



# GENERAL PATHOLOGY

based on Lectures delivered at the  
Sir William Dunn School of Pathology  
University of Oxford

EDITED BY  
SIR HOWARD FLOREY  
Professor of Pathology

*Second Edition*



LLOYD-LUKE (MEDICAL BOOKS) LTD

49 NEWMAN STREET

LONDON

1958

© LLOYD-LUKE (MEDICAL BOOKS) LTD., 1958

*This book is protected under the Berne Convention and may not be reproduced by any means in whole or in part. Application with regard to reproduction should be addressed to the Publisher.*

FIRST EDITION    ·    ·    ·    ·    1954  
SECOND EDITION    ·    ·    ·    ·    1958

PRINTED IN ENGLAND BY  
HAZELL WATSON AND VINEY LTD  
AYLESBURY AND LONDON

# GENERAL PATHOLOGY

## AUTHORS

- E. P. ABRAHAM, M.A., D.Phil.  
Fellow of Lincoln College, Oxford, and Senior Research Officer, Sir William Dunn School of Pathology, University of Oxford
- I. BERENBLUM, M.D., M.Sc.  
Head of the Department of Experimental Biology, The Weizmann Institute of Science, Rehovoth, Israel
- G. V. R. BORN, M.A., D.Phil., M.B.  
Graduate Assistant, The Nuffield Institute for Medical Research. Departmental Demonstrator in Pharmacology, University of Oxford
- G. R. CAMERON, D.Sc., M.B., B.S., F.R.C.P., F.R.S.  
Director of the Graham Laboratories and Professor of Morbid Anatomy, University College Hospital Medical School, London
- H. W. FLOREY, M.D., F.R.C.P., F.R.S.  
Professor of Pathology, Sir William Dunn School of Pathology, University of Oxford
- J. E. FRENCH, D.M., D.Phil.  
University Demonstrator in Pathology, Sir William Dunn School of Pathology, University of Oxford
- G. P. GLADSTONE, M.A., M.B., B.S.  
Reader in Bacteriology, Sir William Dunn School of Pathology, University of Oxford
- J. L. GOWANS, M.A., D.Phil., M.B., B.S.  
Staines Medical Research Fellow, Exeter College, and Departmental Demonstrator in Pathology, Sir William Dunn School of Pathology, University of Oxford
- H. HARRIS, B.A., D.Phil., M.B., B.S.  
Member of Staff of the British Empire Cancer Campaign, Sir William Dunn School of Pathology, University of Oxford
- R. G. MACFARLANE, M.A., M.D., F.R.S.  
Reader in Hæmatology and Clinical Pathologist, Radcliffe Infirmary, Oxford
- G. W. PICKERING, M.D., F.R.C.P.  
Regius Professor of Medicine, University of Oxford
- A. H. T. ROBB-SMITH, M.A., M.D., F.R.C.P.  
Director of Pathology, Radcliffe Infirmary, and Nuffield Reader in Pathology, University of Oxford

K. B. ROBERTS, B.A., D.Phil., M.B., B.S.

Lecturer in Physiology, University of Edinburgh

F. K. SANDERS, M.A., D.Phil.

Member of Medical Research Council External Staff, Department of Bacteriology, London School of Hygiene and Tropical Medicine

W. E. VAN HEYNINGEN, M.A., Sc.D.

Senior Research Officer, Sir William Dunn School of Pathology, University of Oxford

## PREFACE TO THE SECOND EDITION

THE call for a second edition of this book, which appeared first under the title "Lectures on General Pathology", has enabled us to revise its contents and to meet some of the helpful criticisms that were made.

The sequence of the original chapters has been altered and chapters on thrombosis, metabolic changes following injury, atherosclerosis, and tumours have been added. It is felt that the addition of these chapters makes the book more complete, though, for the most part, it still reflects the particular interests of the authors. The present, like the former, edition is intended for the better student who has had a good grounding in physiology and biochemistry. It is hoped to arouse his interest in the functional as well as the morphological aspects of pathology at an early stage of his career.

H. W. FLOREY

*July, 1957*

## PREFACE TO THE FIRST EDITION

PROGRESS in the medical sciences is now so rapid that even those who confine themselves to relatively narrow specialities find it increasingly difficult to master, or indeed to read, the great volume of literature that appears. Nevertheless, the student must try to grasp what is known of the general principles underlying the pathological changes that he will be called upon to diagnose and treat.

For many years it has been the custom at Oxford for every medical student to spend one year studying for an Honour School; in practice this is usually the Honour School of Physiology, which includes a good deal of biochemistry. The aim in the Honour School is not merely to teach facts, but to encourage students, both in the laboratory and by individual tuition, to think about the principles and problems of physiology and biochemistry, an appreciation of which is unquestionably required for the sound building of future clinical knowledge. Thus, it is hoped to give students early in their medical work some training in the deductive and inductive reasoning associated with experimental methods.

It is primarily for those who have read the Honour School of Physiology that a course in General Pathology and Bacteriology is given in Oxford. At present the course lasts for two terms of eight weeks each, and caters particularly for the better student. It is taken at the same time as the study of pharmacology, and immediately before clinical work begins. The lectures in this book are drawn from this course, but they may be of value to those more advanced in their medical work than the students for whom they were prepared; with increasing specialisation the more general aspects of pathology tend to become lost in the details of the subject.

It is to be emphasised that the lectures do not form a complete survey of General Pathology. For the most part they deal with subjects in which one or other of the authors has had a special interest. In particular they attempt to treat of some of the fundamental changes that take place in the body in response to injury, using this word in a broad sense, and to discuss some present-day views about the nature and causes of such changes.

It is hoped that some students will find sufficient stimulus from the lectures to carry an experimental outlook into clinical medicine and surgery, for these subjects have suffered, and continue to suffer in this country, from an approach that pays too little attention to experimental science. At the present day nearly all significant advances in the diagnosis, treatment and prevention of disease depend on the application of experimental methods.

H. W. FLOREY

*December, 1953*



## ACKNOWLEDGEMENTS

IN the preparation of the first edition of this book, from which much material is retained, we received valuable assistance from a number of people. In particular we were indebted to Dr. M. A. Jennings, Dr. Ruth Jordan (Mrs. Klemperer), Dr. G. B. Mackaness, Dr. H. A. Sissons, Dr. J. A. H. Wylie, Dr. R. H. Mole, Dr. R. E. O. Williams, Dr. A. F. B. Standfast, Dr. G. M. Watson, Dr. Peter Harris and the late Dr. A. Felix.

In the preparation of the present edition we are again indebted to Dr. M. A. Jennings for assistance in the preparation of a number of chapters, to Dr. G. S. Dawes and Dr. R. B. Fisher for advice on the subject-matter of Chapter 11, to Dr. William B. Ober, of the U.S.A., for assistance in the preparation of Chapter 22, to Dr. A. F. B. Standfast for help with Chapter 37, to Dr. D. W. Weiss for help with Chapters 40 and 41, and to Dr. G. B. Mackaness for recasting the views expressed on intracellular tubercle bacilli in Chapter 42. Our thanks are also due to Mr. H. H. Johnston and Dr. E. J. G. Glencross for criticism and assistance in reading the proofs.

We have to thank many friends and collaborators for providing illustrations: individual authors can be identified by the reference numbers given at the foot of the illustrations and tables. In particular we are indebted to Dr. Ashworth Underwood, Director of the Wellcome Historical Medical Museum, for furnishing us with a number of portraits and pictures of historical interest, to Lady Coghill for the drawing of Pasteur by Dr. E. Æ. Somerville, and to Dr. William B. Ober for many of the photomicrographs illustrating Chapters 21 and 22. Nearly all the photographs of living preparations from chambers in the rabbit's ear were made by Dr. A. G. Sanders.

The half-tone and line drawings and copies of many of the graphs in Chapters 2, 3, 9, 10, 14, 15, 16, 25, 26, 32, 33, 34, 36, 37 and 39 were produced by Miss Christine Court. Mr. B. H. Glass and Mr. F. Bradley, photographers at the Sir William Dunn School of Pathology, have made most of the original photomicrographs and copied many pictures from journals.

We are greatly indebted to Miss W. M. Poynton for preparing some of the chapters for press, and for attending to the many exacting tasks associated with proof reading. Miss B. Bennett, Miss K. Image, Mrs. Prior and Mrs. J. Coyle assisted with the typing.

The index has been prepared by Dr. H. Harris.

Our publisher, Mr. Luke, has, as for the first edition, given us every help in the production of the book.

The following acknowledgements are made in detail for each chapter.

*Chapter 1.*—FIGURES 1-4 by permission of the Bodleian Library; FIG. 5 from the original in the Hunterian Library in the University of Glasgow, with permission from the University Court; FIGS. 6, 7, 10-13, 15, by courtesy of the Wellcome Historical Medical Museum; FIG. 8 from a print, supplied by the Ashmolean Museum, of an engraving in their possession; FIG. 9 from Holländer's *Die Medizin in der klassischen Malerei*, by courtesy of Ferdinand Enke. We are indebted to Mr. McKenna, the University Librarian and Keeper of the Hunterian Books and MSS, and to Mr. Robert Cowper, one of the Glasgow University photographers, for their assistance in connection with FIG. 5.

*Chapter 2.*—FIGURES 1–3, 9 from Lewis' *The Blood Vessels of the Human Skin*, by courtesy of Shaw & Sons, Ltd.; FIG. 5 by courtesy of the Editor *Experientia*; FIGS. 10, 15, 16, 18 by courtesy of the Editor *Brit. J. exp. Path.*; FIGS. 12, 19 by courtesy of the Editor *J. exp. Med.*; FIG. 13 by courtesy of the Editor *Anat. Rec.*

*Chapter 3.*—FIGURE 10 from MacCallum's *A Textbook of Pathology* 6th edit. by courtesy of W. B. Saunders Co.; FIG. 11 redrawn from Adami's *Inflammation*, originally after Ribbert, by courtesy of Macmillan & Co.; FIGS. 14, 16 by courtesy of the Editor *Amer. J. Anat.*; FIG. 15 from *Pathologische Anatomie*, ed. by L. Aschoff, 8th edit. vol. I, after an illustration of Thoma, by courtesy of Gustav Fischer; FIGS. 17, 18 by courtesy of the Editor *Proc. roy. Soc. B.*; FIG. 19 by courtesy of the Editor *Amer. J. Physiol.*

*Chapter 4.*—FIGURES 1, 2, 18 from Adami's *Inflammation*, by courtesy of Macmillan & Co.; FIGS. 3, 4, 5 by courtesy of the Editor *J. Path. Bact.*; FIGS. 6–14 by courtesy of the Editor *Brit. J. exp. Path.*; FIGS. 15–17, 19 by courtesy of the Editor *J. exp. Med.*

Original prints were kindly lent by Dr. W. Barry Wood (FIGS. 15–17) and Dr. Ralph Tompsett (FIG. 19).

*Chapter 5.*—FIGURE 3 and Table III by courtesy of the Editor *Brit. J. exp. Path.*; FIG. 4 by courtesy of the Editor *J. Path. Bact.*; FIGS. 8–10 by courtesy of the Editor *J. exp. Med.* Table II from Topley and Wilson's *Principles of Bacteriology and Immunity*, by courtesy of Edward Arnold & Co.

*Chapter 6.*—FIGURES 3, 5 by courtesy of the Editor *Quart. J. exp. Physiol.*; FIG. 4 by courtesy of the Editor *Anat. Rec.*; FIG. 9 by courtesy of the Editor *Brit. J. exp. Path.*; FIG. 10 by courtesy of the Editor *J. Path. Bact.*

Original prints kindly lent by Dr. Rhoda Grant (FIG. 4).

*Chapter 7.*—FIGURE 4 by courtesy of the Editor *Quart. J. Med.*; FIG. 5 by courtesy of the Editor *Proc. roy. Soc. Med.*

*Chapter 8.*—FIGURE 2 from a photograph by Dr. A. G. Sanders; Table I from Wintrobe's *Clinical Hematology*, by courtesy of Henry Kimpton.

*Chapter 9.*—FIGURE 1 drawn by Miss Christine Court from a specimen in the museum of the Royal College of Surgeons by permission of the Curator; FIG. 8 by courtesy of the Editor *J. Path. Bact.*; FIG. 10 by courtesy of the Editor *Brit. J. Hematol.*

*Chapter 10.*—FIGURE 1 by courtesy of the Editor *Lancet*; FIGS. 2, 6 by courtesy of the Editor *Ann. N.Y. Acad. Sci.*; FIG. 3 by courtesy of the Editor *J. Physiol.*; FIGS. 4, 5 by courtesy of the Editor *Quart. J. exp. Physiol.*; Table II by courtesy of the Editor *Bull. Johns Hopk. Hosp.*; Table III by courtesy of the Editor *Arch. Surg.*

*Chapter 11.*—FIGURES 1, 2 by courtesy of the Editor *Amer. J. Physiol.*; FIG. 3 by courtesy of the Editor *J. exp. Med.*; FIG. 4 by courtesy of the Editor *Quart. J. Med.*; FIG. 5 by courtesy of the Editor *J. biol. Chem.*; FIG. 6 by courtesy of the Academic Press Inc.; FIG. 7 by courtesy of the Editor *Lancet*.

*Chapter 12.*—FIGURE 1 from Ham's *Histology*, by courtesy of J. B. Lippincott Company; FIG. 9 from Hueck's *Morphologische Pathologie*, by courtesy of Georg Thieme; FIGS. 12, 13 by courtesy of the Editor *Anat. Rec.*; FIG. 14 by courtesy of the Josiah Macy, Jr. Foundation; FIG. 15 by courtesy of the Editor *Proc. Nat. Acad. Sci.*; FIG. 16 by courtesy of the Editor *Ann. N.Y. Acad. Sci.*; FIG. 18 from Eppinger's *Die Permeabilitätspathologie*, by courtesy of Springer-Verlag.

*Chapter 13.*—FIGURES 1, 2, 3, 4 by courtesy of the Editor *Clin. Sci.*; FIG. 5 by courtesy of the Editor *Arch. intern. Med.*

*Chapter 14.*—FIGURES 1, 5 by courtesy of Dr. Samuel Oram; FIG. 2 from a photograph kindly lent by Sir Charles Lovatt Evans; FIGS. 3, 11 and Table 2 by courtesy of the Editor *Amer. J. Physiol.*; FIGS. 6, 8 by courtesy of Dr. Terence East; FIG. 7 by courtesy of Dr. H. M. Sinclair; FIG. 10 by courtesy of Sir Cecil P. G. Wakeley; FIG. 12 by courtesy of the Editor, *J. Amer. med. Ass.*; Table I from Davson's *Textbook of General Physiology*, after Landis (1936), Drinker and Yoffey (1941), by courtesy of J. and A. Churchill Ltd.

FIGURES 1, 5, 6, 8 and 10 are from the King's College Hospital Photographic Records.

*Chapter 16.*—FIGURE 1 from Fulton's *Textbook of Physiology*, by courtesy of W. B. Saunders Co.; FIG. 2 by courtesy of Dr. A. D. Morgan and Professor N. F. MacLagan; FIG. 3 by courtesy of the Institute of Orthopaedics; FIG. 4 by courtesy of the Editor *Physiol. Rev.*

The patient in FIG. 3 was under the care of the late Mr. V. H. Ellis at the Royal National Orthopaedic Hospital.

*Chapter 17.*—FIGURES 4, 5, 9 by courtesy of the Editor *J. Path. Bact.*; FIG. 6 by permission of the Bodleian Library; FIG. 13 by permission of the Editor *Circulation (N.Y.)*.

Chapter 18.—FIGURES 1–3 by courtesy of the Editor *Brit. J. exp. Path.*; FIGS. 4, 7, 9, 10, 13–15 by courtesy of the Editor *Amer. J. Anat.*; FIG. 8 by courtesy of the Editor *Anat. Rec.*; FIGS. 11, 12, 20, 21 by courtesy of the Editor *J. Path. Bact.*; FIG. 19 by courtesy of the Editor *Ann. Surg.*

Prints for FIGS. 4, 7, 13, 14 were supplied by the Photographic Department of the Royal Society of Medicine.

Chapter 19.—FIGURE 2 by courtesy of the Editor *Arch. Path.*; FIGS. 5–11 by courtesy of Dr. A. H. T. Robb-Smith and Dr. William Holmes.

Chapter 20.—FIGURE 1 by courtesy of the Editor *Experimental Cell Research*; FIGS. 2, 3 by courtesy of the Editor *Brit. J. exp. Path.*

Chapter 21.—The photomicrographs for FIGS. 2–6 were supplied by Dr. William B. Ober.

Chapter 22.—The photomicrographs for FIGS. 2–12 were supplied by Dr. William B. Ober.

Chapter 25.—FIGURE 1 by courtesy of the Editor *Brit. med. Bull.*; FIGS. 2–4 by courtesy of the Editor *Parasitology*; FIGS. 5–7 and Table I from Lea's *Actions of Radiations on Living Cells*, by courtesy of the Cambridge University Press; FIG. 8 by courtesy of the Editor *J. Genetics*; FIG. 9 by courtesy of Dr. P. C. Koller.

Chapter 26.—FIGURES 1, 2 by courtesy of the U.S. Armed Forces Institute of Pathology, Washington, D.C., from negatives Nos. HP 111A and HP 144; FIGS. 3, 4, 7 by courtesy of the Editor *J. Chimie Physique*; FIG. 5 by courtesy of the Editor *Medicine*; FIG. 6 from *Symposium on Radiobiology*, ed. J. J. Nickson, reprinted with permission from John Wiley & Sons, Inc., and by courtesy of Drs. A. Lacassagne and R. Latarjet.

Chapter 27.—FIGURE 1 by permission of the Bodleian Library; FIG. 2 by courtesy of the Editor *Bull. Hist. Med.*

Chapter 28.—FIGURES 1, 2 from Jennison's "Atomizing of Mouth and Nose Secretions into the Air as revealed by Highspeed Photography", by courtesy of the Editor *Aerobiology*, A.A.A.S. Publ. No. 17; Table I by courtesy of Dr. D. W. Henderson.

Chapter 31.—FIGURE 2 by courtesy of the Editor *Bull. Johns Hopk. Hosp.*; FIG. 3 by courtesy of the Editor *Lancet*.

The electron micrographs were supplied by Dr. William H. Gaylord (FIG. 1), and the photomicrographs by Dr. D. Bodian (FIG. 2).

Chapter 32.—FIGURE 1 from *The Nobel Prize Winners* by courtesy of the Central European Times Publishing Co. and the Wellcome Historical Medical Museum; FIG. 2 from Boyd's *Fundamentals of Immunology*, 2nd ed. by courtesy of Interscience Publishers; FIG. 3 by courtesy of the Editor *J. Immunol.*

Chapter 33.—FIGURE 1 from *The Enzymes*, by courtesy of the Editor, Dr. James B. Sumner, and the Academic Press, Inc.; FIGS. 2–6 by courtesy of the Editor *Endeavour*; FIGS. 7–12 and Table I by courtesy of the Editor *J. Amer. chem. Soc.*

Prints for FIGS. 7–12 were supplied by the Photographic Department of the Royal Society of Medicine.

Chapter 34.—FIGURE 1 by courtesy of the Editor *J. Hyg. (Lond.)*; FIGS. 2, 3 by courtesy of the Editor *Fed. Proc.*; FIG. 4 by courtesy of the Editor *J. Amer. chem. Soc.*

Chapter 35.—FIGURES 1–6 by courtesy of the Editor *J. exp. Med.*; FIG. 7 by courtesy of the Editor *Acta med. scand.*

Original prints were lent by Dr. P. D. McMaster (FIGS. 1–2), Dr. A. G. S. Hill (FIG. 3) and Dr. A. H. Coons (FIGS. 4, 5).

Chapter 36.—FIGURES 1, 3 by courtesy of the Wellcome Historical Medical Museum; FIG. 2 by kind permission of Lady Coghill.

Chapter 37.—FIGURE 1 by courtesy of the British Postgraduate Medical Federation, University of London, and the Athlone Press.

Chapter 38.—FIGURE 1 by courtesy of the Wellcome Historical Medical Museum; FIG. 3 by courtesy of the Editor *Amer. J. med. Sci.*; FIG. 5 from Pasteur Vallery-Radot's *Précis des Maladies allergiques*, by courtesy of Les Editions Flammarion; FIG. 6 by courtesy of the Editor *J. Pharmacol.*

Chapter 39. FIGURE 1 by courtesy of the Editor *J. exp. Med.*

Chapter 40.—FIGURES 1, 2 by courtesy of the Wellcome Historical Medical Museum; FIG. 4 by courtesy of the Editor *J. Hyg. (Lond.)*; FIGS. 5, 6 by courtesy of the Editor *Amer. Rev. Tuberc.*; FIG. 12 by courtesy of the Editor *Brit. J. exp. Path.*

Chapter 41.—FIGURES 3–6 by courtesy of the Editor *Brit. J. exp. Path.*; FIGS. 12, 13 by courtesy of the Editor *Amer. Rev. Tuberc.*

Original prints were kindly supplied by Dr. Max B. Lurie (FIGS. 12 and 13).

*Chapter 42.*—FIGURE 1 by courtesy of the Editor *J. infect. Dis.*; FIG. 3 by courtesy of the Editor *Endeavour*; FIG. 5 by courtesy of the Editor *Brit. J. exp. Path.*; FIG. 6 by courtesy of the Editor *J. Path. Bact.*

We are indebted to the Research Defence Society for permission to quote from the Twenty-first Stephen Paget Memorial Lecture, and to the Editor of the *Sunday Times* for permission to quote from articles which appeared in that newspaper in December 1952.

*Chapter 43.*—FIGURE 2 by courtesy of the Editor *Nature*; FIG. 3 by courtesy of the Editor *Lancet*; FIG. 4 by courtesy of the Wellcome Historical Medical Museum; FIG. 5 by courtesy of the Editor *J. gen. Microbiol.*; FIGS. 7, 8 by courtesy of the Editor *Tubercle*; FIG. 9 by courtesy of the Editor *Endeavour*.

# CONTENTS

	PAGE
LIST OF AUTHORS	v
PREFACE	vii
ACKNOWLEDGEMENTS	ix
1 THE HISTORY AND SCOPE OF PATHOLOGY	1
H. W. Florey	
2 INFLAMMATION	21
H. W. Florey	
3 INFLAMMATION, MICROSCOPICAL OBSERVATIONS	47
H. W. Florey	
4 CHEMOTAXIS, PHAGOCYTOSIS AND THE FORMATION OF ABSCESSSES	67
H. W. Florey	
5 THE RETICULO-ENDOTHELIAL SYSTEM. THE OMENTUM. LYMPHATIC DRAINAGE. THE LYMPHOCYTE	98
H. W. Florey and J. L. Gowans	
6 THE SECRETION OF MUCUS AND INFLAMMATION OF MUCOUS MEMBRANES	120
H. W. Florey	
7 THE REACTIONS OF THE BLOOD TO INJURY: BLOOD COAGULATION AND HÆMOSTASIS	143
R. G. Macfarlane	
8 THE REACTIONS OF THE BLOOD TO INJURY: CHANGES IN THE BLOOD CELLS, AND THE ACTIVATION OF FIBRINOLYSIS	162
R. G. Macfarlane	
9 THROMBOSIS	180
J. E. French	
10 HÆMORRHAGE AND SHOCK	206
G. R. Cameron	
11 SOME EFFECTS OF INJURY ON METABOLISM	227
G. V. R. Born	
12 THE FUNCTIONAL SIGNIFICANCE OF CONNECTIVE TISSUE	255
A. H. T. Robb-Smith	
13 FEVER	276
G. W. Pickering	
14 ŒDEMA	293
K. B. Roberts	

	PAGE
15 DEGENERATIVE CHANGES AND SOME OF THEIR CONSEQUENCES G. R. Cameron and E. P. Abraham	318
16 NECROSIS, CALCIFICATION AND AUTOLYSIS E. P. Abraham	333
17 ATHEROSCLEROSIS J. E. French	351
18 HEALING H. W. FLOREY	378
19 HEALING IN ORGANS G. R. Cameron	410
20 CELL GROWTH AND MULTIPLICATION H. Harris	428
21 THE NATURE OF TUMOUR GROWTH I. Berenblum	442
22 THE CLASSIFICATION AND MORPHOLOGY OF TUMOURS I. Berenblum	464
23 THE EPIDEMIOLOGY OF CANCER I. Berenblum	489
24 THE STUDY OF TUMOURS IN ANIMALS I. Berenblum	513
25 SOME BIOLOGICAL EFFECTS OF RADIANT ENERGY E. P. Abraham	550
26 SOME EFFECTS OF RADIATION ON THE HIGHER ANIMALS E. P. Abraham	568
27 PATHOGENICITY AND VIRULENCE OF MICRO-ORGANISMS I. THE GERM THEORY OF DISEASE G. P. Gladstone	582
28 PATHOGENICITY AND VIRULENCE OF MICRO-ORGANISMS II. COMMUNICABILITY G. P. Gladstone	592
29 PATHOGENICITY AND VIRULENCE OF MICRO-ORGANISMS III. INVASIVENESS G. P. Gladstone and W. E. van Heyningen	612
30 PATHOGENICITY AND VIRULENCE OF MICRO-ORGANISMS IV. PATHOGENIC ACTION W. E. van Heyningen	629
31 CELLULAR AND TISSUE REACTIONS TO VIRUSES F. K. Sanders	645
32 THE NATURE OF ANTIGENS AND ANTIBODIES E. P. Abraham	660

33	THE ANTIGEN-ANTIBODY REACTION E. P. Abraham	682
34	BIOLOGICAL FACTORS IN THE PRODUCTION OF ANTIBODIES G. P. Gladstone and E. P. Abraham	697
35	THE LOCALISATION OF ANTIGENS AND THE SITES OF ANTIBODY FORMATION K. B. Roberts and J. L. GOWANS	719
36	ACQUIRED IMMUNITY: THE SEROLOGICAL REACTIONS OF BACTERIA G. P. Gladstone and E. P. Abraham	738
37	ACQUIRED IMMUNITY: SOME EXAMPLES ILLUSTRATING THE FACTORS INVOLVED IN PROTECTION G. P. Gladstone	757
38	ANAPHYLAXIS G. P. Gladstone	778
39	SPECIFIC HYPERSENSITIVITY IN MAN G. P. Gladstone	805
40	CHRONIC INFLAMMATION AND TUBERCULOSIS H. W. Florey	829
41	TUBERCULOSIS ( <i>continued</i> ) H. W. Florey	850
42	THE INFLUENCE OF DRUGS ON INFLAMMATORY PROCESSES H. W. Florey	871
43	THE MODE OF ACTION OF ANTIBACTERIAL SUBSTANCES <i>IN VITRO</i> E. P. Abraham	896
	INDEX	919

## Chapter 1

# THE HISTORY AND SCOPE OF PATHOLOGY

By H. W. FLOREY

TO-DAY we are perhaps more conscious than ever before of our debt to our predecessors, and not only to those of the immediate past but to those also of relatively remote times. The study of medical history is both interesting in itself, and may help to modify the view sometimes expressed that medical students and doctors are lacking in culture of any sort. Moreover some historical perspective is often advantageous when one is considering the multitude of advances that are now taking place in the theory and practice of medicine. I do not therefore consider it a waste of time to bring before you what seem to me to be some of the more important events in the development of pathology. Krumbhaar<sup>1</sup> when writing on the history of pathology remarked that "when we consider one of the broader definitions of Pathology—such as 'The study of the causes of and the effects (both structural and functional) produced by disease', we at once realise that a consideration of its history might properly be almost co-terminous with that of medicine."

### Early Studies

The study of disease has no doubt been going on since the time that mankind emerged as a thinking animal, for many of its manifestations are easily seen and felt. There is evidence from mummies, bones, carvings and paintings of antiquity that pathological lesions similar to those of to-day existed, and certain ancient literary fragments contain recognisable descriptions of disease.<sup>2</sup> An Egyptian papyrus of about 2160 to 1788 B.C. notes diseases of women and cattle, and the Edwin Smith papyrus of 1600 B.C. describes fractures, dislocations, infections of wounds, tumours and a number of other conditions. The Ebers papyrus of about 1550 B.C. mentions "coryza, dysentery, mastoiditis, diseases of bones and joints, tumours, cysts, parasitic diseases, abscess, many diseases of the eye, gastro-intestinal tract and female genitalia". It is perhaps surprising that the Egyptians did not construct a firm foundation of anatomical knowledge, for their practice of embalming might be thought to have given them great opportunities for observation of the viscera. The internal organs were, however, apparently removed through small incisions and the Egyptians did not, in fact, contribute anything substantial to the knowledge of human anatomy. There are many references to disease in other ancient writings, for instance those of the Jews, the Assyrians, the Indians and the Chinese.

Though some cultures had well-developed pathological theories which to a certain extent controlled ancient medical practice, it was the Greeks who most profoundly influenced Western medicine. They invaded Greece and Asia Minor from the north, conquering the preceding Minoan civilisation, and not only came into contact with the medicine of their conquered subjects, but in



Asia Minor were influenced by doctrines coming from Mesopotamia and from Egypt. The nimble-witted Greeks absorbed other people's ideas and, as in all they did, added greatly to them by accurate observation and by a new philosophical outlook. They recorded the appearances of many disease conditions that can be recognised by careful clinical examination and such descriptions are still valid, but their studies of pathology were severely handicapped since, except for a short period in Alexandria, they made no systematic examinations of the body after death. The Alexandrian writings have apparently all been lost. With the lack of background founded on post-mortem observation there flourished physiological and pathological theories that had little foundation in ascertained fact. These theories, which may have originated with the Hindus before 2000 B.C., dominated physiological and pathological thought in Europe until the re-awakening of inquiry during the Renaissance began to make its effects felt in the fifteenth and sixteenth centuries.

The Greek views on pathology, based on "humours", to which "spirits" and other elaborations were later added, cannot detain us now, but as they dominated medical thought and paralysed rational progress in western medicine for at least 1500 years, they can rightly be deemed of great importance, perhaps historically the most important pathological theories yet propounded. Greek medicine came down to mediæval times partly through the works of the non-medical patrician Roman, Cornelius Celsus (about 30 B.C. to A.D. 38), who collated much of the knowledge of the time. But it was a Greek, Galen (A.D. 130–200) from Pergamum in Asia Minor, who, besides making many original observations, some of an experimental nature, put the pathological doctrines of the time into a form that was treated as authoritative until well after the Renaissance. It was not until the sixteenth century that a serious breach was made in the teachings of Galen, which had been erected into a dogma which no one challenged by further observation.

The ancient humoral theories still persist in some of the words that we commonly use, indeed much of medical terminology is of Greek origin. The humour, or fluid, that predominated was thought to govern, amongst other things, a man's temperament. Thus one was *sanguine* (from predominance of blood which was hot), another *phlegmatic* (phlegm was thought to be a product of the brain), another *jaundiced* (yellow bile from the liver) and a fourth *melancholic* (black bile from the spleen). Certain expressions such as "to vent one's spleen" come from the same era.

Though the theories that underlay the use of these words have gone, certain aspects of Greek medical thought survive to this day. In particular the oath of dedication that was taken by the followers of Hippocrates set a high standard of moral behaviour for the medical man towards his patients and their relatives. The fact that all medical practitioners to-day are expected, in addition to having professional skill, to adhere to a code of ethics in their practice is a continuance of the ideal that was first clearly formulated by Hippocrates. Though some of the original Hippocratic oath to which Greek medical men subscribed seems outmoded to-day, medical schools given to symbolic rites still use it, and at the present time an attempt is being made to formulate an "international oath" for medical practitioners that would bear a close resemblance to the oath of the Greeks.