

# Essentials of Pathophysiology

Concepts and Applications for Health Care Professionals

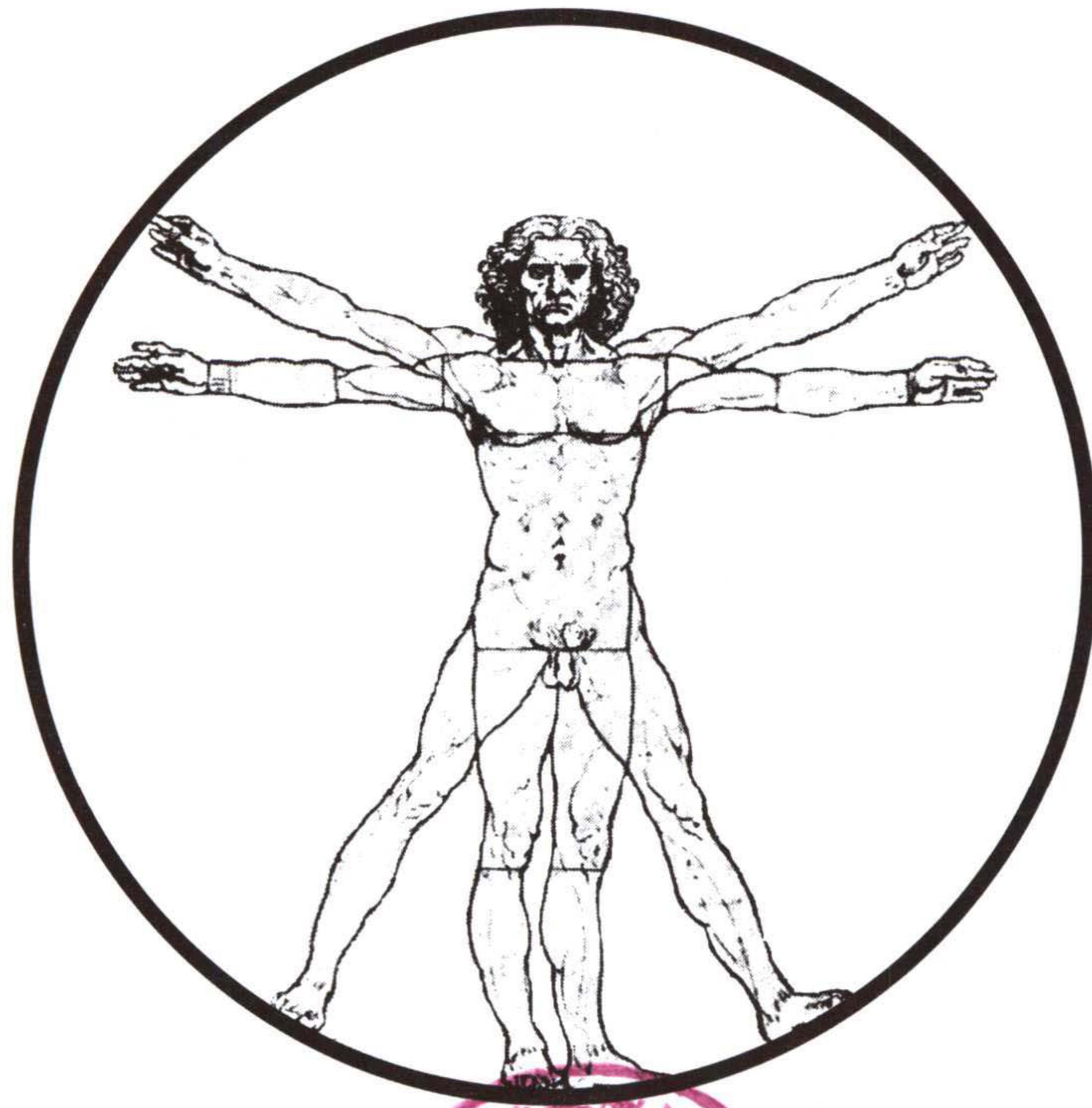


**Nowak • Handford**



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Concepts and Applications for Health Care Professionals



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*To my parents, my wife Maryanna, and my  
children Allison, Christopher, and Andrea. If not  
for you, for whom?*

*T.J.N.*

*To my family and friends.*

*A.G.H.*

# Preface

This text provides an introduction to the essential concepts of pathophysiology for those in training as allied health care professionals. These are the nonphysicians who provide the basis for diagnosis, therapy, and care in various health care settings. The text's writing grew out of the difficulty we encountered in seeking a pathophysiology text that could meet our students' needs without overwhelming them with irrelevant or distracting detail. A further problem was that texts of the appropriate level often included too many specifics of clinical practice. These too often interfere with the students' view of the foundation concepts.

In answer to these difficulties, we have produced a focused treatment of the essential concepts of pathophysiology at a level appropriate to most students' needs. It also avoids undue emphasis on the clinical specifics of any one specialty, presenting the fundamental "whys" and de-emphasizing the clinical "how to's." The result is a text that provides a better fit with today's crowded curricula. We have simplified the content without diluting it.

Recognizing the substantial variations in level among the various health care training programs, we have sought to provide sufficient information to minimize any deficiencies.

On the other hand, some of the material may be seen as a bit too deep on first exposure; it is included because it may well prove useful at some later point in the curriculum or after entry to practice. We hope that the text will retain a place in the graduate's professional reference library.

This text stands alone as an instructional resource, but we have sought to extend its effectiveness by integrating its traditional typeset components with contemporary laserdisc technology. This aim is achieved by the placement of barcodes on the printed page. The barcodes are keyed to a laserdisc collection of thousands of pathology images contained on the laserdisc entitled *A Slice of Life*. For those with access to a laserdisc player, monitor, and barcode reader in a library, learning center, or classroom, a given conceptual point made on the printed page can be instantly reinforced by a relevant full-color image. This approach allows visual learning support that text production costs make prohibitive. The result is a powerfully integrated learning system that sustains student interest, enhances motivation, and provides additional scope for the creative instructor's classroom and laboratory activities.

# Acknowledgements

The names on the title page of this book do not accurately reflect the many who have played a direct or indirect part in bringing this project to completion. We are pleased to acknowledge the contributions of the following.

The Department of Pathology in the University of British Columbia's Faculty of Medicine, and in particular, Dr. W. Chase for access to the specimens in the Boyd Museum and the preparation of many of the photographs which augment the text.

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Our medical consultants, Dr. Geraldine Whitelegg and Dr. Paul Zulver, whose patience and guidance were invaluable assets in focusing our efforts.

Our families, who accepted, with good grace, the necessity of too frequently having to take second place to "The Book."

We are also indebted to the manuscript reviewers whose knowledge and objective appraisal kept us to the straight and narrow:

## Reviewers

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T.J.N.  
A.G.H.

# Notes to the Reader

To promote a clear understanding of the essentials of pathophysiology, the information in this text is presented in a logical progression of conceptual development. A core of foundation material is treated in the introduction and first six chapters, which constitute part I. Part II then goes on to explore the patterns of disease in the body's major organ systems. Each chapter in part II provides a review of those aspects of normal anatomy and physiology required for an understanding of the pathophysiology that follows. If you are fresh from your anatomy and physiology preparation, you may well forgo these, but many students will find them useful and conveniently placed.

The demands of individual curricula will, of course, dictate the sequence of topics in a given course of study, but where possible, we strongly recommend that you follow the chapter sequence as it stands. We feel that it provides a logically unfolding conceptual framework that fosters better understanding and increases the ease with which this information can be transferred to your clinical experiences.

We have placed great emphasis on the visual components of the text. Photographs have been selected to establish certain points, and where appropriate, these are reinforced with details of the history behind the image to provide greater impact. In many cases, we employ carefully executed line art to emphasize key elements and to de-emphasize the potentially confusing nonessentials that can make a specimen or microscopic field very difficult to interpret. Finally, because of their usefulness and popularity, we have made extensive use of flow charts. These not only crystallize the essence of pathogenesis for many students, they also provide a convenient means of study and review.

Throughout the text, special interest content is highlighted with icons to indicate the focus of the material:

Research



Clinical applications



General interest



Extra detail



Some instructors may leave these for you to pursue as your interests dictate, or may use them as a stimulus to classroom discussions or to further exploration in term papers or class presentations.

A case study is provided at the end of each chapter. This provides some "real world" reference that reinforces the information in the chapter, at the same time illustrating that the development and treatment of disease are often not as straightforward or tidy as one might hope. They also serve as reminders that not all health care is provided in large metropolitan medical centers. In addition, the case studies provide an insight into the way in which the various imaging, diagnostic laboratory, and nursing fields combine to address a given patient's situation—a perspective easily lost amid the details and restricted focus of day-to-day activity in one's particular field.

Because the training of health care professionals involves a significant amount of clinical exposure, we include some references to diagnostic procedures and therapy. Our goal is not to provide specific instruction in these areas, but rather to show how their clinical relevance logically emerges from the principles of pathophysiology. Also, linking clinical situations to their underlying pathophysiology provides for more meaningful learning and better retention.

To promote easier recognition of the essentials, at the end of each chapter we list its key concepts, referenced to relevant text pages. These might be thought of as representing the trunk and main branches of the pathophysiological tree, with the twigs and leaves seen as specific matters of detail. The different specialty fields in which health care professionals practice, by their different emphases, may require a different mix of these details, but the key concepts form the core that is common to all.

At each chapter's end we also present a selection of review activities. These are intended to stimulate a more positive and effective interaction with the subject matter as a means of enhancing understanding and retention. An active approach is far more effective than repeatedly rereading the same pages or pursuing other, similarly

passive and inefficient study practices. Once you become familiar with this approach and experience its benefits, you should be able to generate similar review activities on your own. We are confident that more effective and enjoyable learning experiences will result.

This text can be used like any other, but if you have access to a library, learning center, or classroom equipped with a barcode laserdisc system and the laserdisc *A Slice of Life*, it has an added dimension. As you read, the text indicates points at which a barcode on the page should be scanned. The barcode sends an image to the screen that illustrates the point made in the text. In this way, many more images can be made available than could possibly be included in the text. Another approach is to read the text first, and then to return to the barcoded images to review

and reinforce the text content, verifying understanding and retention. You may develop other uses for these readily accessible images, such as class presentations. Whatever your learning style, this added capability of the text gives you the potential to develop new and creative learning activities.

Finally, a word about our text's logo. We selected Leonardo daVinci's famous drawing, which depicts the human figure's proportion and balance, as representative of the state of health and well being. Although subject to disruption by the various disease processes described in the text, it is the restoration of this state toward which the efforts of health care professionals are directed. Our best wishes for your studies in pursuit of this goal!



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# *Part One*

## *Foundation Concepts of Pathophysiology*





# Introduction

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*Objection, evasion, distrust, and irony are signs of health.  
Everything absolute belongs to pathology.*

Friedrich Wilhelm Nietzsche  
*Beyond Good and Evil*

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