

**Bergman's Comprehensive Encyclopedia of Human
Anatomic Variation**

Bergman's Comprehensive Encyclopedia of Human Anatomic Variation

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As the reader sees from the title of this textbook, it is dedicated to Dr. Ronald Bergman. Dr. Bergman was not the first to collect and publish on the variations of the human anatomy (e.g. Henle, Macalister, Adachi). However, he was the first to publish on this topic at such an in depth and comprehensive scale. My first introduction to Dr. Bergman's *Compendium of Human Anatomic Variation* was as a graduate student. As any dissector will eventually do, I came across something unusual in one of our cadavers during a routine dissection. I asked by my mentor, Dr. George Salter, about this who said, "You know there used to be a book in the lab office that focused on the anatomic variations of the body." After some digging, I was delighted to find this book, which I set out to memorize as best as I could. From that day on, Dr. Bergman's book and *Gray's Anatomy* were my main resources for studying anatomy. Therefore, this current text is not only an updated resource but also a tribute to the pioneering efforts of Dr. Ronald Bergman who reminded us that no two bodies are the same!

R. Shane Tubbs

I would like to dedicate my work on this enormous project to my son, Isaiah. Isaiah you are the light of my life! To my wife, Susan, you are the best. Many thanks to Drs. Rod Oskouian and Johnny Delashaw for their encouragement. Also, Dr. W. Jerry Oakes has supported this project and my other academic endeavors and I sincerely thank him. Lastly, I thank Dr. E. George Salter for persuading me to take on a career in anatomy and for first introducing me to the *Compendium of Human Anatomic Variation!*

R. Shane Tubbs

To Susan and Shane Tubbs, a very beautiful couple.

Mohammadali M. Shoja

To the love of my life, my wife Joanna Loukas

Marios Loukas

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Preface

Since the beginning of time, differences between humans have made us identifiable to those around us. Some extreme forms of morphological variation have even resulted in individuals being either unique or outcasts. For example, dwarfs have been revered in various cultures and even represented in royal courts and some cultures have bestowed a god status on children born with multiple limbs. Other variations, however, have been viewed as “different” enough to warrant being ostracized. Children being born with a caudal appendage (tail) who were considered offspring of Satan exemplify this.

Human anatomic variation can be defined as human form that is outside of the normal. However, what is normal? This question is often very difficult to answer. For example, most would agree that having two breasts is normal but what about a woman with accessory breasts? Is this normal, abnormal or even pathologic? Is it a variant or an anomaly? Sometimes, the answer to these questions is based on cultural norms or societal acceptance.

Obviously, hair color is certainly varied among individuals with many having a color that doesn't fit into the classic brown, black, red, or blonde categories. But are various hair colors that one of these terms does not apply to have a variation or is this simply an issue of definition e.g. red in the broader sense would include auburn, strawberry, etc.? In other words, our definition of normal is the gauge by which an anatomic trait is considered a variation or not. Some have tried to shed light on this by using such words as “borderlands.” Beyond the “border” a trait is thereby considered a variation. To confuse these issues, the term anomaly is and has been used interchangeably in regard to both variation and pathology. Herein, we have attempted to avoid pathologic anatomy but often, the line between an anatomic variation that is pathologic or predisposes one to pathology and one that is just a trait that is outside of what is considered normal is very gray. Moreover, as the term “anomaly” is often used to denote a variation that results in dysfunction or disease, we have tried to avoid this term when possible. However, the form of a structure may cause dysfunction in one person and not another. Therefore, “anomalies” do not always result in dysfunction or disease. The terms “abnormal” and “aberrant” have each been used loosely in the medical literature to describe anatomy that is non-pathologic or results in dysfunction.

Confoundedly, there are variations within variations. Where does one draw the line between a variation that is accepted as “normal” (the so-called normal variant) and a variation that is considered “abnormal”? In this text, we have attempted to be

more inclusive than not. If the majority of individuals do not have an anatomic trait, then we have considered it a variation. With this however, the definition of majority has to be defined.

A quarter of a century ago, Dr. Ronald Bergman set forth to collect and publish a compendium of human variation. His textbook soon became the gold standard in human anatomic variation. As anatomists, we consulted this text almost daily. However, in the interim since its publication, radiologic technology and improved optics such as the surgical microscope have allowed us to see into the body with better accuracy than ever before. As a result, many more variations have come to the anatomist's and clinician's attention. Therefore, an updated textbook devoted to human anatomic variation seemed timely. However, as no single text on human anatomy can include all of the intricate details and structures of the body, so too can no single text on human anatomic variation capture all known or reported variants of the body, although we have tried. This tome will attempt to capture many of the known variants of the human form.

Nothing is pleasant that is not spiced with variety.

Francis Bacon

Through every rift of discovery some seeming anomaly drops out of the darkness, and falls, as a golden link into the great chain of order.

Edwin Hubbel Chapin

Variety's the very spice of life that gives it all its flavor.

William Cowper

The essence of the beautiful is unity in variety.

W. Somerset Maugham

I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection.

Charles Darwin

Variety of mere nothings gives more pleasure than uniformity of something.

Jean Paul

The gifts of nature are infinite in their variety, and mind differs from mind almost as much as body from body.

Quintilian

To such an extent does nature delight and abound in variety that among her trees there is not one plant to be found which is exactly like another; and not only among the plants, but among the boughs, the leaves and the fruits, you will not find one which is exactly similar to another.

Leonardo DaVinci

The catalogue of forms is endless: until every shape has found its city, new cities will continue to be born. When the forms exhaust their variety and come apart, the end of cities begins.

Italo Calvino

R. Shane Tubbs

Foreword

With the possible exception of a few pairs of identical twins, the anatomy of every human being on this planet is unique. That means that there are as many anatomical variations as there are people! Obviously, only a small percentage of these variations are of clinical significance. There are subtle variations in facial anatomy that will allow a clinical anatomist to tell one person from another, but that is not the type of variation that this textbook is about. Instead, this textbook is a resource for the clinical anatomist who needs a single comprehensive source for all the variations that have been published in peer-reviewed journals or web sites.

This new text is the first of its kind since *Compendium of Human Anatomic Variation: Text, Atlas, and World Literature* by Ronald A. Bergman, Sue Ann Thompson, and Adel K. Afifi published in 1988. There have been many published accounts of variations since that time. In fact, this text contains thousands of published variations. This update is clinically important in

view of recent advances in surgery and radiologic imaging. For a surgical example, endoscopic surgery makes what was previously an insignificant variation now necessary for the surgeon to recognize in order to perform a procedure safely. Improved resolution of radiologic images in all modalities makes it more important to be able to recognize what is pathologic and what is a normal variation.

Bergman's "Compendium" was the "gold standard" of its day. This text will soon become the new gold standard. Even Dr. Bergman would agree with that!

Respectfully submitted,
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Editor Emeritus, *Clinical Anatomy*

Foreword

This book, with great personal pride for me, provides elegant confirmation of the proven fact that the human body (as well as every living thing) is not created without variability. To paraphrase a profound statement by Sir William Osler, “variability is the rule of life”! The present book complements and extends a previous compendium, and an internet edition of human anatomic variation. Dr. Shane Tubbs conceived and developed this revision. He and his co-editors expand our knowledge and are

to be very highly commended for keeping the concepts fresh in the minds of all who are interested in the structure and function of the human body.

Ronald A. Bergman, PhD
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