THIEME Atlas of Anatomy

THIEME 解剖图谱

General Anatomy and Musculoskeletal System

解剖总论和骨骼肌肉系统

英文影印版

中国医药科技出版社

Thieme

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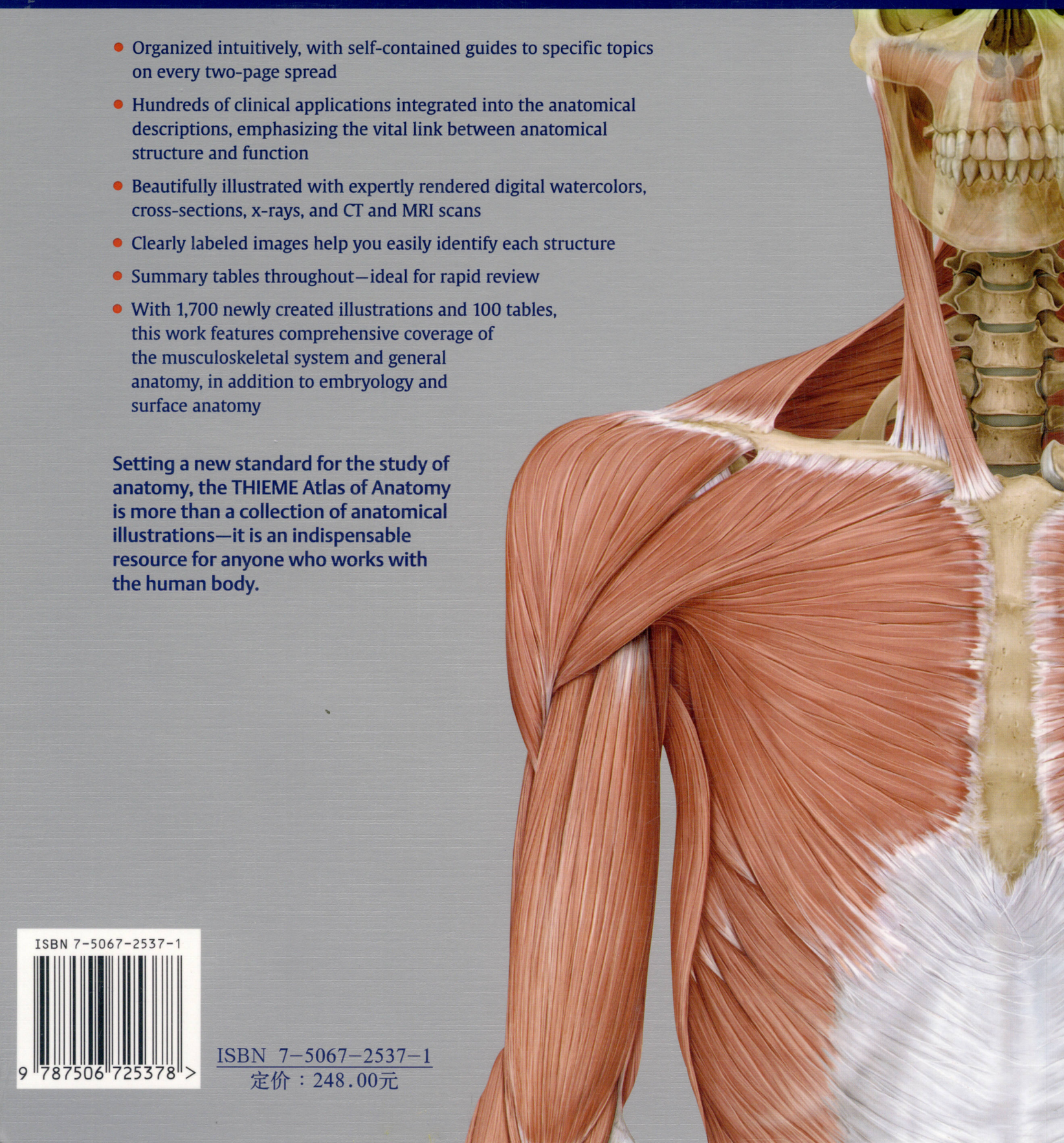

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Illustrators
Markus Voll, Fürstenfeldbruck, Germany;
Karl Wesker, Berlin, Germany (homepage: www.karlwesker.de)

Translator
Terry Telger, Fort Worth, Texas, USA

Rüdigerstraße 14
D-70469 Stuttgart
Germany
http://www.thieme.de

Thieme New York, 333 Seventh Avenue,
New York, NY 10001 USA
http://www.thieme.com

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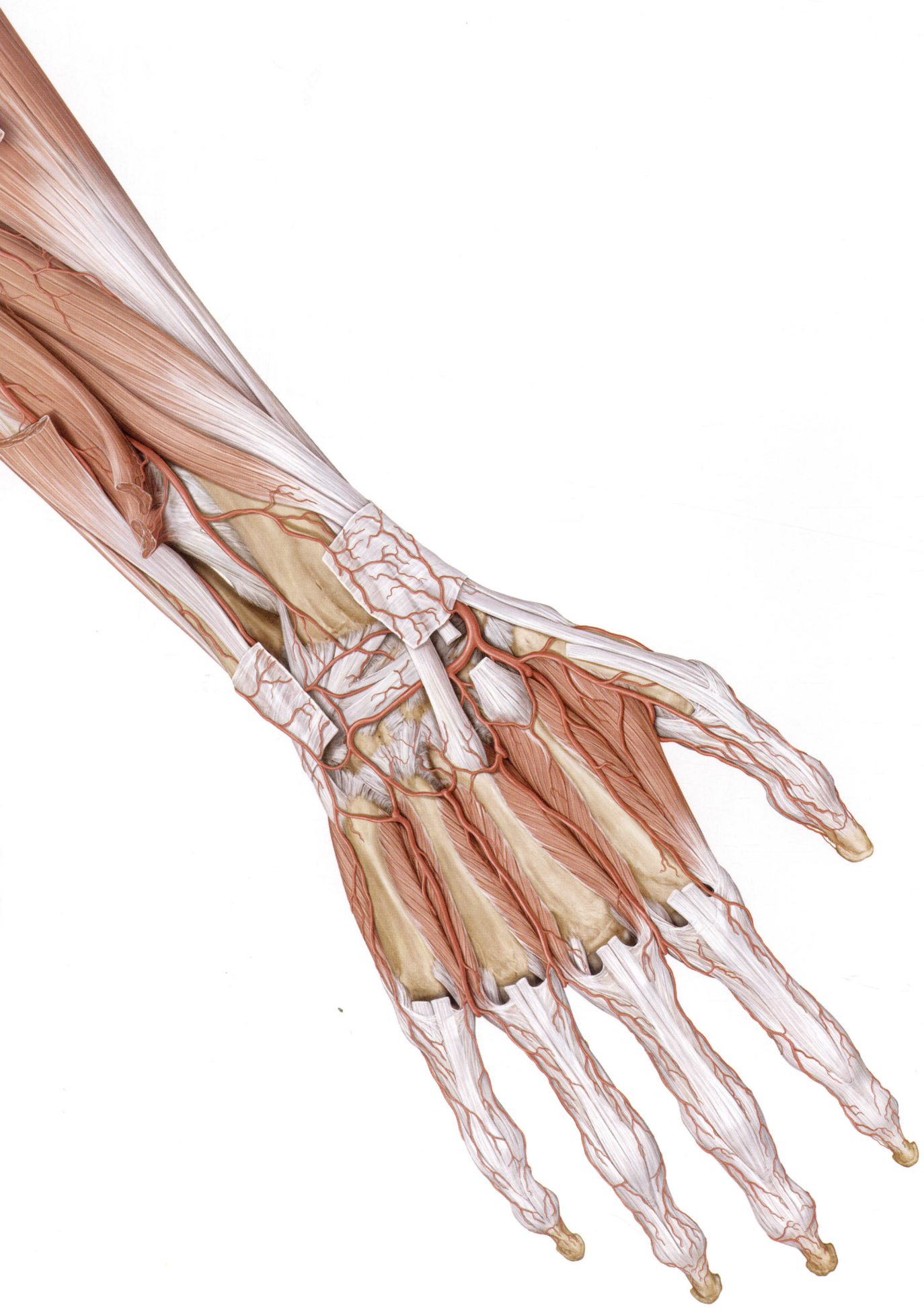

General Anatomy
and Musculoskeletal System

THIEME
Atlas of Anatomy

Consulting Editors

Lawrence M. Ross, M.D., Ph.D.,
The University of Texas Medical School at Houston

Edward D. Lamperti, Ph.D.,
Boston University School of Medicine

Authors

Michael Schuenke, M.D., Ph.D.,
University of Kiel Medical School

Erik Schulte, M.D.,
University of Mainz Medical School

Udo Schumacher, M.D.,
FRCPath, CBiol, FIBiol, DSc,
Hamburg University Medical Center

In collaboration with Jürgen Rude

Illustrations by

Markus Voll

Karl Wesker

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100 Tables

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Foreword

Our enthusiasm for the THIEME Atlas of Anatomy began when each of us, independently, saw preliminary material from this Atlas. Both of us were immediately captivated by the new approach, the conceptual organization, and by the stunning quality and detail of the images of the Atlas. We were delighted when the editors at Thieme offered us the opportunity to cooperate with them in making this outstanding resource available to our students and colleagues in North America.

As consulting editors we were asked to review, for accuracy, the English edition of the THIEME Atlas of Anatomy. Our work involved a conversion of nomenclature to terms in common usage and some organizational changes to reflect pedagogical approaches in anatomy programs in North America. This task was eased greatly by the clear organization of the original text. In all of this, we have tried diligently to remain faithful to the intentions and insights of the original authors.

We would like to thank the team at Thieme Medical Publishers who worked with us. Heartfelt thanks go first to Cathrin E. Schulz, M.D., Senior Editor, for her assistance and constant encouragement and availability.

We would also like to extend our thanks to Stefanie Langner, Production Manager, and Annie Hollins, Assistant Editor, for checking and correcting our work and preparing this volume with care and speed.

Lawrence M. Ross,
Edward D. Lamperti

Preface

As it started planning this Atlas, the publisher sought out the opinions and needs of students and lecturers in both the United States and Europe. The goal was to find out what the "ideal" atlas of anatomy should be—ideal for students wanting to learn from the atlas, master the extensive amounts of information while on a busy class schedule, and, in the process, acquire sound, up-to-date knowledge. The result of this work is this Atlas. The THIEME Atlas of Anatomy, unlike most other atlases, is a comprehensive educational tool that combines illustrations with explanatory text and summarizing tables, introducing clinical applications throughout, and presenting anatomical concepts in a step-by-step sequence that allows for the integration of both system-by-system and topographical views.

Since the THIEME Atlas of Anatomy is based on a fresh approach to the underlying subject matter itself, it was necessary to create for it an entirely new set of illustrations—a task that took eight years. Our goal was to provide illustrations that would compellingly demonstrate anatomical relations and concepts, revealing the underlying simplicity of the logic and order of human anatomy without sacrificing detail or aesthetics.

With the THIEME Atlas of Anatomy, it was our intention create an atlas that would guide students in their initial study of anatomy, stimulate their enthusiasm for this intriguing and vitally important subject, and provide a reliable reference for experienced students and professionals alike.

"If you want to attain the possible, you must attempt the impossible" (Rabindranath Tagore).

Michael Schünke, Erik Schulte, Udo Schumacher,
Markus Voll, and Karl Wesker

Acknowledgments

First we wish to thank our families. This atlas is dedicated to them.

We also thank Prof. Reinhard Gossrau, M.D., for his critical comments and suggestions. We are grateful to several colleagues who rendered valuable help in proofreading: Mrs. Gabriele Schünke, Jakob Fay, M.D., Ms. Claudia Dücker, Ms. Simin Rassouli, Ms. Heinke Teichmann, and Ms. Sylvia Zilles. We are also grateful to Dr. Julia Jürns-Kuhnke for helping with the figure labels.

We extend special thanks to Stephanie Gay and Bert Sender, who composed the layouts. Their ability to arrange the text and illustrations on facing pages for maximum clarity has contributed greatly to the quality of the Atlas.

We particularly acknowledge the efforts of those who handled this project on the publishing side:

Jürgen Lüthje, M.D., Ph.D., executive editor at Thieme Medical Publishers, has "made the impossible possible." He not only reconciled the wishes of the authors and artists with the demands of reality but also managed to keep a team of five people working together for years on a project whose goal was known to us from the beginning but whose full dimensions we came to appreciate only over time. He is deserving of our most sincere and heartfelt thanks.

Sabine Bartl, developmental editor, became a touchstone for the authors in the best sense of the word. She was able to determine whether a beginning student, and thus one who is not (yet) a professional, could clearly appreciate the logic of the presentation. The authors are indebted to her.

We are grateful to Antje Bühl, who was there from the beginning as project assistant, working "behind the scenes" on numerous tasks such as repeated proofreading and helping to arrange the figure labels.

We owe a great dept of thanks to Martin Spencker, Managing Director of Educational Publications at Thieme, especially to his ability to make quick and unconventional decisions when dealing with problems and uncertainties. His openness to all the concerns of the authors and artists established conditions for a cooperative partnership.

Without exception, our collaboration with the entire staff at Thieme Medical Publishers was consistently pleasant and cordial. Unfortunately we do not have room to list everyone who helped in the publication of this atlas, and we must limit our acknowledgments to a few colleagues who made a particularly notable contribution: Rainer Zepf and Martin Waletzko for support in all technical matters; Susanne Tochtermann-Wenzel and Manfred Lehnert, representing all those who were involved in the production of the book; Almut Leopold for the Index; Marie-Luise Kürschner and her team for creating the cover design; to Birgit Carlsen and Anne Döbler, representing all those who handled marketing, sales, and promotion.

The Authors

CONTACT DETAILS 3B SCIENTIFIC GROUP OF COMPANIES

HEADQUARTER
3B Scientific Hamburg
Rudorffweg 8
21031 Hamburg - Germany
Phone: +49-(0)40-739 66 0
Fax: +49-(0)40-739 66 100
E-Mail: 3b@3bscientific.com
Internet: www.3bscientific.com

USA
American 3B Scientific
2189 Flintstone Drive, Unit O, Tucker
Georgia 30084
Phone: +1-770.492.91.11
Fax: +1-770.492.01.11
E-Mail: info@a3bs.com
Internet: www.a3bs.com

UNITED KINGDOM
UK 3B Scientific
8, Beaconsfield Road
Weston-super-Mare, Somerset, BS23 1YE
Tel.: +44-(0)1934-425 333
Fax: +44-(0)1934-425 334
E-Mail: uk3bs@3bscientific.com
Internet: www.3bscientific.co.uk

ITALY
Italia 3B Scientific
Via Progresso 46
40064 Ozzano dell'Emilia (BO)
Tel.: +39-051-790 505
Fax: +39-051-469 5098
E-Mail: i3bs@3bscientific.com
Internet: www.3bscientific.it

GERMANY
3B Scientific Dresden
Heidelberger Straße 26
01189 Dresden
Tel.: +49-(0)351-403 90 0
Fax: +49-(0)351-403 90 90
E-Mail: vertrieb@3bscientific.com
Internet: www.3bscientific.de

FRANCE
France 3B Scientific
8 Rue Jean Monnet, Z.I. Parc 3
68870 Bartenheim
Téléphone : +33-(0)3 89 70 75 20
Fax : +33-(0)3 89 70 75 21
E-Mail : f3bs@3bscientific.com
Internet : www.3bscientific.fr

SPAIN
España 3B Scientific
Calle Cofrentes 9
46183 Valencia
Téléphone: +34-96-2725-237
Fax: +34-96-2725-238
E-Mail: marco.polidori@3bscientific.com
Internet: www.3bscientific.es

HUNGARY
Biocalderoni
Kozma u. 9-11
1108 Budapest
Tel.: +36 1 431 09 17
Fax: +36 1 262 33 93
E-Mail: biocalderoni@biocalderoni.hu
Internet: www.biocalderoni.hu

JAPAN
Nihon 3B Scientific
2-5-18 Sonoki
Niigata-shi, 950-1135
Tel.: +81-025-282 3228
Fax: +81-025-282 3229
E-Mail: 3b@3bs.jp
Internet: www.3bs.jp

CHINA
Suzhou 3B Scientific
45 HuoJu Road, Suzhou New District
Suzhou New District S&T Industrial Park
215009 Suzhou, Jiangsu
Phone: +86 512 6808 1123
Fax: +86 512 6825 8957
E-Mail: c3bs@3bscientific.cn
Internet: www. 3bscientific.cn

3B SCIENTIFIC – ANATOMY IN 3 DIMENSIONS

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Appendix

General Anatomy

1.1 Human Phylogeny

A Brief overview of human phylogenetic development

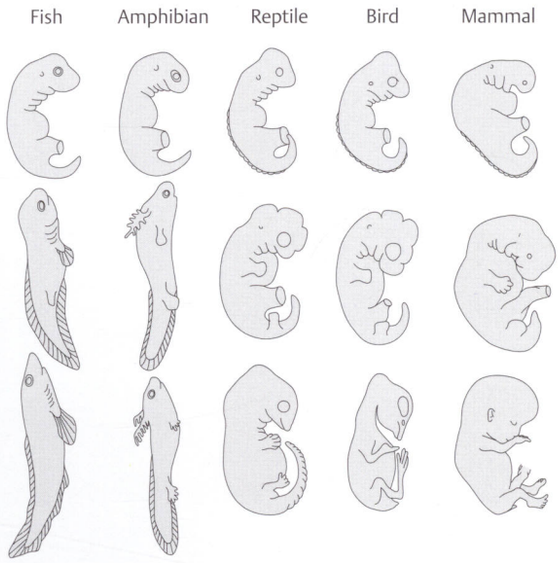
To better understand the evolution of the human body, it is helpful to trace its phylogenetic development. Humans and their closest relatives belong to the **phylum Chordata**, which includes approximately 50,000 species. It consists of two subphyla:

- Invertebrata: the tunicates (Tunicata) and chordates without a true skull (Acraniata or Cephalochordata)
- Vertebrata: the vertebrates (animals that have a vertebral column)

Although some members of the chordate phylum differ markedly from one another in appearance, they are distinguished from all other animals by characteristic morphological structures that are present at some time during the life of the animal, if only during embryonic development (see **G**). Invertebrate chordates, such as the cephalochordates and their best-known species, the lancelet (*Branchiostoma lanceolatum*) are considered the *model of a primitive vertebrate* by virtue of their organization. They provide clues to the basic structure of the vertebrate body and thus are important in understanding the general organization of vertebrate organisms (see **D**).

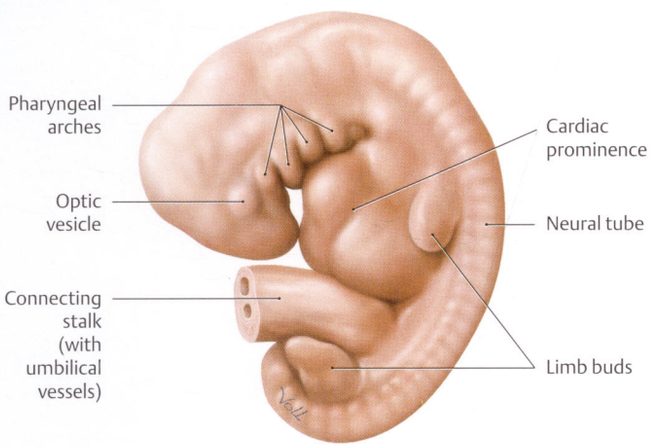
All the **members of present-day vertebrate classes** (jawless fish, cartilaginous fish, bony fish, amphibians, reptiles, birds, and mammals) have a number of characteristic features in common (see **H**), including a row of vertebrae arranged in a *vertebral column*, which gives the subphylum its name (*Vertebrata*). The evolution of an *amniotic egg*, i. e., the development of the embryo within a fixed shell inside a fluid-filled amniotic cavity, was a critical evolutionary breakthrough that helped the vertebrates to survive on land. This reproductive adaptation enabled the terrestrial vertebrates (reptiles, birds, and mammals) to live out their life cycles entirely on land and sever the final ties with their marine origin. When we compare the embryos of different vertebrate classes, we observe a number of morphological and functional similarities, including the formation of branchial arches (see **B**).

Mammals comprise **three major groups:** monotremes (egg-laying mammals), marsupials (mammals with pouches), and placentals (mammals with a placenta). The placental mammals, which include humans, have a number of characteristic features (see **I**), including a tendency to invest much greater energy in the care and rearing of their young. Placental mammals complete their embryonic development inside the uterus and are connected to the mother by a placenta. Humans belong to the mammalian order of **primates**, whose earliest members were presumably small tree-dwelling mammals. Together with lemurs, monkeys, and the higher apes, human beings have features that originate from the early adaptation to an arboreal way of life. For example, primates have movable shoulder joints that enable them to climb in a hanging position while swinging from branch to branch. They have dexterous hands for grasping branches and manipulating food, and they have binocular, broadly overlapping visual fields for excellent depth perception.



B Different stages in the early embryonic development of vertebrates

The early developmental stages (top row) of fish, amphibians, reptiles, birds, and mammals (as represented by humans) present a series of striking similarities that suggest a common evolutionary origin. One particularly noteworthy common feature is the set of branchial or pharyngeal arches in the embryonic regions that will develop into head and neck. Although it was once thought that the developing embryo of a specific vertebrate would sequentially display features from organisms representing every previous step in its evolution ("ontogeny recapitulates phylogeny", the "biogenetic law" of Ernst Haeckel (1834–1919)), subsequent work has shown that the vertebrates share common embryonic components that have been adapted to produce sometimes similar (fins and limbs) and sometimes radically different (gills vs. neck cartilages) adult structures.



C Formation of the branchial or pharyngeal arches in a five-week-old human embryo

Left lateral view. The branchial or pharyngeal arches of the vertebrate embryo have a *metameric* arrangement (similar to the somites, the primitive segments of the embryonic mesoderm); this means that they are organized into a series of segments that have the same basic structure. Among their other functions, they provide the raw material for the species-specific development of the visceral skeleton (maxilla and mandible, middle ear, hyoid bone, larynx), the associated facial muscles, and the pharyngeal gut (see p. 11).