. For earlier contributory effort in the threefold capacity of secretary, linguist, and co-author, the writers are in equal debt to Mrs. Eycke Strickland.

For the selection of the photomicrographs, the authors are beholden to Thomas R. Winch; and for their preparation, to Mr. Homer Montague, Medical School Photographer, University of Wisconsin. Many of the special dissections of osseous specimens of temporal bones were carried out by Dr. Raymond L. Warpeha of the Department of Anatomy, Northwestern University Dental School. Dr. Warpeha's skilled and ingenious handling of the air-driven dental handpiece made possible the intricate demonstration of the internal structure of the petrous part of the temporal bone.

The successful production of any treatise dealing with morphology, especially one of atlas nature, requires the collaboration of an illustrator of exceptional ability. In the preparation of the present book, the authors were fortunate in having as their artist Mr. George Buckley of the Department of Medical Illustration. All drawings are products of his capable hand.

Many former colleagues and co-workers have contributed, albeit at the time unwittingly, to the fund of information requisite to the preparation of this volume. Any attempt to name them all would only lead to the unhappiness that comes of failing to do justice to those whose aid, however vital, was proffered in the early years of association. One name looms large in the roster of those upon whom the authors have more recently been dependent: Dr. Henry L. Williams, by his constructive criticism and through his stimulating acquaintance with the earlier literature in otology, has been largely responsible for the selection of topics in surgery, the bases of which always rest in structure.

Variegation in the course-work of the medical student spells need for a directive channel, an instrumentality for his burgeoning, somewhat nebulous fund of knowledge. For the authors such guidance was effectually provided by Professor Edward Allen Boyden in his anatomical teaching at Harvard Medical School for one, at the University of Minnesota for the other. The concept of the interdependence of anatomy and surgery would remain an empty maxim were it to lack administrative nurturing. Needed sustentation was provided by Dean M. Lierle, M.D. To Professor Boyden and Dr. Lierle this book is gratefully dedicated.

It is a source of pleasure and satisfaction to broaden an association with the W. B. Saunders Company. To work jointly with the members of

their staff is to benefit by the availability of a broad and long-term experience in an honored craft and by gentlemanly discretion in imparting a mature form of bibliophilic guidance.

*Iowa City, Iowa*

BARRY J. ANSON, PH.D. (MED. SC.)

*Seattle, Washington*

JAMES A. DONALDSON, M.D.

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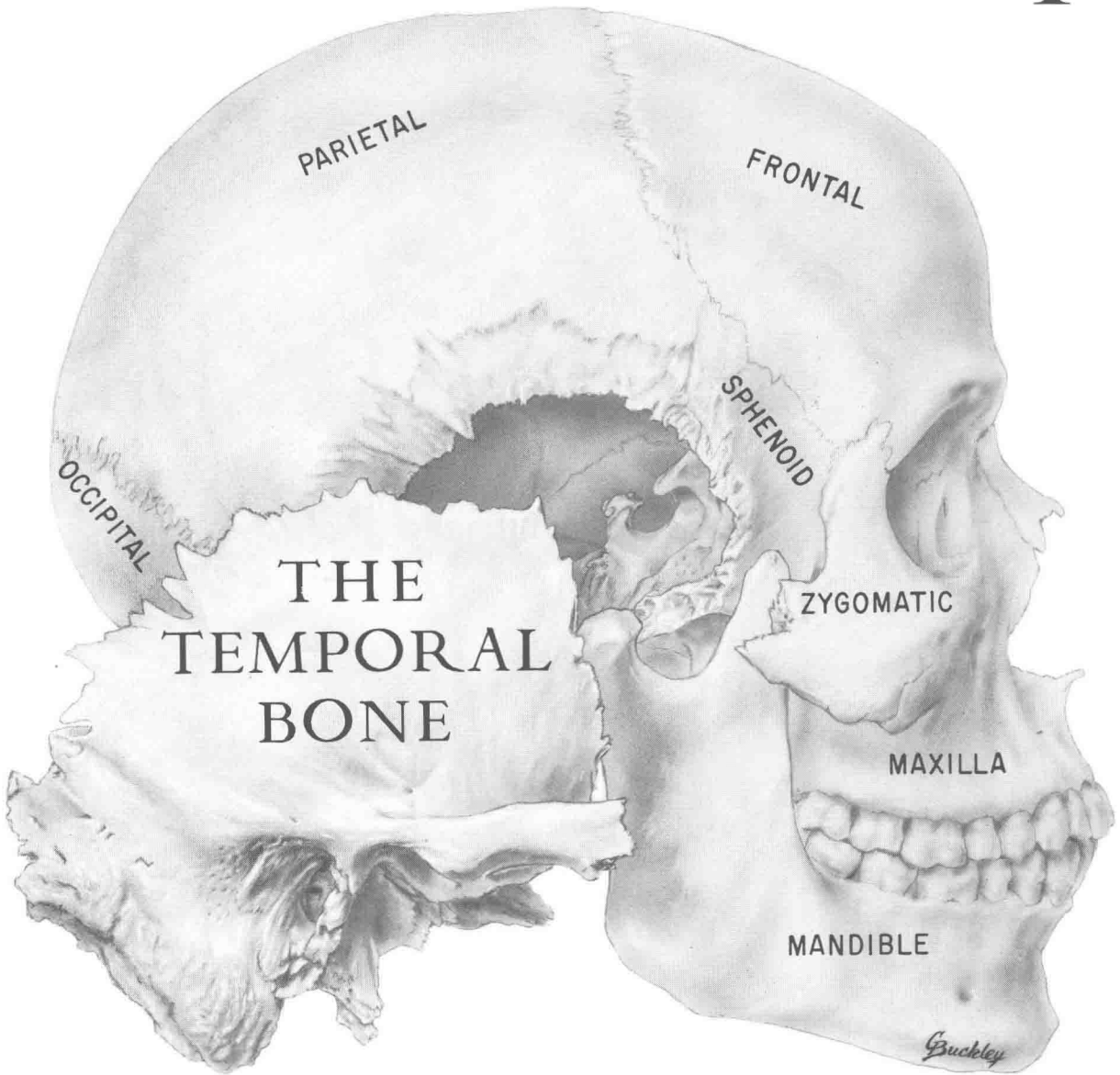
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# Part I



SKULL IN LATERAL VIEW WITH TEMPORAL BONE REMOVED FROM ITS NATURAL SITE.

