



# THE COMPARATIVE ANATOMY AND PHYSIOLOGY OF THE NOSE AND PARANASAL SINUSES

by

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## PREFACE

**A**LTHOUGH my main objective since qualification has been the study of the ear, nose and throat in health and disease, my interest in research has been active, and directed, through the course of many years, first to the study of the anatomy and physiology of the larynx and adjacent parts of the respiratory tract, and for the last eight years or more to the investigation of the comparative anatomy and physiology of the nose.

The commencement of this study was prompted by the need for reconstruction of the collection in the Museum of the Royal College of Surgeons of England illustrating the anatomy of the human nose and sinuses, a collection emanating from the clinic of Professor Onodi of Budapest, and arranged and described by Mr Layton, to be destroyed almost entirely during the bombing of London in 1941.

Much human osteological material was retrieved from the ruins and although badly mutilated, much of it served for the foundations of a collection to replace that destroyed. Having started on this replacement, it appeared interesting and advantageous to supplement the human collection with specimens of various animals, including fish, amphibia, reptiles, birds and mammals.

The store rooms of the College of Surgeons provided a wide range of material, the dissection and preparation of which for mounting has occupied my available leisure for some years. Facilities were freely afforded in the research laboratories of the College, for which I am most grateful; the work was continued and extended to cover not only anatomical investigations, but also experimental research on my appointment to the Ferens Institute of the Middlesex Hospital Medical School, at the courteous invitation of the Directors.

The results of these various investigations, amplified by reference to the work of others, have been arranged in the present book in what it is hoped is an orderly and connected sequence.

The prototype was a catalogue in book form, descriptive of the anatomical collection, with the addition of physiological deductions, compiled at the College and now reposing in the Library. This catalogue was read and criticised by Professor Causey, to whom I am most grateful for advice to alter it and to enlarge it into its present form; he has also allowed me to reproduce two electron microscope photographs of alveoli of the lung. The completed work has been reviewed most patiently and thoroughly by Professor Slome and it now appears with the blessing of an anatomist and a physiologist, to both of whom clarity of expression and accuracy of statement are of prime importance.

Since my early days in the research departments of the College of Surgeons I have benefited by the advice of Sir Arthur Keith and Professor Wood Jones, from both of whom I have derived inspiration and for whose profound knowledge and wide outlook I have sincere and lasting admiration.

One cannot work in the College without feeling the influence of John Hunter, perusal of whose surviving communications and study of whose biological specimens provides so much illuminating information.

At the Middlesex Hospital I had the advantage of discussing many problems

## PREFACE

and obtaining much information from Professor Neil and Professor Walls; the latter has provided me with two illustrations. Mr Seymour of the Ferens Institute has helped me in many ways, both technically and in discussion.

Miss Dobson, Curator of the Anatomical Department of the College of Surgeons has helped me in many directions by virtue of her intimate knowledge of the Collections, particularly that of Hunter, and from Mr Le Fanu and the Librarians I have gained much support in regard to the literature of the subject.

Valuable advice has been given by Professor Boyd on pigment changes and by him and Dr Bellairs on the organ of Jacobson; Dr Cardell, of King's College Hospital, gave me information regarding changes in the lungs of asthmatics and lent me some illustrations.

Of books of great value I would include, among many others, those of Hunter and Lister, of Elliott Smith, Keith and Wood Jones, of Starling and Lovatt Evans, J. Z. Young, Hogben, Ladd Prosser, Schaeffer, Skillern, Moncrieff, Krogh, Le Gros Clark, Osman Hill, Zuckerkandl, McKenzie, Parker and Greville Macdonald; I wish to pay particular tribute to the writings of my friend, Arthur Proetz, who has added very much to our knowledge of the physiology of the nose.

I have derived a great deal of help and information from many communications in journals; I hope I have made suitable acknowledgement in the text, but I repeat my thanks here and trust I have not failed to give credit to those from whose investigations and reports I have benefited.

It would have been impossible for me to have conducted this investigation if I had not been granted the help of many technical experts, particularly Mr Bishop of the Ferens Institute, whose skill in the preparation of sections and in photography, both of microscopical and gross material, has furnished much of the data on which I have based my observations.

At the Royal College of Surgeons specimens have been dissected and mounted over the course of years by Mr Bartlett and Mr Bush of the Anatomical Department; two electron microscope photos and other enlargements owe much to Mr Edwards of the same department. In the Physiology Department many photographs have been produced by Mr Redman.

Since my earliest days at the College I have derived much help from Mr Steward in various directions; in particular the subjects of ciliary action and pigment changes; he is now busy helping Professor Slome and myself in research on air conditioning.

I have been able to study various skulls in the Odontological Collection of the Royal College of Surgeons and mounted specimens in the Haslemere Museum; further anatomical knowledge has been derived from a section of a Tree Shrew given to me by Professor Goldby of St Mary's Hospital Medical School, and also from several skulls of Chimpanzees brought from Equatorial Africa by Dr Chesterman. Radiographs of animal skulls have been made under the direction of Dr Crichlow; Sir Harold Graham Hodgson provided me with radiographs illustrating the naso-pulmonary reflex.

A great deal of time and industry was devoted to the accurate measurement of various areas of the nose by Mr Jameson of the Middlesex Hospital; although the results have been compressed, yet the labour involved was very considerable. My son David carried out investigations and contributed information regarding the organ of Jacobson.

My secretaries and especially Miss Anne Clarke have converted my very

## PREFACE

bad handwriting into accurate typescript, and have helped in many ways in the compilation of this book; Miss Jones has checked the references.

A considerable number of the illustrations, about thirty in all, and particularly those of groups of animals and preparations of human skulls, are the work of my wife; I acknowledge with gratitude the skilled help she has given. Other drawings are the work of Mr Field Marchant, Mr S. Steward, Dr Tompsett and the late Mr Sewell. A number of illustrations in books and journals have been reproduced or adapted for inclusion; acknowledgement is made in the appropriate place, but in addition I wish to express my gratitude in this preface, and especially to Dr Fawcett and Dr Hans Engström for electron microscope photos.

I am sure that the great care and interest devoted by the Directors of Messrs Livingstone to the publication of this book are reflected in the high standard of production.

It has fallen to my lot, over the course of many years, to deal, not only with the usual diseases of the ear, nose and throat, but also with a large number of patients suffering from malignant disease of the pharynx, larynx and oesophagus. In many, radical operations of considerable difficulty are essential if the patient is to be spared a painful and lingering death.

The responsibilities of such cases have been greatly relieved by the compensations of research on the basic principles involved in the regions concerned; I am deeply grateful for the alleviation so provided and commend to others, similarly placed, an interest of this nature. I would repeat a quotation from the Lister Oration I was privileged to give:

'At a Graduation Address delivered at Edinburgh in 1876 Lord Lister spoke as follows: ". . . and truly, if we had nothing but pecuniary rewards and worldly honours to look to our profession would not be one to be desired. But in its practice you will find it to be attended with peculiar privileges, second to none in intense interest and pure pleasures".'

VICTOR NEGUS

LONDON, 1958

## NOTE ON THE ILLUSTRATIONS

THE majority of the illustrations are drawings or photographs of anatomical specimens now in the Museum of the Royal College of Surgeons; some are from dissections, others from sections of skulls and many are photomicrographs from sections enlarged, in many cases, to form transparent serial reconstruction models. The microscopic sections were prepared at the Ferens Institute of the Middlesex Hospital Medical School. The majority of the photographs were taken at the Ferens Institute and the remainder in the departments of Anatomy and Physiology of the Royal College of Surgeons.

Eighteen illustrations have been borrowed and six are adapted from the figures of other authors; acknowledgement is made in each case.

A number of the figures have been reproduced before in communications by me to various journals, or in books.

The numbers of those specimens in the Museum of the Royal College of Surgeons, from which illustrations have been taken, are appended to the figures.

Some of the illustrations have appeared in the course of the years from 1924 to 1958, to illustrate various personal communications in the following journals:—

*Acta oto-laryngologica*  
*Archives of oto-rhino-laryngology*  
*Annals of oto-rhino-laryngology*  
*Annals of Royal College of Surgeons of England*  
*British Journal of Surgery*  
*British Medical Journal*  
*Journal of Anatomy*  
*Journal of Laryngology and Otology*  
*Lancet*  
*Laryngoscope*  
*Proceedings of Royal Society of Medicine*  
*Scientific Basis of Medicine*  
*Thorax*



Dedicated  
to the Memory of  
Sir Arthur Keith and  
Professor Frederic Wood Jones

# CONTENTS

CHAPTER

PAGE

INTRODUCTION . . . . .	3
------------------------	---

## PART I

### THE COMPARATIVE ANATOMY AND PHYSIOLOGY OF THE NOSE

#### SECTION I—THE NOSE AS AN OLFACTORY ORGAN

I ADAPTATIONS FOR OLFACTION . . . . .	9
The Olfactory Sense . . . . .	9
Evolution of the Nasal Organ . . . . .	10
The Olfactory Organ of Cyclostomes and Fishes . . . . .	11
Circulation of Odorous Substances . . . . .	13
Ciliary Action 13; Action of the Jaws 13; Progression 15; Movement of Tentacles 15.	
Minute Structure of the Olfactory Recess . . . . .	15
Function of Goblet Cells 15; Structure of Olfactory Mucosa 19.	
The Nasal Organ in Aquatic Species Which Breathe Air . . . . .	19
Moistening of Olfactory Mucosa 22.	
Conveyance of Odours in Air Breathing Species . . . . .	23
Respiratory Movements 23; Valvular Nasal Apertures 23; Ciliary Action 23; Direction of Air Currents 23.	
Summary . . . . .	25
II THE USES OF OLFACTION . . . . .	26
Recognition of Surroundings . . . . .	26
Recognising Food . . . . .	26
Herbivora 26; Carnivorous Animals 27; Omnivora 28.	
Discovering Prey . . . . .	28
Escaping Enemies . . . . .	29
Repelling Enemies . . . . .	30
Recognising Others of the Species . . . . .	30
Non-sexual 30; Sexual Attraction 30.	
Conclusions . . . . .	30
Summary . . . . .	33
III ANATOMY OF THE OLFACTORY ORGAN . . . . .	34
Histology of Olfactory Mucosa . . . . .	34
Olfactory Pigment . . . . .	38
Effect of Absence of Pigment 38; Occurrence of Olfactory Pigmentation 38; Cutaneous Pigmentation 40; Function of Cutaneous Pigment 40; Pig- ment in Sites other than the Skin 40; Composition of Pigment 42; Regula- tion of Pigment Changes 44; Function of Olfactory Pigment 44.	

# CONTENTS

CHAPTER	PAGE
III <i>continued</i>	
Secretory Glands . . . . .	48
Vascular Supply . . . . .	51
Capillary Circulation 51; Circulation of Lymph 52; Venous Return 52.	
Nerve Supply . . . . .	53
Olfactory Nerves 53; The Cribriform Plate 53; Olfactory Bulb 58; Cerebral Connections 61; Cortical Representation 61.	
Distribution of Olfactory Mucosa in Relation to Acuity of the Olfactory Sense . . . . .	63
Fish 63; Amphibia 66; Reptiles 67; Chelonia 68; Birds 68; Mammals 68; Olfactory Turbinals in Various Species 70; Secondary Regression 74.	
Relative Areas of Olfactory Mucosa . . . . .	77
Relation of Olfactory Area to Acuity and Discrimination . . . . .	80
Summary . . . . .	80
IV ACCESSORIES TO OLFACTION . . . . .	82
Direction of the Air Stream in Relation to the Olfactory Area . . . . .	82
Approximation of Nasal Passages to Pulmonary Air Tract . . . . .	85
Recessing of Olfactory Mucosa . . . . .	87
Sub-ethmoidal Shelf 87; Lateral Ethmoidal Plate 88; Extension of Olfactory Mucosa into Recesses or Sinuses 88.	
Summary . . . . .	90
V OLFACTORY ACUITY AND DISCRIMINATION . . . . .	91
Types of Odours . . . . .	91
Olfactory Stimulation . . . . .	91
Volatility 92; Solubility 92; Deposition of Olfactory Molecules 93; Surface Electrical Charges 94; Essentials of Olfactory Perception 95.	
Olfactory Acuity and Fatigue . . . . .	96
Olfactory Discrimination . . . . .	97
Summary . . . . .	101
Summary of Section I—Chapters I to V . . . . .	101
VI THE ORGAN OF JACOBSON . . . . .	103
Introduction . . . . .	103
Anatomy . . . . .	103
Histology . . . . .	106
Distribution Among Species . . . . .	107
Fishes 107; Amphibia 107; Reptiles 109; Birds 111; Mammals 111.	
Relative Size of the Organ . . . . .	115
Duct of Jacobson's Organ and Naso-palatine Duct . . . . .	116
Nervous Connections . . . . .	120
Conveyance of Olfactory Molecules to the Organ . . . . .	121
Function . . . . .	126
Summary . . . . .	128

## CONTENTS

CHAPTER

PAGE

### SECTION II—THE FUNCTIONS OF THE NOSE IN RESPIRATION

VII	PREVENTION OF INUNDATION: AIR CURRENTS: RELATION TO BREATHING: FILTERING ACTION: ADVANTAGES OF NASAL RESPIRATION . . . . .	131
	Prevention of Inundation 131; Closure of Nostrils 131; Position of Nasal Orifice 132.	
	Respiratory Movements of Alae Nasi . . . . .	134
	Elongation of Nasal Passage . . . . .	135
	Air Currents through the Nose . . . . .	136
	Shape of Nostrils 136; Relative Size of Bony Aperture in Man 138; Nasal Aperture in Animals 140; Straightening of Air Tract 145; Coaptation to Laryngeal Airway 145; Resistance to Passage of Air 145; Effect of Blowing the Nose or of Sniffing 147; Nasal Cycle 147; Naso-Pulmonary Reflex 148.	
	The Nose in Relation to Various Methods of Breathing . . . . .	150
	Air Swallowing 150; Infra Buccal Bellows 150; Thoracic Bellows 150; Rebreathing 151; Advantages of Nasal Respiration 151.	
	Filtering Action of the Nose . . . . .	153
	Retention of Solid Particles 153; Lysozymes 153; Electrical Surface Charges 153.	
	Summary . . . . .	154
	Summary of Section II . . . . .	154

### SECTION III—THE AIR CONDITIONING MECHANISM OF THE NOSE

	INTRODUCTION . . . . .	157
VIII	MOISTENING AND WARMING OF AIR . . . . .	158
	Moistening of Air . . . . .	158
	Atmospheric Moisture 158; Absolute Humidity 158; Relative Humidity 158.	
	Reasons for Humidification . . . . .	161
	Olfaction 161; Respiration 163; Ciliary Action 164; Deglutition 164; Phonation 165; Destruction of Bacteria 165.	
	Warming of Air . . . . .	165
	Physical Factors 165.	
	Reasons for Warming Inspired Air . . . . .	166
	Humidification 166; Protection of Mucous Membranes 166; Raising Body Temperature 166; Loss of Body Heat 166; Adaptation to Climate 169.	
	Summary . . . . .	172
IX	STRUCTURE OF AIR CONDITIONING MEMBRANES . . . . .	173
	Types of Epithelium . . . . .	173
	Histology of Epithelium . . . . .	173
	Glands in the Nose and Lower Respiratory Tract . . . . .	173
	Unicellular Goblet Cells 173; Multicellular Glands 175; Bowman's Glands 181; Conclusion 181.	
	Transudation . . . . .	183

# CONTENTS

## CHAPTER

## PAGE

### IX *continued*

The Function of Mucus and Transudate . . . . .	184
Blood Supply . . . . .	186
Summary . . . . .	190

### X DISTRIBUTION OF AIR CONDITIONING MEMBRANES . . . . . 191

Nasal Vestibule . . . . .	191
Nasal Septum . . . . .	191
Swell Body 191.	
Lateral Nasal Wall . . . . .	193
Anatomy of the Maxillo-turbinal . . . . .	194
Non-convoluted Projections 194; Single Scroll 195; Double Scroll 196; Furrowed or Folded 196; Branching 196; Length of Maxillo-turbinal 196.	
Ethmo-turbinals . . . . .	203
Paranasal Sinuses . . . . .	204
Pharynx . . . . .	204
Trachea and Bronchi . . . . .	204
Relative Areas for Air Conditioning . . . . .	205
Methods of Distributing Heat and Moisture . . . . .	206
Diffusion 206; Convection 207; Radiation 207; Ciliary Action 207.	
Summary . . . . .	207

### XI MEASUREMENTS OF TEMPERATURE AND HUMIDITY . . . . . 208

Temperature in Respiratory Tract . . . . .	208
Measurements of Humidity . . . . .	211
The Derivation of Moisture in the Nose and Respiratory Tract	214
Summary . . . . .	216
Summary of Section III . . . . .	216

## SECTION IV—OTHER FUNCTIONS OF THE NOSE

### XII FUNCTION OF THE NOSE IN PHONATION, ETC. . . . . 217

Phonation . . . . .	217
Resonation . . . . .	217
Articulation . . . . .	217
Prehension . . . . .	217
Elongation of Nose for Seeking Food . . . . .	217
Siphoning Water . . . . .	217

# CONTENTS

CHAPTER

PAGE

## SECTION V—CILIARY ACTION

INTRODUCTION . . . . .	219
XIII EVOLUTION AND MODE OF ACTION . . . . .	220
Functions . . . . .	220
Locomotion 220; Deglutition 221; Respiration 221; Olfaction 222; Cleansing 222; Humidification 224; Vision 224; Hearing 224; Reproduction 224.	
General Distribution in Man . . . . .	224
Minute Structure of Cilia . . . . .	225
Metaplasia of Cilia . . . . .	228
Number of Cilia . . . . .	229
Integration of Action . . . . .	229
Rate of Progress . . . . .	230
Rate of Stroke . . . . .	230
Force Exerted . . . . .	230
Direction of Streams . . . . .	230
Distribution of Cilia in Various Species . . . . .	234
Protozoa 234; Molluscs 234; Fish 234; Amphibians 234; Caudata 234; Reptiles 234; Birds 235; Mammals 235; Man 235; Conclusion 236.	
Powers of Resistance . . . . .	237
Regeneration . . . . .	237
Summary . . . . .	238
XIV CONDITIONS AFFECTING CILIARY ACTION . . . . .	239
Normal Ciliary Action . . . . .	239
Moisture 239; Temperature 240; Sleep 240; Reaction of Medium 240; (a) Secretions 240, (b) Tissue Fluids 242; Osmotic Pressure 243; Effect of Gravity 243.	
Conditions Producing Disordered Action . . . . .	244
Drying 244; Irradiation 244; Swelling of Epithelium 245; Mechanical Obstruction 245; Interruption of Stream 245; Effect of Drugs 245; Changes in Reaction of Medium 247; Changes in Viscosity of the Fluid Blanket 247.	
Relationship between Upper and Lower Air Passages . . . . .	248
Conclusions . . . . .	248
Summary . . . . .	249
Summary of Section V . . . . .	250

## SECTION VI—EXCHANGE OF FLUID IN THE NOSE AND RESPIRATORY TRACT

XV EXCHANGE OF FLUID IN THE NOSE AND RESPIRATORY TRACT . . . . .	251
Introduction . . . . .	251
Hydrostatic Pressure . . . . .	253
Diffusion 253; Cell Membranes 254; Fluid Exchanges in Air Sacs and Alveoli of the Lungs 255.	

## CONTENTS

CHAPTER		PAGE
	<i>XV continued</i>	
	Osmosis . . . . .	256
	Semipermeable Membranes 257; Osmotic Pressure 257; Ionic Composition of Body Fluids 258; Regulation of Osmotic Exchanges 260; Osmotic Pressure in the Nose and Respiratory Tract 261.	
	Application of Hydrostatic and Osmotic Pressures to the Present Enquiry . . . . .	262
	Sympathetic Control . . . . .	266
	The Influence of Changes in Reaction of the Tissue Fluids .	267
	The Role of Calcium . . . . .	267
	Secretory Glands . . . . .	268
	The Role of Mucus . . . . .	270
	Conclusions . . . . .	276
	Abnormal Exchanges of Fluid . . . . .	280
	Summary of Section VI . . . . .	280

## PART II

### SECTION VII—THE COMPARATIVE ANATOMY AND PHYSIOLOGY OF THE PARANASAL SINUSES

	INTRODUCTION . . . . .	285
XVI	THE UPPER JAW . . . . .	286
	Maxillo-turbinal Bodies . . . . .	289
	Unwanted Air Spaces . . . . .	290
	Maxillary Recesses and Sinuses 290; Maxillary Ostium 296; Functions of Maxillary Sinuses 296.	
	Summary . . . . .	297
XVII	EFFECTS OF CHANGES IN OLFACTORY AREA: HISTOLOGY . . . . .	298
	Increase of Olfactory Area . . . . .	298
	Sinuses of Positive Function 298; Distribution of Frontal and Sphenoidal Sinuses 301.	
	Decrease of Olfactory Area . . . . .	307
	Empty Sinuses in Primates 307; Formation of Ethmoidal Air Cells 307.	
	Conclusion . . . . .	310
	Other Air Spaces in the Nose . . . . .	310
	Supra-Cranial Cavities 314.	
	Relation of Turbinal Systems to the Orbit . . . . .	315
	Histology of Mucosa . . . . .	318
	Summary . . . . .	318

## CONTENTS

CHAPTER		PAGE
XVIII	OTHER FUNCTIONS ASCRIBED TO PARANASAL SINUSES . . . . .	320
	Humidification . . . . .	320
	Phonation . . . . .	320
	Conservation of Heat . . . . .	321
	Respiratory Exchange of Air . . . . .	322
	Lightening the Skull . . . . .	322
	Growth of the Face . . . . .	325
	Insulation of the Base of the Brain . . . . .	326
	Summary . . . . .	327
	Summary of Section VII . . . . .	327

## PART III

### SECTION VIII—THE ANATOMY OF THE HUMAN NOSE AND ACCESSORY SINUSES

XIX	THE NOSE AND NASAL FOSSAE . . . . .	331
	The External Nose . . . . .	331
	The Cartilages 331.	
	The Nasal Fossae . . . . .	331
	Anterior Nares 331; Nasal Septum 331; The Lateral Nasal Wall 334.	
	Summary . . . . .	338
XX	THE ACCESSORY SINUSES . . . . .	339
	General Arrangement . . . . .	339
	Position of Ostia . . . . .	339
	Relationship of the Sinuses to Other Systems . . . . .	339
	Cranial Fossae 339; Orbit 340; Nasal Fossae 340; Lacrimal Apparatus 341.	
	Individual Sinuses . . . . .	341
	Maxillary Sinus 341; Ethmoidal Sinuses 343; Sphenoidal Sinus 345; Frontal Sinus 347.	
	Function of Paranasal Sinuses . . . . .	348
	Summary . . . . .	348
	Summary of Section VIII . . . . .	348

## APPENDIX

THE EVOLUTIONARY HISTORY OF MAN FROM THE EVIDENCE OF THE NOSE AND LARYNX . . . . .		351
	Introduction . . . . .	351
	Anatomical Basis of this Enquiry . . . . .	351
	Man's Affinities . . . . .	351



# CONTENTS

	PAGE
Appendix <i>continued</i>	
Origin of Primates . . . . .	352
Adaptation for a Herbivorous Diet . . . . .	353
Modifications for Grasping and Climbing . . . . .	356
Effects of Arboreal Life on Olfaction . . . . .	358
Changes in Respiration . . . . .	362
Evolution of Speech . . . . .	363
Later Modifications for Terrestrial Life . . . . .	364
Conclusion . . . . .	364
GLOSSARY . . . . .	367
REFERENCES . . . . .	375
INDEX . . . . .	381