

VOLUME 1

**CARDIAC
AND
VASCULAR
DISEASES**

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CARDIAC and VASCULAR DISEASES

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with the collaboration of 102 contributors

Volume 1



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Frontispiece. An anatomical drawing of the heart, great vessels, and other organs by Leonardo da Vinci. It seems amazing that observers in general and Leonardo in particular did not realize that blood was being pumped by the heart through these vessels. Other illustrations by him demonstrate his precise knowledge of both cardiac and venous valves as well as of hydrodynamics. Yet it was more than a century after this drawing that William Harvey produced "De Motu Cordis." Leonardo convinced himself by a logic which to him was impeccable that blood flowed from auricle to ventricle, then directly back to auricle, but never from vena cava to auricle. The truth is now clear to us. Are there other unestablished truths of almost equal import to be gleaned from the facts presented in this book?

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Dedication

Certainly one of the prime objectives in compiling this volume was to provide a testimonial to Dr. Charles C. Wolferth and his ideas. The extent to which it does so is a tribute to his greatness. Dr. Wolferth liked to describe himself as a "West Philadelphia general practitioner." He was that, but much more. He was an outstanding clinical cardiologist. He had a near compulsion about bringing concept and observations to the bedside and a similar feeling about using bedside problems as a starting point for investigational endeavors. He was profoundly convinced of the virtue of applying lessons learned in the physiology, pharmacology, chemistry, and anatomy laboratories to difficult situations. He was perhaps the greatest man of his time in bridging the gap between modern basic scientific technology and clinical cardiology. He transmitted this philosophy to several generations of pupils with considerable success.

There are books available, and current, that give an ample view of the details of clinical cardiology; others containing an exhaustive bibliography of the cardiovascular field; still others that provide detailed accounts of the anatomy, physiology, and pharmacology of the circulation. However,

it has been our opinion that there is no book truly reflecting the essence of Dr. Wolferth's greatness. We have believed that there should be such a book to guide students, house officers, and physicians in the general practice of medicine, and to offer a substitute for the welter of details that flood frustratingly from all sides. It is our goal to bring into focus basic data and principles that bear on the prevailing cardiovascular issues and beyond that to indicate developing information which may soon be ripe for translation into clinical practice.

We are pleased to include Dr. Hugh Montgomery as a contributor. He was a friend, admirer, and associate of Dr. Wolferth's. His patience, confidence, and encouragement have been inspirational to us.

Many of the authors were pupils of Dr. Wolferth, some in name and some in spirit. We believe their contributions, in fact all contributions, reflect Dr. Wolferth's catholic interests, logical approach to decision making, and his scholarly pragmatism where pertinent facts could not be generated. The editors wish to thank each author for his patience, cooperation, and scholarship.

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Preface

"In *our* country," said Alice, still panting a little "you'd generally get to somewhere else—if you ran very fast for a long time, as we've been doing."

"A slow sort of country!" said the Queen. "Now, *here*, you see, it takes all the running *you* can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that."

Never has the dictum of the Red Queen in "Through the Looking Glass" proved to be so justified as in recent years. The dramatic explosions of knowledge have been of such magnitude that technical equipment as well as technical literature may be condemned as obsolete even before reaching general attention. After the final die of a book such as this one has been cast and the skeleton has been frozen by the publishers, the editors are likely to attend scientific sessions where it is learned that the import of a not inconsiderable portion of their opus has been cast in doubt. The sum of knowledge in so many technical subjects, such as cardiology, has increased on an exponential curve as illustrated in Figure I. In most cases, as in the case of our knowledge of cardiovascular disease, the first break in the curve started somewhere in the beginning of the century, gained momentum in the thirties, and has literally, as well as figuratively, exploded since just before the end of World War II.

It has been estimated (or guessed) that the number of available but indiscriminate scientific facts has doubled in the past five years. If we continue along the hyperbolic curve shown in Figure I, the number of these facts as well as the population and the square miles of paved road will eventually double themselves every few seconds. Fortunately this is manifestly absurd, and we will undoubtedly untrack ourselves from the hyperbola as shown in the dotted lines in the inset figure. This will hopefully be accompanied by a renaissance of philosophy. This might help us to begin to make a slave of technology instead of being enslaved by it.

Under such circumstances it is interesting to compare this textbook with "Diseases of the Heart," written by Sir Thomas Lewis and published by the MacMillan Company, Limited, London in 1936. Sir Thomas Lewis was certainly one of the leading authorities on cardiovascular disease of his time. He started his Preface as follows: "If I had set out to describe the many and often very complex methods of examination now in use, had attempted to discuss at any length the pathology of heart disease, had included all known disorders of the heart, giving to each of these the space commensurate with our knowledge of it, and without consideration of its commonness or rarity, this book would have grown to form an

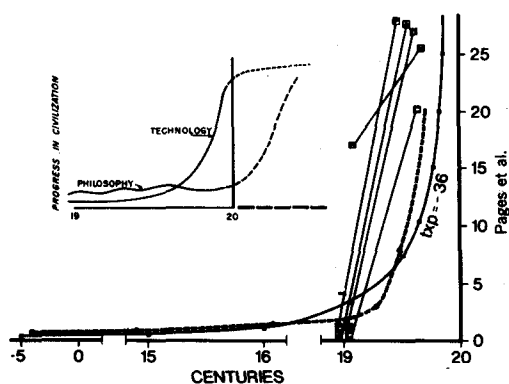


FIG. 1. Dotted line in larger graph represents the number of pages of the largest contemporary text-books on cardiovascular disease plotted against time in centuries. Points on curve start with anonymous contemporary of Hippocrates who in about 400 BC wrote less than 1000 words describing the heart as a hollow muscular organ containing valves. Other points along the curve represent the contributions of Leonardo da Vinci (see frontispiece), toward the end of the fifteenth century, William Harvey, 1625, Thomas Lewis, 1936, and more modern times. The solid line is that of a hyperbola $tp = -36$ where t = time in decades less than year 2000 and p = pages of books in hundreds. The lines with letters represent: [C]—[C] increase in population of California, a product of increase of number of births plus migration; [A]—[A] increase in number of automobiles; [P]—[P] increase in pieces of mail; [D]—[D] increase in National Debt; [H]—[H] relative increase in deaths from cardiovascular disease per 100,000 population;—all since 1900. The inset graph represents the hopeful shape of things to come.

unwieldy treatise." He also states: "the impulse to write a work of reference has not stirred me." We are very much in the same position as Sir Thomas Lewis in some respects. However, by his standards we have probably given birth to an "unwieldy treatise." Considering, however, that entire books have been written to cover the material that our contributors and we have tried to condense into each chapter, and considering also that in some cases several books have been published to cover material that our contributors and we have tried to condense into each chapter, and considering also that in some cases several books have been published to cover material which we

have condensed into *part* of one chapter, it is not too odious to make some comparison between our book and that of Sir Thomas Lewis. It must be remembered that the pages of his book are smaller than the pages of ours and that the number of pages devoted to various subjects listed in Table I for our book necessarily represent an estimation rather than the exact number of pages.

We see that the amount written about congestive failure is at least doubled, whereas that amount written about coronary artery disease is increased by more than 500 per cent. There has also been tremendous expansion in our knowledge of the arrhythmias and valvular heart disease, since in the latter case we are no longer quite so therapeutically impotent. Considerably more scientific data have also accumulated concerning heart strain, work, and cardiac enlargement. Little has changed

Table I

Pages, Sir Thomas Lewis	Subject	Approximate Number of Pages, Conn-Horwitz
40	Congestive failure	75
29	Coronary artery disease and electrocardiography thereof	180
41	Arrhythmias	150
32	Valvular disease	100
21	Heart strain, work, and failure and cardiac enlargement	125
9	Neurocirculatory asthenia	10
4	Pulmonary edema	15
2	Pulmonary infarction	15
10	Pericarditis	40
10	Bacterial endocarditis	50
26	Rheumatic heart disease	80
14	Syphilitic heart disease	10
14	Hypertension	90
2	Myocarditis and rare forms of heart disease	70
7	Pulmonary heart disease	20
5	Thyrotoxic heart disease	20
7	Congenital heart disease	100
1	Childbearing and heart disease	20
2	Anesthesia and heart disease	15
1	Surgery in patients with heart disease	150
12	Diagnosis, prognosis, and treatment	100
289		1435

in our knowledge of neurocirculatory asthenia. There have been considerable advances in our scientific knowledge of pulmonary edema, in spite of the small increment in the number of pages. Great advances have been made in our knowledge of pulmonary embolus and pulmonary infarction. Apparently medical knowledge was surprisingly and particularly weak in this respect. There have been huge advances in our knowledge of pericarditis, bacterial endocarditis, and rheumatic heart disease, with respect to etiology, diagnosis, and treatment. The chapters in both books on syphilitic heart disease are about the same size, probably because there has for some time been considerable knowledge of the pathology of this disease, as well as of the physical findings. Since 1936 there has been, of course, much better control of lues and therefore of its cardiovascular manifestations. There has been a huge increase in our knowledge of the etiology, differential diagnosis, and treatment of hypertension as well as a great increase in our knowledge of myocarditis and of some of the more unusual forms of heart disease. We have also learned a great deal about emphysema, pulmonary heart disease, and thyrotoxic heart disease. The surgeons have forced us to learn a great deal more about congenital heart disease. We have probably learned considerably more about childbirth in the patient with cardiovascular disease, and we have certainly learned a great deal more about anesthesia and surgery in the patient with cardiovascular disease.

Our knowledge of definitive diagnosis and treatment has, of course, been increased immensely.

In quoting the following two apparently erroneous concepts, which were held by Sir Thomas Lewis, we wish to point out that this is not done in the spirit of being adversely critical, but rather to make the point that to err is to be human. In his book he stated as follows: "Briefly the diagnosis of mitral regurgitation has a very limited importance; it may be useful as an early indication of muscle failure in acute infectious

disease and occasionally in old age. Further reasons will be given for concluding that it should not be allowed to modify either prognosis or treatment." And "in heart disease, infarction of the lung usually originates from an embolus. The original thrombus is attached to the wall of the right auricular appendage, or less commonly at the apex of the right ventricle or elsewhere. It becomes detached, is swept into the pulmonary artery, entering and blocking one of the pulmonary arterial branches. Frequently thrombus accumulates upon it subsequently. Infarction is occasionally due to thrombosis originating in the pulmonary artery or pulmonary veins." No mention is made of venous thrombosis, which we now believe to be the origin of at least 90 per cent of pulmonary emboli.

Since Sir Thomas Lewis was probably as wise as many of our contributors and editors, we regret that it is highly probable that such errors are also present in this volume. We can only hope that they are detected and rectified in the near future.

Since our book, if anything, must be an attempt to pave the road from the basic sciences to the clinical application of our knowledge of cardiovascular disease, it is little wonder that most of the subject matter of the chapters in Section One were omitted by, or completely unknown to, the author of a book in the early thirties. The same applies to much of Section Two. It is from Section Three that most of the comparisons were made. Sir Thomas Lewis had a great interest in peripheral vascular disease and it is not remarkable that his works in this field provided a great deal of our present knowledge. It is true that there have been considerable advances since his time, in this respect, especially in the fields of radiology, vascular surgery, oxygen tension studies, and plethysmography. However, the book to which we are referring made no attempt to cover the field of vascular disease.

Section Five for the most part contains descriptions of methods that have been developed in the last thirty years.

Almost completely unavoidable is the

overlap or repetition in a book of this sort. Such may be innocuous or even desirable in some cases. For instance, lipemia is discussed under etiology of arteriosclerosis and under diabetes mellitus. Deleting any of this would, we believed, disturb the continuum of fine contributions. Brief descriptions of coarctation also are present in the chapters on diseases of the thoracic aorta, on congenital heart disease, and on hypertension. Little gain and possibly some loss might result from deleting such short passages. Descriptions of pheochromocytoma were purposefully requested from a surgeon-endocrinologist, as well as from those writing our section on hypertension. As an "anti-unwieldy" measure, however, an effort has been made to avoid excessive repetition.

Our knowledge of the effect of weightlessness and space travel upon the cardiovascular system is so poorly developed at present that it hardly permits more than

mention. The cardiac transplant, rather than a therapeutic procedure, has proved to be a physiological and surgical stunt and will probably remain a limited tool until the chemists and allergists get into the act. A future book of this sort should probably contain a chapter on the computer.

We have not been loath to enlist the aid of surgeons and gynecologists from their pastures outside the field of medicine. We have also drawn heavily from basic scientists as well as medical specialists. We believe that the hematologists, endocrinologists, nephrologists and others have much to contribute to our efforts to obtain a more penetrating understanding of our own specialty and to bring the basic science laboratory to the aid of the patient suffering from various types of circulatory distress.

Philadelphia

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