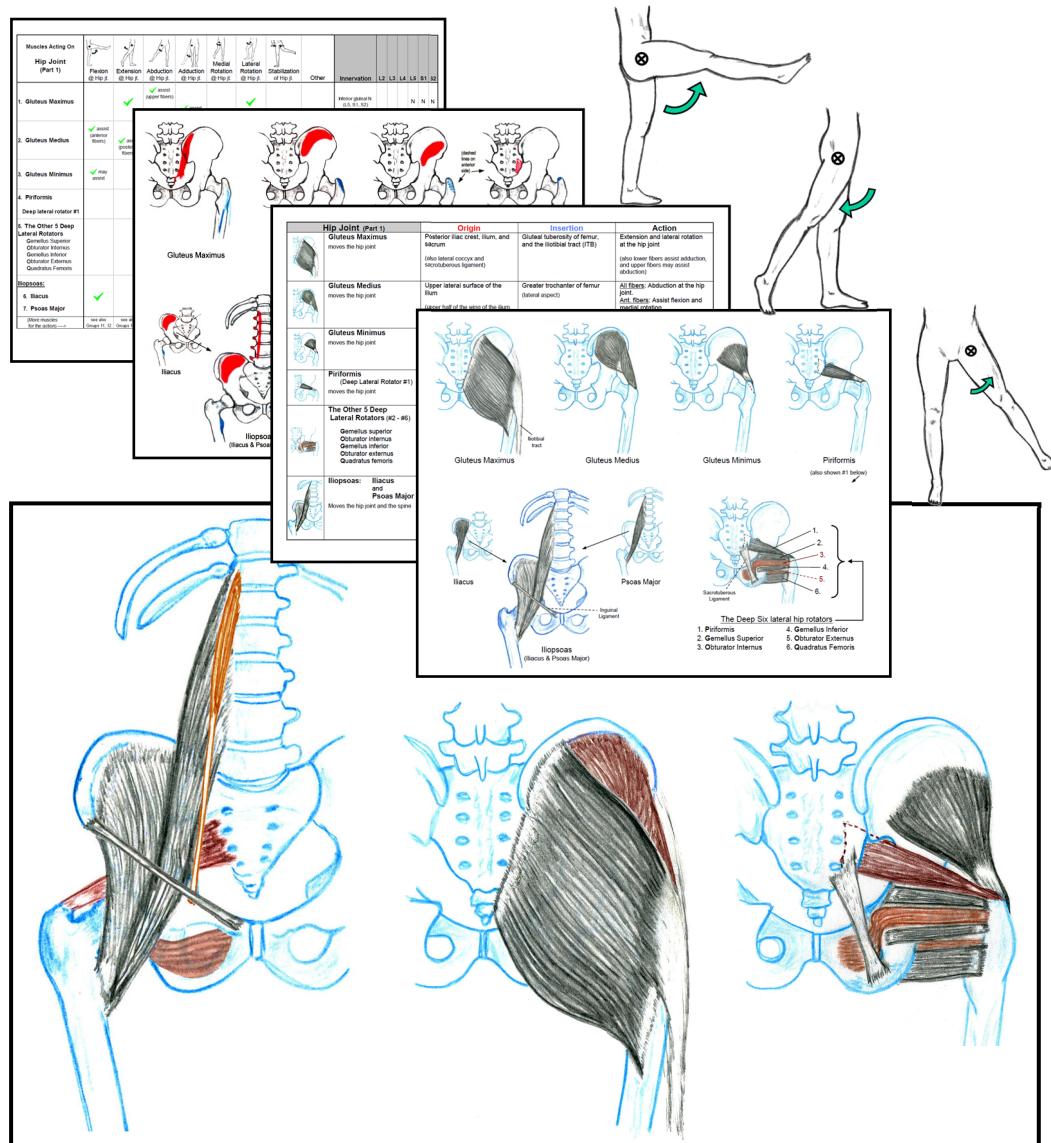


Mastering Muscles & Movement

SECOND EDITION

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



Written and illustrated by David M. Campbell



Mastering Muscles and Movement

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

Second Edition

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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.

The screenshot shows a 3D anatomical model of the shoulder joint from a posterior perspective. The Deltoid muscle is highlighted in blue. Labels include: Lateral Clavicle, Acromion, Spine of Scapula, Deltoid Tuberosity, and Deltoid. Detailed information for the Deltoid muscle is provided:

- Origin:** Lateral clavicle, Acromion of scapula, and Spine of scapula
- Insertion:** Deltoid tuberosity of the humerus
- Action:**
 - All / middle fibers: Abduction of the humerus at the shoulder joint
 - Anterior fibers: Flexion, medial rotation, and horizontal adduction
 - Posterior fibers: Extension, lateral rotation, and horizontal abduction
- Nerve:** Axillary N. (C5, C6)

At the bottom, there are navigation buttons: © 2011 Bodylight Books, Posterior, Remove O/I Labels, G2 - 1, MMM, p. 80, bodylightbooks.com.

Brain-Friendly Muscle Viewer App

The screenshot shows a 3D anatomical model of the hip joint from a posterior perspective. The Gluteus Maximus muscle is highlighted in blue. Detailed information for the Gluteus Maximus muscle is provided:

- O:** Posterior iliac crest, ilium, and sacrum
(Also: Lateral coccyx and sacrotuberous ligament)
- I:** Gluteal tuberosity of femur, and iliotibial tract
- A:** Extension and lateral rotation at the hip joint
(Also: Lower fibers assist adduction, and upper fibers may assist abduction)
- N:** Inferior Gluteal N. (L5, S1, S2)
* = Iliotibial Tract (aka Iliotibial Band - ITB)

At the bottom, there are navigation buttons: < Home, Shuffle, Reset, Mode >, IMAGE First, G10-1, 1 of 8, www.studymuscles.com, muscle list, close window, zoom_in, help.

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 interrelationships 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

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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

- Trapezius p. 75-82
- Levator scapulae
- Rhomboideus major & minor
- Serratus anterior
- Pectoralis minor
- Subclavius



Group 2 – Shoulder Joint

- Deltoid p. 83-90
- Supraspinatus
- Infraspinatus
- Teres minor
- Subscapularis
- Pectoralis major
- Coracobrachialis
- Latissimus dorsi
- Teres major

Group 3 – Elbow, Forearm

- Biceps brachii p. 91-98
- Brachialis
- Brachioradialis
- Pronator teres
- Pronator quadratus
- Triceps brachii
- Anconeus
- Supinator



Group 4 – Wrist, Hand, Fingers

- Flexor carpi radialis p. 99-106
- 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

- Flexor pollicis longus
- Flexor pollicis brevis
- Oponens pollicis
- Adductor pollicis
- Abductor pollicis brevis
- Abductor pollicis longus
- Extensor pollicis longus
- Extensor pollicis brevis



Bonus Group

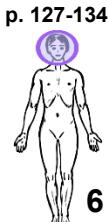
- Intrinsic muscles of the hand



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

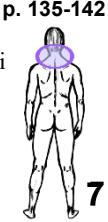
Group 6 – Face, Jaw

- Masseter p. 127-134
- 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

- Sternocleidomastoid p. 135-142
- 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 scapulae*
- Trapezius, upper fibers*
- *(revised for reversed O/I actions)



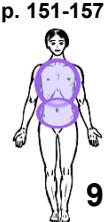
Group 8 – Spine

- Spinalis p. 143-150
- Longissimus
- Iliocostalis
- Semispinalis
- Multifidus
- Rotatores
- Quadratus lumborum
- Interspinales & Intertransversarii



Group 9 – Thorax, Abdomen, Breathing

- Rectus abdominis p. 151-157
- External oblique
- Internal oblique
- Transverse abdominis
- Diaphragm
- External intercostals
- Internal intercostals
- Serratus posterior superior
- Serratus posterior inferior
- Levator costae
- Transversus Thoracis



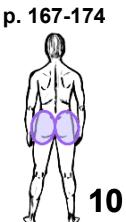
Bonus Group p. 158-159'

- Muscles of the pelvic floor and perineum

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

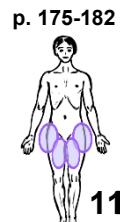
Group 10 – Hip Joint (Part 1)

- Gluteus maximus p. 167-174
- 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)



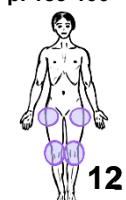
Group 11 – Hip Joint (Part 2)

- Sartorius p. 175-182
- Tensor fascia latae
- Pectenius
- Adductor brevis
- Adductor longus
- Adductor magnus
- Gracilis



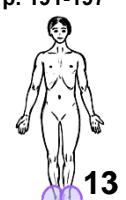
Group 12 – Knee (& Hip Joint, Part 3)

- Rectus femoris p. 183-190
- Vastus lateralis
- Vastus intermedius
- Vastus medialis
- Biceps femoris
- Semitendinosus
- Semimembranosus
- Popliteus



Group 13 – Ankle, Foot, Toes

- Gastrocnemius p. 191-197
- 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

A

- Abductor digiti minimi of the foot 198
- Abductor digiti minimi of the hand 114
- Abductor hallucis 198
- Abductor pollicis brevis 110
- Abductor pollicis longus 110
- Adductor brevis 178
- Adductor hallucis 198
- Adductor longus 178
- Adductor magnus 178
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- Anconeus 94

B

- Biceps brachii 94
- Biceps femoris 186
- Brachialis 94
- Brachioradialis 94
- Buccinator 128
- Bulbospongiosis 158

C

- Coccygeus (ischiococcygeus) 158
- Compressor urethrae 158
- Coracobrachialis 86

D

- Deep Six lateral rotators of the hip 169
- Deep transverse perineal 158
- Deltoid 86
- Depressor anguli oris 128
- Depressor labii inferioris 128
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- Dorsal interossei of the hand 114

E

- Erector spinae group (ESG) 146
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- Extensor carpi radialis longus 102
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- Extensor digiti minimi 105
- Extensor digitorum (fingers) 102
- Extensor digitorum brevis (toes) 198
- Extensor digitorum longus (toes) 194
- Extensor hallucis brevis 198
- Extensor hallucis longus 194
- Extensor indicis 102
- Extensor pollicis brevis 110
- Extensor pollicis longus 110
- External abdominal oblique 154
- External anal sphincter 158
- External intercostals 154
- External urethral sphincter 158

F

- Fibularis brevis (peroneus brevis) 194
- Fibularis longus (peroneus longus) 194

- Fibularis tertius (peroneus tertius) 197
- Flexor carpi radialis 102
- Flexor carpi ulnaris 102
- Flexor digiti minimi of the foot 198
- Flexor digiti minimi of the hand 114
- Flexor digitorum brevis 198
- Flexor digitorum longus 194
- Flexor digitorum profundus 102
- Flexor digitorum superficialis 102
- Flexor hallucis brevis 198
- Flexor hallucis longus 194
- Flexor pollicis brevis 110
- Flexor pollicis longus 110

G

- Gastrocnemius 194
- Gemellus inferior & superior 170
- Geniohyoid 130
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- Gluteus medius 170
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I

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- Infrahyoids group 130
- Infraspinatus 86
- Intercostals, external 154
- Intercostals, internal 154
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- Interspinale 144
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L

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- Levator ani 158
- Levator costae 154
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Muscles – Alphabetical List

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Oblique capitis inferior	138	Semispinalis	146
Oblique capitis superior	138	Semispinalis capitis	138
Obturator externus	170	Semitendinosus	186
Obturator internus	170	Serratus anterior	78
Occipitofrontalis	130	Serratus posterior superior	154
Omohyoid	130	Serratus posterior inferior	154
Opponens digiti minimi	114	Soleus	194
Opponens pollicis	110	Spinalis	146
Orbicularis oculi	128	Sphincter urethrae	158
Orbicularis oris	128	Sphincter urethrovaginalis	158
P		Splenius capitis	138
Palmar interossei	114	Splenius cervicis	138
Palmaris longus	102	Sternocleidomastoid	138
Pectineus	178	Sternohyoid	130
Pectoralis major	86	Sternothyroid	130
Pectoralis minor	78	Stylohyoid	130
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Peroneus longus (fibularis longus)	194	Subscapularis	86
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Pronator teres	94	Teres minor	86
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Psoas minor	165	Thyrohyoid	130
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Pterygoid, medial	130	Tibialis posterior	194
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Rectus capitis posterior minor	138	Z	
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Rhomboid minor	78		
Risorius	128		

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

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