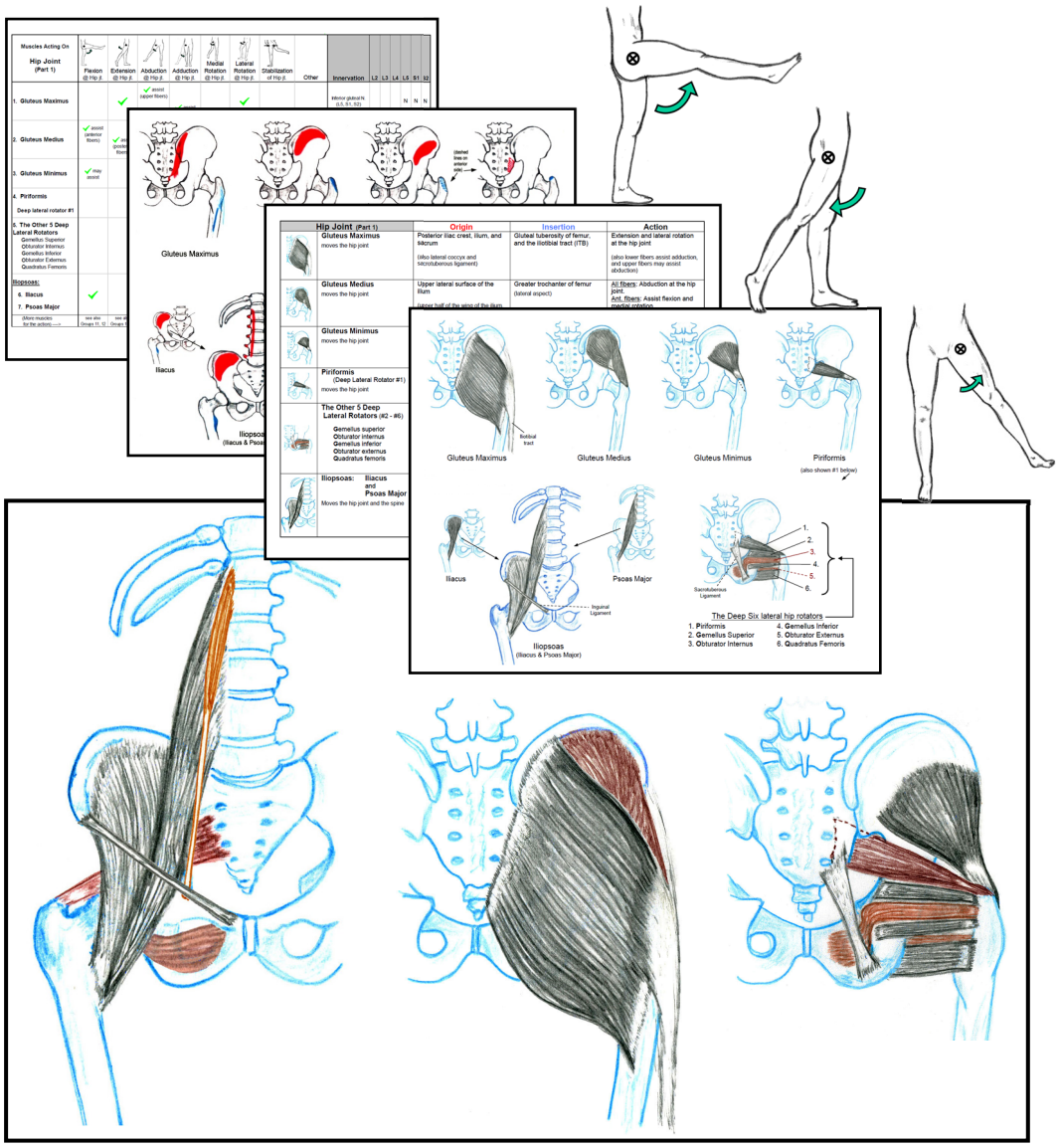
Mastering Muscles & Movement

SECOND EDITION

A Brain-Friendly System for Learning Musculoskeletal Anatomy and Basic Kinesiology



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What professionals are saying about Mastering Muscles & Movement

"Mastering Muscles & Movement makes human anatomy and kinesiology highly accessible to the reader. The information is presented in a format that accelerates the learning process and creates a long-term functional memory for the student. Accompanied with the study cards, Mastering Muscles & Movement makes learning fun and simple. I highly recommend this book for undergraduate to post-graduate students as well as practitioners in the field of healing arts and musculoskeletal medicine."

Avilio Halme, MPT, COMS

"Mastering Muscles and Movement presents an innovative and practical learning tool for students of Anatomy and Kinesiology. It is the first book that I have seen that actually demonstrates the steps to successful memorization and information retention. It gives you the sense that you are looking through the notes of the best student in class and learning their secret code. The simple, quick access to detailed content and the excellent selection of study tools will make this a book that students reach for first."

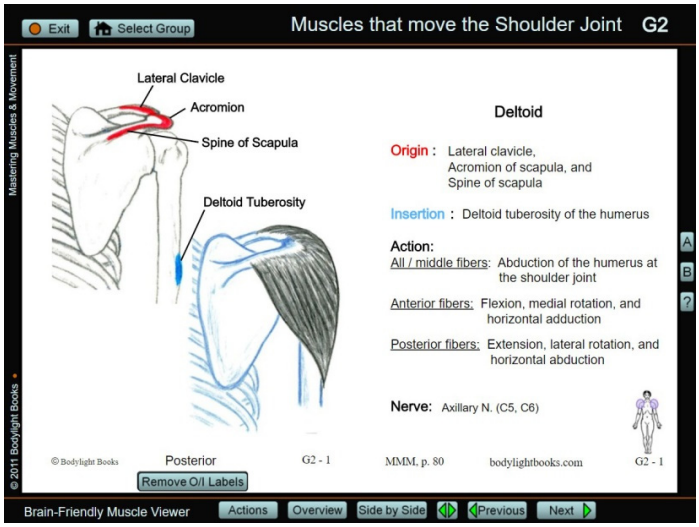
Ellen K. Geary MS, LAc

"Mastering Muscles and Movement outshines every other learning guide I have seen, and it is the ONLY book offering a system that maximizes the learning potential for every student of anatomy, kinesiology, massage therapy, physical therapy, etc. The layout, images, muscle groupings, and tables included in the system are pure genius. The author provides helpful online learning resources that add power and efficiency to the system. The clear and concise images allow for quick referencing of material. I'm impressed with the accuracy and level of detail included on innervation, attachment sites, actions, joints, and ligaments. There is so much information packed into this gem of a book! Additionally, it includes sections on the muscles of the face and jaw as well as the pelvic floor, two areas that are often overlooked in kinesiology textbooks. Mastering Muscles and Movement is truly in a class of its own and it is my first choice for instructing kinesiology courses and as a reference guide in my clinical practice."

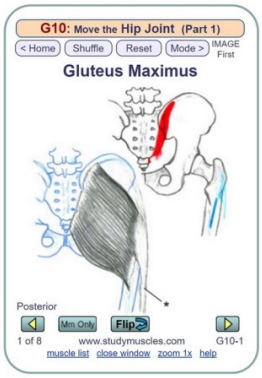
Wren McLaughlin, PT, DPT, PRC, WCS, MS

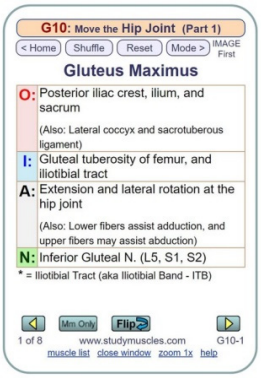
www.studymuscles.com

Interactive apps and downloadable support materials are available at the companion website.



Brain-Friendly Muscle Viewer App





Flashcard App

Also…

Bony Landmark Flashcards
Study Questions
Interactive Atlas of Bones & Landmarks
Muscle Layering Slide Shows
And more!

Preface

Mastering Muscles & Movement – A Brain-Friendly System for Learning Musculoskeletal Anatomy and Basic Kinesiology, provides a unique, strategically organized approach for learning the muscles, bones, joints, movements, and motor innervation of the human body. As the subtitle implies, research in brain-based learning has been richly applied in the design of this book to facilitate understanding, memorization, and mastery of this body of knowledge.

Approach

This book provides a complete set of information for the study of musculoskeletal anatomy and basic kinesiology. While there are many books available that cover the subject, **Mastering Muscles & Movement** (MM&M) presents a fresh *approach* that is designed to leverage the natural ways the brain observes, learns, and recalls this type of information. Rather than employing the usual one-muscle-per-page format, this book treats *groups* of muscles as "movement families" and presents them in a way that provides a rich visual, verbal, and relational learning environment.

The result is a truly **brain-friendly** experience for the student. The myriad details and inter-relationships are easily recognized in simple and natural ways by the innovative arrangement of the muscle information on each page and from page-to-page. The reader comfortably stays aware of the bigger picture while studying any one item, easily compares and contrasts related features and facts, and is enabled to structure study time to play to strengths or to eliminate weaknesses.

Benefits

Some benefits of this approach are:

- Isolates and supports learning and repetition from many directions: visual, verbal, relational.
- Supports the brain in doing what it does best: Consistently encourages the reader, simply by the way the material is laid out and sized on the pages, to compare and contrast, see patterns, perceive interrelationships, and "come at" the information from different directions.
- Muscle and bone information and illustrations are arranged to allow easy and repetitive self-testing while studying.
- Precise and uncluttered presentation clarifies common misunderstandings, and illuminates facts and relationships that are often overlooked.
- While studying, the information is anchored in the brain with multiple "hooks", providing rich cross-neuronal connections that are important for easier recall of details and relationships.
- Material is clearly organized throughout, and has visual cues that always keep the reader aware of where they are within the greater body of knowledge contained in the book.

Audience

The first edition of MM&M has been successfully utilized by students learning massage therapy, yoga instruction, physical therapy, Pilates instruction, athletic training, and dance, as well as students in college undergraduate functional anatomy and anatomical kinesiology classes. This new second edition has incorporated many improvements suggested by students and instructors over the years. The format has been redesigned and new information and illustrations added, while maintaining the original brain-friendly organization and approach that has proved useful in the past.

For many students MM&M has served as a **course textbook**, while in other educational programs it has proved valuable as **supplemental material** (depending on the level of specialization required for the course). In addition, this book has served as an easily accessible **reference** on the shelf of practicing professionals. Finally, because of its clarity of organization and simplicity of approach, it is an excellent **quick-review** book for students who are preparing for examination, and for practicing professionals who want to refresh their knowledge before attending continuing education classes.

Organization

MM&M is organized in a way that flows through a course of study of the musculoskeletal system. The clearly delineated segments allow the reader to focus on a specific portion of information while staying oriented within the whole. Note that the muscle groups in Chapters 4-6 can be taught in any order. Each presentation is independent of the others, allowing instructors to structure their class to their preference.

Chapter 1 – Basic Information provides foundational information for the study of muscles and movement. It gives definitions of terms and establishes a system for describing and analyzing body movement. Basic information is provided for the main body systems that are related to the study of kinesiology: bones, joints, muscles, nerves, and fascia. Finally, it introduces some important kinesiology concepts.

Chapter 2 – Bones, Bony Landmarks, Joints, and Ligaments employs an atlas format to present detailed features of all the bones of the body. This provides a central location that can be quickly referred to while proceeding through learning the muscles of the body later in the book. It gives information about the overall skeleton, as well as details about each individual bone. Master lists of the joints of the body and ligaments of the body are also included. Note that detailed illustrations of the joints and ligaments are provided at the beginning of chapters 4 through 6 as appropriate for the upper extremity, axial skeleton and lower extremity divisions of the body.

Chapter 3 – Using the Brain-Friendly System to Optimize Your Learning is a must-read to prepare the reader to fully utilize the brain-friendly approach employed to describe all the muscles in Chapters 4, 5 and 6. Understanding how to proceed is an essential step to allow the learner to truly master the muscles and movements of the body. Chapter 3 also outlines the types of information to learn and how that information is used in practical applications.

Chapters 4, 5, and 6 provide the bulk of the muscles and movement information in a special format that emphasizes constantly comparing and contrasting facts and pictures. The unique organization allows the reader to comfortably understand, memorize and recall the muscles of the body and study their actions and innervations. This approach helps the brain build a rich neuronal network that will lead to true mastery of the subject.

Chapters 7 – Summary Tables provides a handy presentation that can be quickly referenced once the reader has learned all the muscles in chapters 4, 5, and 6. The tables also reconcile some of the overlaps or gaps that were necessarily created by dividing the muscles into 13 groups for chapters 4-6 (especially multi-joint muscles). These tables are very useful when assessing and analyzing a client's movement patterns or posture, when performing or teaching stretching or strengthening exercises, or when reviewing material prior to an exam. Chapter 7 also includes a comprehensive master table of the motor innervation of the entire musculoskeletal system of the body.

Chapter 8 – Study Aids gives a summary of the ancillary materials currently available on the companion website. These include downloadable PDF files and interactive apps, The end of the chapter also includes some general purpose worksheets that can be photocopied by the purchaser of the book for their personal use. Note that the online materials are likely to evolve over time, given the dynamic nature of the internet.

Ancillary Materials

Online materials based on the text and illustrations in ***Mastering Muscles & Movement*** are available at www.studymuscles.com to support both students and instructors.

Student materials include muscle and bone flashcards, muscle and bony landmark practice sheets, synergist/antagonist practice sheets, muscle tickets, study questions and other study aids. The study tools also include a muscle flashcard app and the **Brain-Friendly Muscle Viewer**, which is an interactive app that presents all the muscles in a style that matches the organization of the textbook.

The instructor resources include downloadable Powerpoint presentations, homework and quiz templates, study questions with keys, and other materials.

Mastering Muscles & Movement

Contents

Muscles – List by Group

Muscles are placed in groups based on the bones and joints they *move* as they contract.

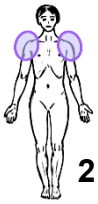
----- Upper Extremity -----
(Chapter 4)

Group 1 – Scapula / Clavicle
p. 75-82

Trapezius
Levator scapula
Rhomboid major & minor
Serratus anterior
Pectoralis minor
Subclavius

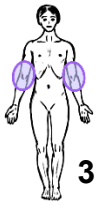
Group 2 – Shoulder Joint
p. 83-90

Deltoid
Supraspinatus
Infraspinatus
Teres minor
Subscapularis
Pectoralis major
Coracobrachialis
Latissimus dorsi
Teres major



Group 3 – Elbow, Forearm
p. 91-98

Biceps brachii
Brachialis
Brachioradialis
Pronator teres
Pronator quadratus
Triceps brachii
Anconeus
Supinator



Group 4 – Wrist, Hand, Fingers
p. 99-106

Flexor carpi radialis
Palmaris longus
Flexor carpi ulnaris
Flexor digitorum superficialis
Flexor digitorum profundus
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor carpi ulnaris
Extensor digitorum
Extensor indicis

Group 5 – Thumb
p. 107-113

Flexor pollicis longus
Flexor pollicis brevis
Opponens pollicis
Adductor pollicis
Abductor pollicis brevis
Abductor pollicis longus
Extensor pollicis longus
Extensor pollicis brevis

Bonus Group
p. 114-115

Intrinsic muscles of the hand

----- Axial Body -----
(Chapter 5)

Group 6 – Face, Jaw
p. 127-134

Masseter
Temporalis
Lateral pterygoid
Medial pterygoid
Occipitofrontalis
Platysma
Suprahyoids Group
  Geniohyoid, Mylohyoid, Stylohyoid, Digastric
Infrahyoids Group
  Sternohyoid, Sternothyroid, Omohyoid, Thyrohyoid
Muscles of facial expression

Group 7 – Neck, Head
p. 135-142

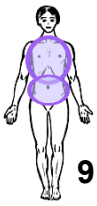
Sternocleidomastoid
Scalenes group
Longus capitis & longus colli
Suboccipital group
  Rectus capitis posterior major
  Rectus capitis posterior minor
  Oblique capitis superior
  Oblique capitis inferior
Splenius capitis
Splenius cervicis
Semispinalis capitis
Levator scapula*
Trapezius, upper fibers*
  *(revisited for reversed O/I actions)

Group 8 – Spine
p. 143-150

Spinalis
Longissimus
Iliocostalis
Semispinalis
Multifidus
Rotatores
Quadratus lumborum
Interspinales & Intertransversarii

Group 9 – Thorax, Abdomen, Breathing
p. 151-157

Rectus abdominis
External oblique
Internal oblique
Transverse abdominis
Diaphragm
External intercostals
Internal intercostals
Serratus posterior superior
Serratus posterior inferior
Levator costae
Transversus Thoracis



Bonus Group
p. 158-159`

Muscles of the pelvic floor and perineum

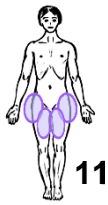
----- Lower Extremity -----
(Chapter 6)

Group 10 – Hip Joint (Part 1)
p. 167-174

Gluteus maximus
Gluteus medius
Gluteus minimus
Piriformis (1st lateral rotator)
The other 5 lateral rotators
  Gemellus superior
  Obturator internus
  Gemellus inferior
  Obturator externus
  Quadratus femoris
Iliopsoas
  (Iliacus & Psoas major)

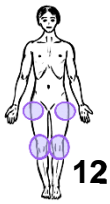
Group 11 – Hip Joint (Part 2)
p. 175-182

Sartorius
Tensor fascia latae
Pectineus
Adductor brevis
Adductor longus
Adductor magnus
Gracilis



Group 12 – Knee (& Hip Joint, Part 3)
p. 183-190

Rectus femoris
Vastus lateralis
Vastus intermedius
Vastus medialis
Biceps femoris
Semitendinosus
Semimembranosus
Popliteus



Group 13 – Ankle, Foot, Toes
p. 191-197

Gastrocnemius
Plantaris
Soleus
Tibialis posterior
Flexor digitorum longus
Flexor hallucis longus
Fibularis longus (peroneus)
Fibularis brevis (peroneus)
Tibialis anterior
Extensor digitorum longus
Extensor hallucis longus

Bonus Group
p. 198-199

Intrinsic muscles of the foot

Muscles – Alphabetical List

Muscles – Alphabetical List

About the Information in This Book

Books on muscles and movement are notoriously inconsistent in the details of the muscle attachments, actions and innervation assigned to individual muscles. Variations in artistic renderings of muscles and other structures present an additional challenge when studying musculoskeletal anatomy. There are many valid reasons for these apparent inconsistencies, including human anatomical variation, measurement and analysis methods employed by anatomists, and editorial decision processes.

Suffice it to say, this book necessarily adds one more resource to the fray. As such, I will note the main resources and the process I used while making decisions about the information I present in this book. The Bibliography on page 231 lists the main resources used while developing the material. Some resources were influential in my artistic choices, while others were given varying degrees of influence in my decisions about factual muscle information (origin, insertion, action, innervation), as well as terminology and descriptions regarding physiology and kinesiology.

For muscle, nerve, bone, joint and ligament details, I studied and compared many sources, from introductory muscular system books to high-end anatomy atlases to comprehensive kinesiology textbooks (see bibliography). When differences were not easily reconciled, I turned to the highly detailed analyses of anatomy and function in the Travell and Simons manuals (ref. 33 and 39) and sometimes to newer peer-reviewed articles in the medical literature. In more difficult cases I made tables to compare sources and look for common ground, discussed the information with colleagues, consulted additional books and internet resources, and studied cadaver dissections.

After weighing all of the above, I then "flavored" the presentation based on my specific approach, i.e., to be **brain-friendly**. The information was then incrementally refined while seeing students' responses over many years of teaching kinesiology and cadaver anatomy. Please read the Preface on page *i*, and read Chapter 3 – "Using the Brain-Friendly System to Optimize Your Learning" to better understand the specific approach used in the Mastering Muscles & Movement system.

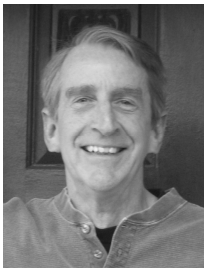
Acknowledgements

Over the many years I have been developing and improving this book there have been too many influences and contributors to name them all individually. However, the following is an attempt to "name a few" of the people who graciously helped me along the way.

Those making direct contribution to the process and/or content of this book (in alphabetical order): Pat Archer, Jack Blackburn, Elizabeth Fletcher Brown, Barb Collins, Jen Cosgrove, Gwen Crowell, Janae Fletcher, George Gottlieb, Avilio Halme, Kinsey Jackson, Liz Lamm, Whitney Lowe, Anna Mariano, Wren McLaughlin, Brenda Mitchell, Lisa Nelson, Eric Root, Helen Thayer, Diana Thompson, Kristin Torok, and my students and colleagues at the Spectrum Center School of Massage in WA state.

And finally for patience, love, support, expert editorial advice, and a little fun in between the hard work: Laurie Pitts.

About the Author/Illustrator



Dave Campbell, BS, LMT, has been an instructor of kinesiology and cadaver anatomy since 2001. He has been a manual therapy practitioner for over 30 years and has an enduring fascination with the intricacies of the human body, mind, and spirit. Dave maintains a bodywork practice at The Natural Health Clinic in Bellingham, WA, specializing in craniosacral therapy, organ- and nerve-specific fascial mobilization, and myofascial therapies.

Dave holds a B.S. in Mathematics from the University of California. A former engineer at the Fairchild Laboratory for AI Research in Palo Alto, CA, he developed his brain-friendly approach to teaching muscles and movement based on years of experience in the study of human perception, artificial intelligence, and graphic representation of scientific information.