A Treatise on the
Functional Pathology of the Musculoskeletal System:
Volume One — Introduction

Preface

This Preface presents the developmental history of this four-volume treatise on the functional pathology of the musculoskeletal system (ie, this Treatise), in the course of which numerous major contributing individuals are acknowledged.

Genesis and Acknowledgments
Summary

Key terms and concepts: biomechanics, cardiovascular system, dysfunction, high velocity/low amplitude, integrative medicine, maintenance care, manual therapy, musculoskeletal system, organs, osteopathic cranial manipulative medicine, osteopathic manipulative medicine, osteopathic manipulative treatment, muscle energy, myofascial release, paradigm, reliable/reliability, soft tissue/articulatory, strain/counterstrain, tissues, valid/validity

Genesis and Acknowledgments

This Treatise began in the mid-1960s with zucchini casserole! Much to the distress and protests of my siblings and me, one evening my mother presented this dish to us for dinner, which came as a great shock insofar as before then we were fed a steady diet of meat, potatoes, vegetables (often from a can), white bread, and the occasional salad. This sudden change in diet was a result of my mother having met Hadley Cecil Perrin (1902-1973), a "physical culturalist"[1] who practiced manipulation, massage, nutrition, and "energy medicine" in Ontario, Canada. As a life mentor, he inspired me by his deep sincerity, spirit of service, and admonition to "think for yourself."

Robert Storey (1920-1987), my speech teacher and debate coach at Elmhurst High School in Fort Wayne, IN, provided the academic highlight of my high school years. His mentorship in basic concepts of logic, outlining skills, and—of course—public speaking played a foundational role in the generation of this Treatise. His insight that we "think with our bodies, not just our brains" was not only generations ahead of his time but has also been foundational to the Functional Pathology of the Musculoskeletal System (FPMSS) *paradigm*.

In the early 1970s, during my undergraduate years as a philosophy and premedical student at Earlham College in Richmond, Indiana, I was especially inspired by Len Clark, PhD (1941-), whose admonition to "question your

[1] Non-MD health care providers in Ontario were licensed under the "drugless practitioner" act.

assumptions" remains at the forefront of my consciousness.[2] In 1973, I read The Natural Mind by Andrew Weil, MD (1942-), which offered a nascent critique of the limitations of what was at that time mainstream medicine. Subsequently, lending gravitas to both the nutritional consciousness to which Mr. Perrin had introduced me as well as the limitations of mainstream medicine indicated by Dr Weil, when I read Nutrition Against Disease by Roger J. Williams, PhD (1893-1988) (Williams, 1973),[3] I decided that it was time to scrutinize my choice of health care profession. For my junior-year independent study at Earlham, I produced three public presentations on the philosophical underpinnings of a spectrum of healing traditions. These presentations were the launching pad for my explorations into what is now referred to as *integrative medicine.*

This trajectory was surprising given that I grew up in a family that worshipped mainstream medicine. Understandably so, as my grandparents were born in the 19th century, shortly after anesthesia was developed and germs were first recognized as a cause of disease. They witnessed the ravages of the Great Influenza Epidemic of 1918. My parents were born in the first half of the 20th century, when various vitamins and hormones were discovered and before antibiotics and steroids were available. In 1929, at age 6 years, my father and his identical twin survived whooping cough (pertussis) after, failing any other options, my grandparents acted on the advice of their physician to "take the boys to Florida for fresh air and sunshine"—long before the importance of vitamin D[4] was appreciated. In the 1950s, as my mom and dad started their family, the polio epidemic continued to present an ever-present worry. The wonder of the polio vaccines, along with major advances in psychopharmacology, only served to reinforce the blessings of modern medicine. The headline-grabbing advances in health care in the century before I entered medical school were primarily the result of improved understanding of biology and biochemistry—**not *biomechanics***.[5]

So, it was not without some angst and weathering of family concern that I chose to be an osteopathic physician and entered the Chicago College of Osteopathic Medicine (CCOM) in 1975. I was motivated by my resonance with the stated osteopathic philosophy (which, in a nutshell, was that the body was an integrated whole system and that the integrity of that whole system ["the host"] was just as important in determining health/disease as were the germs, toxins, and traumas to which it was exposed) and a curiosity about manipulative medicine—as

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[2] In recent years, I have had the much-appreciated opportunity to again be mentored in Western philosophy by my friend Len Clark, PhD.

[3] Dr Williams discovered vitamin B_5 and played a central role in discovering folic acid and other B vitamins. In Nutrition Against Disease he cited 1100 references to the scientific literature, recommended a diet of "a wide variety of whole, natural foods and a multivitamin as an insurance policy"—a radical notion at the time.

[4] Except for its role in rickets.

[5] Surgery might be understood as biomechanical, but surgery would likely be but little advanced over the century without anesthesia.

“hands-on healing” was an ancient and ubiquitous (Lomax, 1975; Pettman, 2007) theme among the “alternative” traditions—a theme that persisted into the second half of the 20th century despite being under considerable political assault from mainstream medicine as an “unscientific” practice. Along with my curiosity came a strong intuition that an approach so enduring ought ultimately to be understood scientifically and soundly practiced under the guidance of scientific principles. My family background, as well as my strong scientific undergraduate education, tempered my curiosity with skepticism, so I entered CCOM with an active but scrutinizing interest in *osteopathic manipulative medicine* (OMM).

At CCOM, OMM Department Chair Norman Larson, DO (1913-1993), along with OMM Department faculty members Robert E. Kappler, DO (1934-2017), and Mark Walton, DO (1944-2014), instructed me in OMM. Our textbook was Osteopathic Diagnosis and Techniques, written by Mark Walton’s father, William Walton, DO (1916-1992) (Walton, 1970). The “Chicago model” (Fraser Strachan, 1908-1985) in which I was trained consisted of learning two patterns of spinal *dysfunction* (single vertebra and group) and two patterns of sacral dysfunction (“anterior” and “posterior”), along with aspects of appendicular and rib dysfunction. Training in *osteopathic manipulative treatment* (OMT) was limited to *high velocity/low amplitude* (HVLA) along with *soft tissue/articulatory* techniques. At that time, other OMT models were just beginning to gain traction within the profession, including *strain/counterstrain* (Lawrence “Larry” Jones, DO, 1912-1996), *myofascial release* (Robert C. Ward, DO, 1932-), *muscle energy*[6] (Fred Mitchell Sr, DO, 1909-1974), and *osteopathic cranial manipulative medicine* (OCMM) (William Garner Sutherland, DO, 1873-1954, and Charlotte Weaver, DO, 1884-1964).

CCOM’s Psychiatry Department Chair John Lee, MD (1904-1979), was a special mentor to me as I completed a year of undergraduate fellowship in the Psychiatry Department. Like Mr Perrin and Dr Clark before him, Dr Lee left me with his distilled wisdoms: "face reality,” “acknowledge uncertainty,” and “have faith in God” (ie, something larger than yourself). My special interest in mind-body medicine dovetailed with my interest in OMM. So, during my fellowship years, I took every opportunity to study with Dr Larson. He had a very rich experience examining seriously ill hospitalized patients. His appreciation for the musculoskeletal reflections of internal disease—also known as “tissue texture changes” resulting from viscerosomatic reflexes—was deep and is difficult to replicate in contemporary times given modern pharmaceutical suppression of pathologic processes. Unfortunately, just as I was beginning to establish a strong mentoring relationship with Dr Larson, he retired for health reasons.

Another organizing focus for my explorations was that I suffered from a chronic upper respiratory tract infection (which I believe was fungal based on history, presentation, response to treatment, and a pathologist’s report). My

[6] Muscle energy was—and remains—the only mechanically based diagnostic system other than the Chicago model.

undergraduate fellowship afforded me the opportunity to explore a rich variety of traditions in an effort to address the infection. Those “adventures” helped me appreciate that symptoms are not always undesirable, but rather that they may be cathartic, healing experiences.

A pivotal experience occurred when I was taking the basic course in OCMM. A few months before the course, I had nasal surgery and had also been treated with multiple long-acting corticosteroid injections. Concurrently, I completed the 10 basic sessions of Rolfing (also known as “structural integration”) (Ida P. Rolf, PhD, 1896-1979) (Rolf, 1977) and was engaged in depth psychotherapy. I felt physically and emotionally exhausted when the OCMM course began. On the second day, my table trainer was Robert C. Fulford, DO (1906-1997), one of the original students of Dr Sutherland. We were learning to palpate the sacral rhythmic impulse.

When the morning session was done, Dr Fulford asked me to lie prone. He placed his thumbs on my sacral base. After a few moments, his body very briefly shook, and he said, “OK, that's better.” I was quite perplexed, as I was unaware that anything had happened other than my being gently touched and his body shaking. I was then quite surprised and pleased when, throughout that afternoon, I felt particularly vitalized and then, in turn, quite discouraged the next morning when my exhaustion returned. Nevertheless, the brief treatment from Dr Fulford caught my attention.

A couple of days later, when I saw Dr Fulford sitting alone in a remote corner of a restaurant, I remembered my Boy Scout admonition to “do a good turn every day.” I thought he might appreciate some company. That was one of the best decisions I have ever made! I was traveling to Tucson, Arizona, the next week for a clinical rotation. Dr Fulford had retired to Tucson after his career-long practice in Cincinnati and lived in an apartment next door to Tucson General Hospital,[7] where I was to be stationed.

During my month in Tucson, I saw Dr Fulford on three occasions. At the first visit he performed a “shock release” and an “umbilical release”—both of which were on my abdomen. As open-minded as I thought I was, those techniques seemed extremely strange to me given my OMM training at CCOM that focused on the spine and ribcage. I was very skeptical that they would have any clinical effect. However, beginning a few hours after the treatment and throughout the subsequent 10 days, I had a dramatic positive psychological response and physical catharsis. Even though I was seemingly acutely severely ill with a respiratory tract infection, my vitality was distinctly improved. I was sufficiently inspired by my experience with Dr Fulford that month to seek and successfully obtain an internship at Tucson General Hospital.

[7] Tucson General Hospital, which opened in 1949, closed in 2000. All records of the hospital are archived with the Tucson Osteopathic Medical Foundation.

During my internship year, Dr Fulford reentered the practice of OMM in a limited capacity, caring exclusively for pediatric patients. Fortunately, he was willing to continue treating me with his novel version of OMM, and I continued to have a succession of dramatic cathartic reactions that fit a distinctive progressive pattern (building on similar experiences I had from other “alternative” interventions prior to meeting Dr Fulford). This pattern is one that he would often describe to his patients as “unpeeling an onion one layer at a time.”

Upon completing my internship, I was unencumbered by personal or financial obligations, and it was still commonplace for a physician to enter general practice after a rotating internship without completing a residency. My hopes to be closely mentored by Mr Perrin, Dr Lee, and Dr Larson had been thwarted by their deaths or disability. Dr Fulford was aged in his mid-70s when I finished my internship. Only one residency was available in OMM, the professors for which held Dr Fulford in very high regard. These factors compelled me to seize the moment—lest I miss a “once in a lifetime” opportunity—to be closely mentored by Dr Fulford. I asked him for mentorship without any definitive plans as to what professional practice into which it might lead me.

Dr Fulford welcomed me, and I set up an office directly across the hall from his with the intention of practicing OMM as a specialist—though in 1981, the specialty received no political recognition.[8] Suddenly, and on the strength of Dr Fulford’s reputation, patients whom he had excluded from his practice[9] began—often desperately—knocking at my door: adult patients with severe, chronic, multiregional musculoskeletal pain. This patient group was one of the two that physicians in the early 1980s found the least attractive for whom to care[10]—the other being dying children (ie, pediatric oncology patients). My 6 years of osteopathic medical training had not well prepared me for this challenge.

But I could not pass up the opportunity to learn as much as I could from Dr Fulford, and the effort to help this very challenging population resonated with my core motivations to be a physician: to be of service as well as to discern and advance the scientific basis of OMM. Forty years later, this class of patient remains my clinical focus, although I also have had successful experiences helping patients with other conditions. Notably, as the years have gone by, various allied health care providers (physical therapists, functional optometrists, massage therapists, biofeedback practitioners, acupuncturists, dentists, and psychologists being the most notable examples) have often enhanced my

[8] It would be almost a decade later before the first OMM specialty board was formed—the American Osteopathic Board of Special Proficiency in Osteopathic Manipulative Medicine, which subsequently became the American Osteopathic Board of Neuromusculoskeletal Medicine. My certificate is #100.
[9] Adults and anyone with “low back pain,” workman’s compensation claim, or a personal injury claim (usually a motor vehicle accident).
[10] “Pain management” as a subspecialty of anesthesiology had yet to fully emerge.

successes, and, in turn, my efforts have often facilitated their successes—by my discovery and successful treatment of otherwise unrecognized *musculoskeletal system* (MSS) dysfunction.

In 1981, I suspect that I was like many new physicians when my lifetime professional goal was to just approximate the wisdom, skill, and success of my mentor. While under Dr Fulford's tutelage (1981-1985), I did focus my study on learning his clinical approach and his unique manipulative technique. However, the clinical challenges I faced forced me to think critically about not only his approach but also the Chicago model, other models of OMM (which I studied in various continuing medical education settings), and the spectrum of then-emerging physical medicine practices: the “flexion exercises” of Paul Williams, MD (1900-1978) (Williams, 1937; 1965); the “trigger point” model of Janet Travell, MD (1901-1997), and David Simon, MD (1922-2010) (Travell & Simons, 1983); the “extension exercises” for “low back” pain of Robin McKenzie, PT (1931-2013) (McKenzie, 1991); and various “work hardening” protocols then in vogue.

A couple of cases were pivotal in starting me along the path that generated this Treatise (see Case Example P-1 and Case Example P-2). All case histories presented in this Treatise are cases from my actual practice that have been deidentified according to the standards established for protecting human subjects in formal research. Whenever feasible, explicit permission from the patient has also been obtained.

Case Example P-1
One afternoon during the first couple months of my practice, Dr Fulford called me across the hall and asked me to help him treat a 35-year-old man whom he had cared for from birth. He was frustrated that he had been “unable to get his pelvis loose.” Well, as a young physician seeking to emulate Dr Fulford, I was honored, skeptical, and frankly overwhelmed by the notion that I would have anything constructive to add to his efforts. Given that the “Fulford approach” had been very fully provided, my only option was to fall back on the Chicago model. So, I employed a high velocity/low amplitude (HVLA) technique for a “posterior sacrum.” I was shocked when Dr Fulford said, “You got him loose, and I haven't been able to do that for 35 years.”

Case Example P-2
Another case highlighted some principles foundational to the Functional Pathology of the Musculoskeletal System (FPMSS) paradigm. Within the first several months of my practice, a 76-year-old woman presented with a headache. When I asked her how long she had had the headache, she said, “Since I was 16.” My **unspoken** thought was, “And you expect me to do something about this headache after 60 years? You must be kidding!" So, I asked her why she sought my care now, after so many years. She explained that her headaches had been getting worse in recent months and that she was deeply troubled because she

was taking an increasing amount of potentially addictive medication (a combination of butalbital, aspirin, caffeine, and codeine). I agreed to care for her but expressed to her the unlikeliness of success.

I evaluated her to the best of my ability at that time using Dr Fulford's diagnostic routine. I did not find much musculoskeletal dysfunction with that method. But then having only modest confidence in my diagnostic skills (using the methods of both Dr Fulford and the CCOM) coupled with the low risk of Dr Fulford's percussion vibrator technique—also known as "myofascial release with percussive vibration amplification" (MFRPVA)[11]—and "light touch" osteopathic cranial manipulative medicine, I thought a therapeutic trial was apropos. So, I initiated a trial employing Dr Fulford's methods to her spine along with novice attempts to "balance the cranial mechanism."

When Dr Fulford reached an end point with his OMM techniques, his body would jerk in a manner not dissimilar to the myoclonic jerk many of us experience while falling asleep. He said that was the "release"—that is, an end point. When I attempted to use MFRPVA, I did feel changes in the myofascial structures under my left hand,[12] but I had very little sense of an endpoint of any sort.[13] Nevertheless, I had had enough experience to notice that my patient's myofascial structures were very loose. Just to be confident of an adequate therapeutic trial, I proceeded to use these methods for three or four visits—in spite of lacking confidence that I was accomplishing anything. At that point I surmised that the benefit of MFRPVA, if any, had been maximally achieved. I requested that she cut her analgesic dose in half.

She came back a couple of weeks later and said that her severe headaches had returned. I stated that I was very sorry, but apparently my best efforts had failed. She broke down in tears and pleaded with me to continue. With considerable angst, I considered trying the high velocity/low amplitude (HVLA) skills that I learned at CCOM. My angst was due to what I now know to be the mistaken notion that those techniques to the cervical spine are contraindicated in her age group. Her pleading overcame my concern. I took a deep breath and proceeded.

When I examined her spine using CCOM's methods, it immediately struck me that she exhibited quite a number of spinal dysfunctions, in contrast to the paucity of dysfunctions I found using Dr Fulford's methods. HVLA treatment to address those spinal dysfunctions resulted in numerous cavitations (ie, "pops"). I found these observations very curious, as I had concluded from my MFRPVA efforts that she was very loose. After a couple more sessions during which I applied the HVLA technique, the volume of spinal dysfunctions and cavitations

[11] MFRPVA interfaces an electrically powered percussion vibrator between ones' hands on the patient.
[12] I hold the percussion vibrator in my right hand.
[13] I did eventually achieve a similar level of skill—at least as evidenced by my body responding in a similar manner.

diminished. I again requested that she reduce her analgesic intake.

When she came back a couple of weeks later, she said that she felt “fine.” I was quite surprised! Was it possible that the HVLA technique had been more successful than the seemingly ultrapotent techniques of Dr Fulford? Was it possible that, after 60 years, her headaches could sustainably improve? I was not going to argue with success and continued to employ the CCOM diagnostic model and provide HVLA treatments for a couple more sessions, noting further progressively decreasing numbers of spinal dysfunctions along with corresponding decreasing cavitations upon HVLA treatment. She was successfully tapered entirely off pain medication. Upon a chance encounter 18 months later, she reported taking no medication for pain and no recurrence of headache.

I learned three crucial lessons from these two cases: (1) it is possible to not merely manage with medication, to not merely maintain with repeated treatment, but to actually **resolve** a musculoskeletal pain syndrome of decades-long duration; (2) it is **perhaps**[14] possible to **resolve** a pattern of decades-long dysfunction; and (3) myofascial release with percussive amplification (MFRPVA)—while clearly a powerfully effective form of mobilization—is not a panacea. As I reflected on these and similar experiences, Dr Fulford's strong admonition that “diagnosis is the key”[15] came into sharper focus for me.

These cases also illustrate that even though my diagnostic skills were novice and the FPMSS paradigm had not yet begun to form in my mind, my evaluation of **motion**—in contradistinction to **posture/structure**—was potent. While I strongly believe that my mature evaluation is much more potent, the cases highlight a major “conceptual shift” embedded in the FPMSS paradigm: a shift from organizing diagnostic thinking, language, and interpretation primarily upon disturbance of posture/structure to, instead, motion.[16]

Dr Fulford’s practice was distinctly different from a general or family practice in which a DO employs OMM. His skill and singular focus on OMM, along with other

[14] I did not reexamine her upon the chance encounter 18 months after her last OMT session. Even if I had, the sophistication (reproducibility and quantifiability) of my diagnostic method and documentation thereof was nascent.

[15] In most fields of 21st century medicine, that admonition may seem ridiculously obvious; however, in both pain medicine in general (where, so often, the source of pain is obscure) and in OMM specifically (where diagnostic models are largely discordant with one another, being largely bound to a treatment technique), the admonition remains profoundly apropos.

[16] From inception, the osteopathic profession has concerned itself with evaluation of **both** posture/structure and movement; however, the admixture of addressing those questions—instead of rigorously separating them—has been highly problematic and limiting, as will be shown in a variety of respects throughout this Treatise.

physicians' requests that he consult on and care for their patients, deemed him worthy of the label "specialist." However, OMM as a specialty was then ill defined and politically controversial. So, other than simply modeling my practice after his, I had little notion of what it meant to be a "specialist" in OMM. One day, I received a consultation note from a cardiologist to whom I had referred a patient. I read the well-reasoned and very thorough three-page report focused on the *cardiovascular system* (CVS) and thought, "This is an example of how a specialist in the CVS thinks and practices." I then asked myself, "How does a MSS specialist think and practice?" Then it hit me: I did not know what the musculoskeletal **system** was. I knew what muscles, joints, bones, and connecting structures were, but I did not know what those were when grouped together as a **system.**

So, I began reasoning by analogy. First, I asked myself, what constitutes a system in general? And second, how is it that the cardiovascular structures are readily understood as a system? Immediately I noticed a difference in taxonomy between the CVS and the MSS. The CVS consisted of ***organs***; the MSS consisted of **bones and "soft *tissues.*"** I then recalled basic histologic principles, which state that only four tissues constitute all the organs of the body.[17] MSS language was not grounded in the otherwise universally applicable and accepted language of histology. What, then, were the **organs** of the MSS? No one had ever posed that question to me.

I had been perplexed by why the woman's headache in Case Example P-2 had resolved after 60 years in response to HVLA treatment but not MFRPVA (as well as by Dr Fulford's patient's response to HVLA). Now, with the question of what constituted an **organ** of the MSS in the forefront of my mind, I realized in retrospect that she had had substantial dysfunction (loss of range of motion) resulting from her spinal joints and/or periarticular structures but not from the larger myofascial structures of her trunk and neck. She had dysfunction (more clearly defined than in any other adult patient whom I recall) generated by specific musculoskeletal organs and not by other musculoskeletal organs.

And, as the muscle energy OMM model was then coming into vogue, it further occurred to me that perhaps one reason a given patient would respond to a certain type of technique but not another was that a given technique more effectively addressed dysfunction of certain organs and less effectively other organs. The label "muscle energy" embedded the notion that if hypertonicity and/or microfibrosis of the organ **"muscle"** was the mechanism limiting motion, then muscle energy techniques might more likely be effective than, for example, if the microfibrosis of the organ **"ligament"** was the mechanism, in which case HVLA techniques might more likely be effective. Thus, I began my list of the organs constituting the MSS and made my first presentation of what became the FPMSS paradigm for medical students and interns at Tucson General Hospital in

[17] Nervous, connective, muscular, and epithelial. Henceforth in this Treatise, the non-bone components of the MSS are referred to as "soft structures."

1983. It was a two-page outline that matured into a 100-page outline by the time I began the narrative version of this Treatise in the early 2000s.

It was in the ferment of these early experiences—attempting to help tertiary multiregional chronic pain patients, emulating Dr Fulford, seeking to establish an identity as a specialist in OMM, and interacting with other OMM practitioners as well as physical therapists, various medical specialists, dentists, and a psychologist (an early practitioner of biofeedback and enduring friend Robert Crago, PhD [1948-], who was associated with one of the early pain clinics at the University of Arizona)—that I came across several articles published in *The Journal of the American Osteopathic Association* (Beal et al, 1980, 1982; Dinnar et al, 1980; Dinnar et al, 1982; McConnell et al, 1980).

Michigan State University College of Osteopathic Medicine—the first osteopathic medical school to be associated with a major university—had attracted many renowned senior OMM practitioners to join the faculty. It was well understood that establishing interexaminer *reliability* is fundamental to scientific validity and acceptance of OMM. It seemed an ideal setting to evaluate interexaminer reliability of OMM palpatory diagnosis. Unfortunately, just the opposite was reported in these articles: interexaminer reliability was poor.

But what struck me more deeply was that—apparently—the experts' diagnostic methods were not standardized and, thus, were not likely addressing the same questions. In other words, as is discussed in Chapter One, whether a test yields **reliable data** and whether it is **construct *valid*** are separate questions. While it is conceptually possible that an invalid construct will yield reliable data, when tests (a method) do not satisfy conditions necessary for construct validity, then the likelihood of reliable results is significantly diminished. In the aforementioned studies, failure to consciously ask the same question about the body and to use the same (content and internally valid) evaluative techniques very likely undermined any chance of demonstrating interexaminer reliability.

At that time, I felt that my biggest professional challenge was mastering my treatment skills and defining myself as a specialist. However, the interexaminer reliability articles, in conjunction with the aforementioned clinical cases and others, added an additional challenge—galvanizing my academic focus on finding a **scientific** method of diagnosing musculoskeletal dysfunction. Therefore, the motivation for and organizing focus of the FPMSS paradigm presented in this Treatise is to establish a **scientific, construct valid method** for evaluating function and dysfunction of the MSS when understood as an organ system. To this day I view this effort as central to whatever clinical success I may have, to my identity as a specialist, and to confirming my premedical intuition that OMM will eventually be scientifically verified and valued.

After a few years under Dr Fulford's tutelage, I moved to St. Paul, Minnesota, and opened a private practice. I also concurrently served as a consultant in the

Orthopedic Surgery Department at the Park Nicollet Medical Center (PNMC), a large multispecialty group practice staffed by MDs trained at many of the country's most prestigious medical centers. Dale Anderson, MD (1933-), a general surgeon who practiced orthopedic medicine in the department, was pivotal in securing opportunity and supporting me in that consulting practice.

Notably, the health maintenance organization (HMO) penetration rate of the Minnesota marketplace was very high. Consequently, I felt considerable pressure at PNMC to resolve my patients' chronic pain complaints **and** to do so promptly, as HMO insurance plans would not support "*maintenance care.*" My sense was that employing the MFRPVA technique would prove too strange for my MD colleagues at PNMC, so I left the percussion vibrator at my private office. This complex set of circumstances forced me to explore even more deeply the diagnostic aspects of my work. During my years at PNMC, I developed an enduring friendship and intellectual collaboration with John T. Schousboe, MD, PhD (Rheumatology) (1955-), who is now internationally recognized as an authority on osteoporosis. Dr Schousboe has often provided valued feedback and scientific mentorship during the development of the FPMSS paradigm.

After 3 years in Minnesota, I returned to Tucson and took a position as a full-time academic faculty member in the Section of Orthopedic Surgery at the University of Arizona College of Medicine. To the best of my knowledge, it was a "first of its kind" position for an OMM practitioner at a major allopathic academic medical center and clearly controversial. As was true for my MD colleagues at PNMC, considerable social courage was demonstrated by my new colleagues in welcoming me, including Head of the Section of Musculoskeletal Radiology Michael J. Pitt, MD (1938-); Head of the Department of Radiology M. Paul Capp, MD (1930-); Interim Head of the Department of Surgery and former Head of Orthopedic Surgery Leonard F. Peltier, MD, PhD (1920-2003); Head of the Section of Rheumatology Eric P. Gall, MD (1942-2020); and Head of the Section of Orthopedic Surgery Robert G. Volz, MD (1932-); as well as all of the other then-members of the Section of Orthopedic Surgery. At the University of Arizona, not unlike at PNMC, I felt considerable pressure to not only excel as a clinician but also to sharpen my ability to effectively and succinctly communicate to my MD colleagues the scientific **rationale** underlying my OMM clinical practice.

Over the years, my role as an educator has also galvanized my effort to elucidate and communicate the FPMSS paradigm. A major effort in that regard began in 1988 just before I returned to Arizona when Mark R. Bookhout, PT, MS, FAAOMPT, CFMM (1953-), and I formed a business partnership (Biomechanix) for the purpose of presenting seminars on FPMSS to PTs, MDs, and DOs.

Collaborating with Mr Bookhout played a pivotal role in the development of my thinking, especially with respect to discriminating questions of available motion from questions of control of movement and posture. He had spent considerable time and effort learning and teaching OMM, especially the muscle energy model,

under the guidance of Phillip E. Greenman, DO (1928-2013)—one of the original students of Fred Mitchell Sr, DO. When we decided to visit each other's practices, I assumed that he would be practicing muscle energy *manual therapy*. In contrast, I saw an entirely different approach to patients with musculoskeletal pain, one that I came to characterize as "neuromuscular reeducation"[18] based on an entirely different set of diagnostic and therapeutic efforts than those that were then part of the OMM tradition.

In preparation for the seminars, Mr Bookhout and I took courses in the models of rehabilitation advocated by Arthur Lincoln Pauls, DO (1929-1997) ("ortho-bionomy"); Moshe Feldenkrais, DSc (1904-1984) ("Awareness Through Movement") (Lyttle, 1997); and Vladimir Janda, MD, DSc (1928-2002) (postural distortion due to muscle imbalance) (Page, 2006), as well as an early course in "spinal stabilization exercises." We presented seminars on seven occasions thanks to the much-appreciated sponsorship of PNMC and the Tucson Osteopathic Medical Foundation.

After several years of work at the University of Arizona, which included observing many orthopedic surgeries and caring for All-American athletes along with wide acknowledgment from my colleagues, I was itching to find a position that would support substantial teaching of the FPMSS paradigm. Much to my surprise and delight, Department Chair of Osteopathic Principles and Practice John C. Glover, DO, MS (1951-), at the University of Health Sciences College of Osteopathic Medicine in Kansas City, Missouri, had the humility to acknowledge to me that "we are not getting the job done" (insofar as a very low percentage of DOs practiced OMM) and the courage to welcome someone with a set of ideas challenging established OMM thought. So, I took a position in that department in 1996. The experience of educating first and second year osteopathic medical students further sharpened my thinking—especially about spinal mechanics—and confirmed that the FPMSS paradigm can successfully be taught to beginners. During the 3 years that I served in that department, I developed a very beneficial academic partnership with Michael M. Patterson, PhD, DO (Hon) (Experimental Psychology) (1942-22), an internationally renowned neuroscientist and osteopathic educator.

In more recent years, I have had the privilege to participate in various research projects at the A.T. Still Research Institute in Kirksville, Missouri, which is under the leadership of Brian F. Degenhardt, DO (Family Medicine and OMM) (1962-). Dr Degenhardt is one of the world's premier researchers in the field of OMM and has played an important role in my ongoing scientific development. Additionally, the logistical support provided by Dr Degenhardt and A. T. Still University have significantly facilitated bringing Volume One to completion.

David Griesemer, MD (Pediatric Neurology) (1951-), warrants very special

[18] Neuromuscular reeducation is a form of physical medicine intended to improve a patient's orchestration of their posture and/or movement.

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Summary

Years of clinical experience facilitating resolution of many chronic, complex, multiregional, nonspecific pain syndromes from "head to toe and everything in between" have convinced me and my protégés that no substitute exists for understanding and evaluating the **entire** MSS to adequately address any given region of pain. Additionally, as will become clear throughout this book, the central question organizing the FPMSS compels it. Using the FPMSS paradigm, I have also contributed to the successful care of patients with a variety of other clinical conditions, including persistent postconcussion syndrome, spinal deformity, a wide variety of developmental delays, and some congestive and/or dysautonomic disorders of the respiratory and gastrointestinal tracts.

I sincerely hope that the reader will find within these volumes the conceptual and diagnostic tools to distinctly improve his or her care of patients suffering from these vexing syndromes—as, I believe, they pivotally have for my patients.