THE AAO
JOURNAL
A Publication of the American Academy of Osteopathy

TRADITION SHAPES THE FUTURE • VOLUME 11 NUMBER 1 SPRING 2001

2001 CME Calendar

March
19-21
Visceral Manipulation Workshop (Emotional/Trauma)
The Broadmoor
Colorado Springs, CO
Hours: 24 Catebory 1A

22-25
AAO Convocation
The Broadmoor
Colorado Springs, CO
Hours: 28-31 Category 1A

May
4-6
Prolotherapy/Above the Diaphragm
UNECOM
Biddeford, ME
Hours: 20 Category 1A

18-20
New Advances in HVLA
Midwestern University/CCOM
Chicago, IL
Hours: 20 Category 1A

19-20
Fulford Percussion Technique (Basic)
Renton, WA
Hours: 14 Category 1A

June
1-3
Introduction to OMT/Muscle Energy
St. Vincent Marten House Hotel
Indianapolis, IN
Hours: 20 Category 1A

July
6-8
Osteopathic Considerations in Systemic Dysfunction
UNTHSC at Fort Worth/TCOM
Fort Worth, TX
Hours: 20 Category 1A

28-29
Alleviation of Common, Chronic Pain by Optimization of Normal Posture
Chicago Marriott Downtown
Chicago, IL
Hours: 16 Category 1A

August
16-19
OMT Update at WDW®
Contemporary Hotel
Buena Vista, FL
Hours: 23 Category 1A

September
13-16
Introduction to HVLA Basic
Nugget Hotel
Reno, NV
Hours: 23 Category 1A

The Still Technique: A Manipulative Method of Andrew Taylor Still, MD
Nugget Hotel
Reno, NV
Hours: 23 Category 1A

October
5-7
Prolotherapy/Below the Diaphragm
UNECOM
Biddeford, ME
Hours: 20 Category 1A

21-25
AOA/AAO Convention
San Diego, CA

November 30-December 2
Visceral Manipulation (Abdominal/GI)
St. Vincent Marten House Hotel
Indianapolis, IN
Hours: 24 Category 1A

For more information, contact:

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THE AAO JOURNAL
A Publication of the American Academy of Osteopathy
TRADITION SHAPES THE FUTURE

The mission of the American Academy of Osteopathy is to teach, advocate, advance, explore, and research the science and art of osteopathic medicine, emphasizing osteopathic principles, philosophy, palpatory diagnosis and osteopathic manipulative treatment in total health care.

Editorial Section

Peer-Reviewed Section

Instructions to Authors

The American Academy of Osteopathy (AAO) Journal is a peer-reviewed publication for disseminating information on the science and art of osteopathic manipulative medicine. It is directed toward osteopathic physicians, students, interns and residents and particularly toward those physicians with a special interest in osteopathic manipulative treatment.

The AAO Journal welcomes contributions in the following categories:

Original Contributions
Clinical or applied research, or basic science research related to clinical practice.

Case Reports
Unusual clinical presentations, newly recognized situations or rarely reported features.

Clinical Practice
Articles about practical applications for general practitioners or specialists.

Special Communications
Items related to the art of practice, such as poems, essays and stories.

Letters to the Editor
Comments on articles published in *The AAO Journal* or new information on clinical topics. Letters must be signed by the author(s). No letters will be published anonymously, or under pseudonyms or pen names.

Professional News of promotions, awards, appointments and other similar professional activities.

Book Reviews
Reviews of publications related to osteopathic manipulative medicine and to manipulative medicine in general.

Note
Contributions are accepted from members of the AOA, faculty members in osteopathic medical colleges, osteopathic residents and interns and students of osteopathic colleges. Contributions by others are accepted on an individual basis.

Submission
Submit all papers to Anthony G. Chila, DO, FAAO, Editor-in-Chief, Ohio University, College of Osteopathic Medicine (OUCOM), Grosvenor Hall, Athens, OH 45701.

Papers submitted to *The AAO Journal* may be submitted for review by the Editorial Board. Notification of acceptance or rejection usually is given within three months after receipt of the paper; publication follows as soon as possible thereafter, depending upon the backlog of papers. Some papers may be rejected because of duplication of subject matter or the need to establish priorities on the use of limited space.

Requirements for manuscript submission:

Manuscript
1. Type all text, references and tabular material using upper and lower case, double-spaced with one-inch margins. Number all pages consecutively.

2. Submit original plus three copies. Retain one copy for your files.

3. Check that all references, tables and figures are cited in the text and in numerical order.

4. Include a cover letter that gives the author's full name and address, telephone number, institution from which work initiated and academic title or position.

5. Manuscripts must be published with the correct name(s) of the author(s). No manuscripts will be published anonymously, or under pseudonyms or pen names.

6. For human or animal experimental investigations, include proof that the project was approved by an appropriate institutional review board, or when no such board is in place, that the manner in which informed consent was obtained from human subjects.

7. Describe the basic study design; define all statistical methods used; list measurement instruments, methods, and tools used for independent and dependent variables.

8. In the "Materials and Methods" section, identify all interventions that are used which do not comply with approved or standard usage.

Computer Disks
We encourage and welcome computer disks containing the material submitted in hard copy form. Though we prefer Macintosh 3-1/2" disks, MS-DOS formats using either 3-1/2" or 5-1/4" discs are equally acceptable.

Abstract
Provide a 150-word abstract that summarizes the main points of the paper and it's conclusions.

Illustrations
1. Be sure that illustrations submitted are clearly labeled.

2. Photos should be submitted as 5" x 7" glossy black and white prints with high contrast. On the back of each, clearly indicate the top of the photo. Use a photocopy to indicate the placement of arrows and other markers on the photos. If color is necessary, submit clearly labeled 35 mm slides with the tops marked on the frames. All illustrations will be returned to the authors of published manuscripts.

3. Include a caption for each figure.

Permissions
Obtain written permission from the publisher and author to use previously published illustrations and submit these letters with the manuscript. You also must obtain written permission from patients to use their photos if there is a possibility that they might be identified. In the case of children, permission must be obtained from a parent or guardian.

References
1. References are required for all material derived from the work of others. Cite all references in numerical order in the text. If there are references used as general source material, but from which no specific information was taken, list them in alphabetical order following the numbered journals.

2. For journals, include the names of all authors, complete title of the article, name of the journal, volume number, date and inclusive page numbers. For books, include the name(s) of the editor(s), name and location of publisher and year of publication. Give page numbers for exact quotations.

Editorial Processing
All accepted articles are subject to copy editing. Authors are responsible for all statements, including changes made by the manuscript editor. No material may be reprinted from *The AAO Journal* without the written permission of the editor and the author(s).

Editorial Review

From the Editor

by Anthony G. Chila, DO, FAAO

Acknowledge ability and service to the Academy and to the profession

Contributions from recently conferred Fellows of the American Academy of Osteopathy are featured in this issue. Kenneth E. Nelson, DO, FAAO has kindly provided us with a *Special Communication* regarding work done by him and his colleagues (N. Sergueef and T. Glonek). This communication briefly summarizes Changes in the Traube-Hering Wave following cranial manipulation.

The full paper addressing the group's observations is scheduled for publication in an upcoming issue of the *Journal of the American Osteopathic Association (JAOA)*.

Scientific Papers/Theses submitted for Fellowship Status in the AAO (conferred in 2000) are presented. Daniel D. Janiak, DO, FAAO, offers a Review of Sacral Somatic Dysfunction. The paper addresses the following considerations: Anatomical landmarks; Planes of motion; Types of dysfunction; Diagnosis and treatment; Sacral base unleveling; The common compensatory pattern. The sacrum, as always, remains a challenging subject in osteopathic practice. R. Paul Lee, DO, FAAO discusses The primary respiratory mechanism beyond the craniospinal axis. A proposal for application of the cranial concept to the body in general considers three basic precepts: Inherent motility of organs; Reverberation of water and its dissolved, biological and electrical elements; Tensegrity and passive mobility of all connective tissues. The influence of literature citations of work done in these areas outside of the United States is noteworthy.

"There are other fields of research. May my grand army march on. If we cannot have the pure osteopathic principles taught in our schools, I hope the faithful will rally around the flag and we will build an international school that will offer no compromise unless it is the golden truth. D.O. Means DIG ON."

Michael A. Seffinger, DO, FAAP presents a concise *Book Review* of The Muscle Energy Manual: Evaluation and Treatment of the Pelvis and Sacrum, Volume Three (Mitchell and Mitchell). Readability is insured by the writing style, enhanced by historical references and discussions of controversies in the current medical literature. Robert T. Kellam, DO provides a veteran practitioner's view of management of herniated lumbar discs in *Letter to the Editor*.

Research issues are addressed in *From the Archives* as well as *Dig On*. The two columns offer a Back to the Future perspective of the osteopathic profession's efforts to engage in the basic and clinical study of its premises, practice and role in health care delivery.

Message from the President provides an excellent overview of the accomplishments of the American Academy of Osteopathy during the past decade. John M. Jones, III, DO has served the osteopathic profession well during his tenure in the AAO trans-millennial period. *Message from the Executive Director* should be read carefully by ALL osteopathic physicians. Stephen J. Noone, CAE brings to attention the increasing worldwide spread of osteopathy as well as its influence on healthcare in the United States. In the numerous examples cited, the influence of President John M. Jones is acknowledged. The comments in the two messages were certainly anticipated by A.T. Still on August 1, 1915:

"There are other fields of research. May my grand army march on. If we cannot have the pure osteopathic principles taught in our schools, I hope the faithful will rally around the flag and we will build an international school that will offer no compromise unless it is the golden truth. D.O. Means DIG ON."

Tradition Shapes the Future.

❐

Letter to the Editor

Dear Dr. Chila

William J. Swords, DO wrote a most interesting article, " Low Back Pain: Cost and treatment", in the Winter 2000 issue of *The AAO Journal*. He should be complimented for the study that he has conducted on 62 of his patients with low back problems. In perusing his article, I wish to make a few comments. The effectiveness of OMT in the treatment of low back injuries has been well established for many years, but the effectiveness varies with the experience and manipulative skills of the physician. Seventy-nine percent of Dr. Swords patients needed no other treatment other than OMT. It would be my guess that with further experience, his success rate using manipulation should rise closer to 100 percent. However, his statistical data should gain the attention of third-party payors if the cost of his management of low back injuries is drastically less than those of physicians not employing OMT. Around 1950, I was told that the Workman's Compensation Board of the State of New York reported the cost of low back treatment by osteopathic manipulation was $15, medical management $300 and surgical treatment was $3,000. They did not consider the effectiveness of the treatment, just the cost. Needless to say, the Compensation Board was more than willing to honor the treatment offered by competent DOs, employing manipulative therapy as the prime mode of treatment. In his discussion, Dr. Sword places the discussion of herniated discs under C Surgery, which in the minds of surgeons, might rightfully belong, but not to my way of thinking. In my 38 years of practice, I treated many herniated disc problems with manipulation very successfully. Only upon nine (9) occasions did I find it necessary to refer the patients to a neurosurgeon for disc surgery due to the fact that the patients had extensive osteoarthritis, making manipulative therapy totally ineffective and impossible. As we well know, herniated discs are frequently found on CT Scans and MRIs of the lumbar spine when the patients are totally asymptomatic. The reason for this, as I understand, is that the cause of pain is not due to direct pressure of the disc on the nerve root, but by the stretching of the nerve sleeve from the derangement of the spinal mechanics because of the herniated disc or perhaps due to disturbed low back mechanics.

Also, it is my opinion that most herniated discs are the end result of disturbed spinal mechanics not a condition solely due to a deteriosation of the disc itself. So many times the sudden onset of low back pain, where ruptured discs have been discovered on CT scans and MRIs, the episode arrives after the patient picks up a pencil from the floor, a cough, a sneeze, or any sudden movement, hardly the kind of an episode resulting in a herniated disc. We can be well assured that there was musculoskeletal dysfunction preceding the " trigger mechanism" that precipitated the episode of low back pain. I felt compelled to make these comments to a younger group of DOs who might harbor the idea that manipulation is not indicated for the management of herniated disc problems, or that it is somehow harmful. Nothing can be farther from the truth. Manipulative therapy is the first treatment of choice for herniated discs in the lumbar spine. I remember, some 20 years ago, one of our most distinguished DO orthopedic surgeons, the late John Woods, making the statement that disc surgery at that time was only 22 percent successful. For me, I will opt for manipulative therapy for disc problems until you can prove to me that it will not work in the right hands. Hopefully my remarks might be helpful to some DO facing the herniated disc problem with his or her patient.

Robert T. Kellam DO
Orlando, FL

Message from the President

by John M. Jones, III, DO

As I finish the trans-millennial year as president of the American Academy of Osteopathy (AAO), I would like to express my gratitude to the members and staff of the AAO, and also to the Kirksville College of Osteopathic Medicine for supporting my efforts to serve the osteopathic profession.

The mission of the AAO is to teach, advocate, advance, explore, and research the science and art of osteopathic medicine, emphasizing osteopathic principles, philosophy, palpatory diagnosis and OMT in total health care. Our goal is actually to spread the osteopathic philosophy (healthcare paradigm) until it permeates all healthcare systems. We contribute toward achieving this goal not only through our Academy efforts, but also through the individual efforts of each Academy member. The body works as a unit-but each cell's efforts contribute to the goals of the body.

The following comments about the past decade's achievements-and a decade is a short time in the life of a profession-demonstrate gains for the osteopathic philosophy by the Academy, by our individual members, and by related or similar organizations.

Seeking Health in the AAO

The Academy is following a long-range, strategic plan first developed in 1992 and revised in 1998, with broad representation. This plan includes living within our means-a situation which has shown steady improvement in operating the AAO within a current year income. A significant bequest left to us by Alan Becker, DO, has helped to bolster our reserves. The majority of the work in our organization is done by our committees and staff, which have been doing an excellent job.

Remembering that Academy members account for less than 5% of the osteopathic profession in the United States, here are some encouraging statistics:

* 39.9% membership growth from July, 1991 to July, 2000 (1,243 to 1,739)
* 54% growth in UAAO membership in the same time period (2,157 to 3,324)
* 47 AAO members were delegates; 14 were alternate delegates to the 2000 AOA House of Delegates (approximately 15% of the elected delegates)
* 286 physicians are now certified either in OMM or NMM/OMM.
* 22 new FAAOs have achieved this distinction since 1991.
* Our specialty certification continues under the American Osteopathic Board of Neuromusculoskeletal Medicine (While the name was not what we wanted, continuing our specialty certification was assured.)

AAO/AOA Interaction

* The second AOA-sponsored Educational Policies and Procedures Review Committee (EPPRC-2) conference in July, 2000, asked an invited group of osteopathic leaders whether we should reaffirm that the osteopathic medical profession is indeed a distinctive branch of medicine, or decide that we are not. The consensus after debate: we still are.
* 25% of AOA Health Policy Fellows since its origin in 1995 have been Academy members.

Teach

* Our Education Committee has scheduled 18 programs during 2001.
* We have gone beyond technique courses to include OMM in Systemic Dysfunction courses, offered through the Academy as an AAO outreach to OPTIs.
* The AAO offers teaching on OMT coding for reimbursement at all of our courses
* Six institutions offer OMM residency training at the current time (including multiple sites).
* Combined FP/OMM programs have been created.
* Proposals for new OMM-track combined residencies are being processed.
* Four new osteopathic medical colleges were founded in the United States in the last decade (LECOM, MidwesternU/AZCOM, PCSOM, and TUCOM).
* The AOA mandated the development of Osteopathic Postdoctoral Training Institutions (OPTIs) in the late '90s. Their call for a seamless 7-year curriculum created an opportunity for increased formal instruction in OP&P during hospital training. The AOA eleventh annual Osteopathic Medical Education Conference, held in Chicago last September, continued to promote these efforts.
* The second edition of Foundations for Osteopathic Medicine, the omnibus text/reference book sponsored by the AOA, is now in production. The 1996 edition has sold more than 11,000 copies.
* The *Glossary of Osteopathic Terminology* is being formulated as an osteopathic thesaurus to be included in the National Library of Medicine database.
* The Kirksville and Texas college libraries are working under a grant to produce an osteopathic database including a indexing of all osteopathic literature back to the time of the profession's founding.

Advocate

* The AAO, with all component colleges of the AOA, endorsed and supported the Unity Campaign. Advertisements generated by this campaign have focused on the holistic nature of DO care, as well as the availability of all

continued on page 16

Message from the Executive Director

by Stephen J. Noone, CAE

International growth of osteopathy

Throughout his presidential year, John Jones, DO has documented very well the worldwide spread of osteopathy as well as its influence on modern healthcare in these United States. In this issue of the journal, he describes the impressive contributions of the Academy and its dedicated members to the growth of the osteopathic paradigm. I hope readers will bear with me while I enumerate my own observations and experiences which will illustrate further the scope of the international growth of osteopathy.

As an association executive responsible for professional publications of the Academy, I am genuinely impressed at the quality of international osteopathic journals received in this office since last fall. These publications are one barometer of a more prominent role for osteopathy in the delivery of health care in these international communities. The peer-reviewed *Journal of Osteopathic Medicine*, now in its third year, is published by the Faculty of Health at the University of Western Sydney in Australia. *ApoStill: le journal de l'Académie d'Ostéopathie* is the professional journal of the French Academy of Osteopathy. Editor Bruno Ducoux has expressed keen interest in improving the links between his journal and the AAO's publications. *Osteo: la revue des ostéopathes* is a trilingual (French, English and Italian) European quarterly magazine focusing on osteopathic topics published by editor Michel Coquillat of Marseille, France. *Osteopatía: la revista de los profesionales, alumnos y amigos de la Osteopatía* is a publication of the Foundation of the Argentinean Institute of Osteopathy in Buenos Aires. Finally, Torsten Liem shared with the Academy a new German journal of osteopathy, *Osteopathische Medizin*. Germany now has the distinction of publishing two competing osteopathic journals.

"the impressive contributions of the Academy and its dedicated members to the growth of the osteopathic paradigm"

In addition to the Academy's periodicals, there is considerable interest in translation of the AAO's books-in-print. Over the past several years, I have negotiated three French translation agreements for *The Collected Papers of Viola M. Frymann, DO*; Dr. Thomas Schooley's *Osteopathic Principles and Practice*; and *The Collected Works of Irvin M. Korr*; two AAO Yearbooks into Italian - *The Collected Papers of Irvin M. Korr* and Myron Beal's *Principles of Palpatory Diagnosis and Manipulative Technique*; and Dr. Van Buskirk's new book into Japanese, *Applications of a Rediscovered Technique of Andrew Taylor Still*. The AAO has received overtures for more translation agreements - Fryette's *Principles of Osteopathic Technic* into Italian and Van Buskirk's work into French.

In my ongoing communications to members, I have reported on the increasing number of "hits" to the Academy's Web site <www.academyofosteopathy.org> (The latest data documents 4 million "hits" within the last year, growing to nearly 23,000 per day within the last month.) The predominant "hit" comes from the curious public and consumers seeking an osteopathic physician in their home town. However, we also receive international inquiries from patients, most recently a communication in Spanish from a resident of Puerto Rico who learned about osteopathy from Dr. Andrew Weil's Web site.

However, this Internet presence also attracts students of osteopathy from throughout the world. For example, just last month British-trained osteopaths, Philippe Pailhous and Bernard Quef, advised the Academy of the foundation of a new registry in Brazil, "Registro Brasileiro dos Osteopatas." D. M. Bohra of Lesotho, Africa is anxious to promote osteopathic manipulative treatment in his country for patients presenting with a number of musculoskeletal problems. Similarly, Volodymyr Borets, an allopathic "vertebroneurologist" physician in the Ukraine, wants to network with osteopathic physicians to learn osteopathic principles and practices. International students frequently contact the Academy searching for literature citations and documented research outcomes for use in fulfilling their academic requirement to write a thesis suitable for defense before a professional jury.

Finally, the Academy has officially co-sponsored gatherings of international physicians and osteopaths who

are interested in manual/musculoskeletal medicine. The AAO and its members actively participated in the triennial World Congress on Low Back Pain in La Jolla, CA in 1995 and will do so again at the November 2001 congress in Montreal. In his presidential letter published in the February 2001 issue of *The AAO Newsletter*, Dr. Jones encouraged AAO members to consider participation in the July 2001 World Congress of the International Federation of Manual/Musculoskeletal Medicine (FIMM.) The Academy will sponsor a pre-conference workshop as part of the 2001 FIMM meeting in Chicago. As one of the dues-paying, voting members of FIMM, the Academy also co-sponsored the organization's 1998 World Congress in Australia.

When I arrived at the Academy in 1992, the leadership proposed an ambitious goal "to establish the AAO as the preeminent, worldwide source of education on osteopathy by the year 2000." If not achieved in full, these observations would at least suggest that the Academy has realized that goal to a great extent. However, as with any success, the challenge now becomes to maintain the leadership role which international physicians and osteopaths expect. This will require continued dedication on the part of individual AAO members and a continued commitment of the Academy's resources. I am confident that all of you are capable of accepting the challenge, in the words of Dr. Jones, "to spread the osteopathic philosophy (healthcare paradigm) until it permeates all healthcare systems."❐

Affiliated organization's CME calendar

April 23-26
79th Annual Convention
Arizona Osteopathic Association
Contact: AOMA Office
888-266-6699

April 26-29
Left-Brained Cranial Manipulation
The Cranial Academy
Rosemont (Chicago), Il
Hours: 32 Category 1A
Contact: The Cranial Academy
(317) 594-0411

May 3-6
104th Annual Convention
Indiana Osteopathic Association
South Bend, IN
Hours: 30 Category 1A
Contact: IOA
(800) 942-0501
(317) 926-3009

May 4-6
46th Annual Conference
Florida Academy of Osteopathy
Crystal River, FL
Hours: 20 Category 1A
Contact: Ken Webster
(727) 581-9069

May 18-21
NeuroFascial Release Conference; a new paradigm in osteopathic thought
Arizona Academy of Osteopathy
Contact: Stephen Davidson, DO
(800) 359-7772

June 16-20
June Basic Course
The Cranial Academy
Rancho Mirage, CA
Hours: 40 Category 1A
Contact: The Cranial Academy
(317) 594-0411

June 21-23
Getting a Grip on Low Back Pain
Mark S. Cantieri, DO, FAAO
Thomas H. Ravin, MD
Denver, CO
Hours: 17 Category 1A
Contact: AAOM
303/331-9339

June 21-24
2001 Annual Conference: Special Sensory Systems: Integrating Posture and Balance into the Osteopathic Cranial Concept
The Cranial Academy
Rancho Mirage, CA
Hours: 21 Category 1A
Contact: The Cranial Academy
(317) 594-0411

July 25-28
21st Annual Convention & National Family Practice Update
Orlando, FL
Hours: 30 Category 1A
Contact: Dr. Kenneth Webster
(727-582-9317)
(877/600-9317)

August 9-11
Musculoskeletal Medicine Below the Waist
Mark S. Cantieri, DO, FAAO
Thomas H. Ravin, MD
Denver, CO
Hours: 19 Category 1A
Contact: AAOM
(303) 331-9339

September 1-3 (tentative)
Advancing our Cranial Skills
The Cranial Academy
Location TBA
Hours: 24 Category 1A
Contact: The Cranial Academy
(317) 594-0411

December 7-9
20th Annual Winter Update
Indiana Osteopathic Association
Indianapolis, IN
Contact: I.O.A. office
(800) 942-0501

What Your Will Reveals About You

Your will says something about you. First, it says that you care about your loved ones. You want to make it easier for them by taking care of legal matters relating to the transfer of your estate. You want your affairs handled smoothly and without undue inconvenience to those who will be experiencing grief.

Second, having a will means that you have sought to conserve your estate. You can reduce taxes and probate costs by designating what things will go where and who will be responsible for handling the details. The cost savings resulting from a carefully constructed estate plan means that more of your estate can go to family members and other beneficiaries.

Third, your will provides insight into your lifetime involvements and concerns. Bequests to family members tell of your love and concern for their welfare. And bequests to organizations speak volumes about your values.

For example, when you include the American Academy of Osteopathy in your will, you reveal that caring for others is worthwhile and you affirm your belief in the mission of the Academy. Such action encourages those you leave behind to consider how they can help those in need.

Finally, when you include the Academy in your will, you tell us that you want us to continue to fulfill the mission of the AAO in this world. You reveal your vision for our future! You encourage us to be good stewards of the new resources you place in our hands.

Your will says other things as well about your interests and values and commitments. And because it says so much, you are wise to think it through carefully.

Academy members have been most generous over the years in bequeathing portions of their estates to the AAO. The **Samuel Robuck Fund** supports "pediatric" research and education. The **Floyd Swift Fund** supplements the AAO's efforts to promote OMM. The **Carl Moore Cook Fund** will revert to the Academy after the death of his widow. Over the last decade of the second millennium, the Academy received bequests from seven AAO members - **Alan Becker**, **Louise Estell**, **Robert Fulford**, **Earl Frisbie**, **Rebecca Lippincott**, **Azora Reese Matthews**, and **Mable R. Perkins**. The third millennium just began when the AAO received generous a gift from the estate of **Harold Blood**.

The Academy's leadership wants you to experience the good feelings of having a well-considered and well-crafted will (or other comprehensive estate planning document). We encourage you to take care of this very important matter. If you want to talk with an AAO representative about finding a good attorney or about how to leave a bequest to the Academy, please use the form below to let us know how best to serve you. Or call our executive director Steve Noone at (317) 879-1881.❐

(Please complete and return this reply form.)

Dear Friends at the American Academy of Osteopathy :

_____ Please send me free literature about making a will.

_____ I have already provided a bequest for the AAO in my will.

_____ Please send me information about the Academy's Endowment Fund.

Name:_____

Address:_____

City:_____

State:_____ Zip:_____ Phone:_____

Mail this form to: American Academy of Osteopathy, 3500 DePauw Blvd., Suite 1080, Indianapolis, IN 46268.

Dig On!

The *Journal of the American Osteopathic Association (JAOA)* annually publishes Research Conference Abstracts in advance of the AOA Annual Convention and Scientific Program. The abstracts published for the 44th Annual Research Conference are found in *JAOA Vol 100, No 8, August 2000, 511-21 (Part I) and Vol 100, No 9, September 2000, 579-89 (Part II).*

In the following compilation, it was recognized that various investigators had submitted more than one abstract. Accordingly, selection was made in order to give the broadest representation of investigators whose abstracts had been accepted for publication. In the case of multiple investigators, the primary investigator's name is given. In instances of dual authorship, both names are given.

Part I addressed AOA Research Fellowships, poster presentations on OMM/OPP and Clinical Studies.

The following subjects were noted:

Pham and Kneble:	Effects Of OMT On Knee Osteoarthritis
Rivera-Martinez, et al:	Cranial Strain Patterns In Parkinson's Disease
Capobianco and Protopapas:	Motion Characteristics Of A Typical Cervical Vertebral Unit-A Palpatory Diagnosis Of Sidebending And Rotation Of C3 On C4
Swift, et al:	The Effect Of Paravertebral Manipulation On The Sympathetic Nervous System
Noll, et al:	A Pilot Study Using OMT To Reduce Antibiotic Use In Nursing Home Residents
Werden, et al:	Quantitative Analysis Of Elderly Immune Responses To Influenza Vaccination With Osteopathic Manipulation
Coppola, et al:	Osteopathic Manual Medicine And Acute Injuries
Yates and Johnson:	Opinions Toward The Use Of OMT By Oklahoma DOs Responding To Surveys In 1984 And 1999
Hallas, et al:	A Summary Of Studies Comparing Physical And Pharmacological Treatment Parameters Using An Animal Model Of Arthritis
Vorro and Johnston:	Myoelectric Patterns In The Mid-Thorax During Clinical Rotation Tests
Lombardo, et al:	Magnetic Resonance Imaging (MRI) Correlation Of Somatic Dysfunction In The Cervical Spine
Degenhardt, et al:	Impact Of An Holistic Wellness Program On The Severity Of Stress Perceived By Osteopathic Medical Students
Licciardone, et al:	Public Perceptions Of Osteopathic Physicians-Results From The First Osteopathic Survey Of Health Care In America
Wells, et al:	Osteopathic Manipulation In The Management Of Parkinson's Disease-Preliminary Findings

Part II addressed Basic Sciences and Medical Education. The following subjects were noted:

Wells, et al:	A Strategy For Developing Locomotor And Postural Skills
Dally and Patterson:	Effects Of Crossed Extensor Activation On Spinal Fixation In Rats

Hallas, et al:	Myosin Isoform Composition As A Measure Of Beneficlal Effects Of Manipulative Therapy On Muscle Health In A Rat Model Of Arthritis
Andrews, et al:	Initial Results Of The Treatment Of Nerve Compression Syndromes With Manipulative Therapy
Stoll, et al:	Complementary And Alternative Medicine Research Curriculum Development With Emphasis On Osteopathic Manipulative Medicine-A Proposal
Sanders, et al:	Understanding And Impressions Of Osteopathic Medicine-A Survey Of Truman State University Biology Students
Brooks, Onsager, et al:	Indexing The World's Osteopathic Literature
Nassiri and Ferretti:	International Rotational Electives In Medicine And Public Health

In casual reading of the titles alone, it becomes obvious that a significant amount of investigative effort is being expended in research activity particularly addressing osteopathic philosophy, science and art. Multiple institutions of osteopathic education are represented in this effort. Focusing more critically on the study descriptors, it can be seen that basic sciences and clinical sciences often impact each other. The utilization of fundamental investigative methods to elucidate understanding of clinical activity is demonstrated in the utilization of animal models. Interdisciplinary cooperation is seen in several of the studies. On a broader scale, public perception of the osteopathic profession, indexing of the profession's literature, and the use of international rotational electives to broaden the educational front of osteopathic medicine are noted. When anyone asks "What is being done in osteopathic research?", the answer is immediately obvious: "A great deal, on many levels!" What may not be immediately obvious, of course, is the longer term demonstration of outcome of this effort in terms of publication and elaboration of the original studies. Time, along with the sustained motivations of institutions and investigators will address those considerations.

Elsewhere in this issue (p. 37) From the Archives offers the *Introduction* to The A.T. Still Research Institute; Bulletin No. 1, August, 1910. This volume was Copyrighted 1910 by E.R. Booth, premier historian of the osteopathic profession during the early years of the 20th Century. Printing was done by the Press of Monfort & Co., Cincinnati, Ohio. The investigative efforts of C.P. McConnell, Louisa Burns, N.A. Bolles, C.W. Proctor, J.M. Littlejohn and C.A. Whiting were represented in this volume, as appointed by the Council of the A.T. Still Research Institute in 1908. The topics presented in Bulletin No. 1 included: The Osteopathic Lesion; Immediate Effects Of Bony Lesions; Diet; Neoplasms; The Opsonic Index As Affected By Mechanical Stimulation. We now know that their dedication cast long shadows in the development of osteopathic research. We have an obligation to demonstrate equal dedication.

It was said then, and is no less true now, that:

"Few know the labor they have performed in their attempt to arrive at the truth. No one will claim at the present time that the last word relating to the important subjects presented has been spoken. That a good beginning has been made is evident. May this pioneer work, the most difficult step, be an inspiration to others to show the same devotion to science!"

Tradition Shapes the Future.

Anthony G. Chila, DO, FAAO

❒

NEW THOUGHTS ON HVLA:
UPDATE ON ARTICULAR TECHNIQUES
MAY 18-20, 2001

New Course in 2001

JOHN G. HOHNER, DO
PROGRAM CHAIRPERSON

Days of the Week: Friday-Sunday
Location: MidwesternU/CCOM, Chicago, IL
CME Hours: 20 Category 1A

COURSE DESCRIPTION:

This course is designed to review, and add to, the basic concepts fundamental to utilizing articular techniques in your manipulative practice. We will review the diagnostic criteria for the use of articulatory OMT. We will discuss the variability inherent in the application of articular techniques, from HVLA to deep articulation to low velocity/high amplitude articular techniques. The majority of the time will be hands on, learning new (and reviewing old) diagnostic and treatment methods. The treatment segments of the course will be divided by body section: cervical, thoracic, lumbar, sacral/pelvic and extremities.

LEARNING OBJECTIVES:

Upon completion of the course the participant will be able to:

- Identify correct diagnostic criteria for the application of articulatory OMT
- Understand the mechanism behind articulatory OMT
- List indications and contraindications for articulatory OMT
- Diagnose somatic dysfunction that can be treated with articulatory OMT
- Perform articulatory OMT for each body area
- Correctly dose OMT
- Incorporate articulatory OMT with other manipulative modalities

PROGRAM TIME TABLE:

Friday, May 18 ..... 8:00 am – 5:00 pm
Saturday, May 19 ..... 8:00 am – 5:00 pm
Sunday, May 20 ..... 8:00 am – 12:00 noon

HOTEL INFORMATION:

MARRIOTT SUITES DOWNERS GROVE
1500 OPUS PLACE, DOWNERS GROVE, IL 60515
PHONE: (630) 852-1500 • AAO ROOM RATE: $69.00

Reservation Deadline: April 18, 2001

(Reservations received afterApril 18, 2001 will be provided on a space available basis at prevailing rates.)

REGISTRATION FORM
New Thoughts on HVLA:
Update on Articular Techniques
May 18-20, 2001

Full Name _____

Nickname for Badge _____

Street Address _____

_____

City _____ State _____ZIP_____

Office phone # _____

Fax #: _____

AOA # _____

College/Yr Graduated _____

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I require a vegetarian meal ❒

REGISTRATION RATE

	PRIOR TO 4/18/01	AFTER 4/18/01
AAO Member	$550	$650
AAO Non-Member	$650	$750

(sorry, no discounts on new courses)

AAO accepts Visa or Mastercard

Credit Card #

_____

Cardholder's Name

_____

Date of Expiration

_____

Signature

_____

ELEVENTH ANNUAL OMT UPDATE

"APPLICATION OF OSTEOPATHIC CONCEPTS IN CLINICAL MEDICINE
PLUS PREPARATION FOR CERTIFYING BOARDS
AUGUST 23-26, 2001

ANN L. HABENICHT, DO, FAAO, PROGRAM CHAIRPERSON

CME Hours: 23 Category 1A

COURSE OBJECTIVES:

This Academy program was designed to meet the needs of the physician desiring the following:

- OMT Review: hands-on experience and troubleshooting
- Integration of OMT in treatment of various cases
- Preparation for OMT practical portions of certifying boards
- Preparation for AOBNMM (American Osteopathic Board of Neuromusculoskeletal Medicine) certifying boards
- Information on CODING for manipulative procedures
- Good review with relaxation and family time

TESTIMONIALS:

• Faculty is great, excellent course, well organized, "I will be back". Can't wait to take another course.
• I always learn several new ideas and approaches at every AAO course I attend, even though I have been in practice for several years.
• Excellent Review! I appreciate how useful the handouts are to teach and improve the OMT skills of my house staff and med students

PROGRAM TIME TABLE:

Thursday, August 23	5:00 pm – 10:00 pm
Friday, August 24	7:00 am – 1:30 pm
Saturday, August 25	7:00 am – 1:30 pm
Sunday, August 26	7:00 am – 1:30 pm

HOTEL INFORMATION:

Disney's Contemporary Resort
Lake Buena Vista, FL
1-407-824-3869 (Reservation line)
Reservation Deadline: July 23, 2001

Room Rate: $149.00 single/double
$25.00 per person each additional
(Identify yourself as attending
American Academy of Osteopathy's Conference)

REGISTRATION FORM
11th Annual OMT Update
August 23-26, 2001

Full Name _____
Nickname for Badge _____
Street Address _____
_____
City _____ State _____ Zip_____
Office phone # _____ Fax #: _____
AOA # _____ College/Yr Graduated _____
I need AAFP credit ❒
I require a vegetarian meal ❒

REGISTRATION RATE

	Prior to 7/23/01	After 7/23/01
AAO Member	$630	$730
Intern/Resident	$530	$630
AAO Non-Member	$730	$830

AAO accepts Visa or Mastercard
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Date of Expiration _____
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For more Information, contact:
American Academy of Osteopathy
3500 DePauw Blvd., Suite 1080
Indianapolis, IN 46268
Phone: (317) 879-1881
Fax: (317) 879-0563

THE STILL TECHNIQUE: A MANIPULATIVE METHOD OF ANDREW TAYLOR STILL, MD

SEPTEMBER 13-16, 2001

RENO, NV

Hours: 23 Category 1A

RICHARD L. VAN BUSKIRK, DO, FAAO
PROGRAM CHAIRPERSON
AUTHOR OF *THE STILL TECHNIQUE MANUAL: APPLICATIONS OF A REDISCOVERED TECHNIQUE OF ANDREW TAYLOR STILL, MD*

Testimonials

• Well organized, great overheads, well-paced. I will be trying this approach to treatment in my office tomorrow!
• Very pleased with both the technique and instruction. Approach looks very hopeful as it is both gentle and effective.
• Simple and straight forward, this is great!

LEARNING OBJECTIVES:

By the end of this course the attendee will know:

- the history of the Still technique, its loss and recovery;
- the underlying method;
- segmental diagnostic techniques that are shared by this technique with HVLA and muscle energy techniques as well as those unique to the Still technique, and
- specific applications of the technique to the cervical, thoracic, and lumbar spine, ribs, pelvis, extremities, muscles, and tendons.

PROGRAM TIME TABLE:

Thursday, September 13 ..... 5:00 pm - 10:00 pm
Friday, September 14 ..... 7:00 am – 1:30 pm
Saturday, September 15 ..... 7:00 am – 1:30 pm
Sunday, September 16 ..... 7:00 am – 1:30 pm

HOTEL INFORMATION:

John Ascuaga's Nugget Hotel and Casino
1100 Nugget Avenue,
Sparks, NV 89432

Room Reservations only: (800) 648-1177

AAO Room Rate: $94.00 single/Double

Reservation Deadline: August 13, 2001
(Reservations received after August 13, 2001 will be provided on a space available basis at prevailing rates.)

REGISTRATION FORM

The Still Technique

September 13-16, 2001

Full Name _____

Nickname for Badge _____

Street Address _____

_____

City _____ State _____ Zip_____

Office phone # _____ Fax #: _____

AOA # _____ College/Yr Graduated _____

I require AAFP credit ❒

I require a vegetarian meal ❒

REGISTRATION RATE

	Prior to 8/13/01	After 8/13/01
AAO Member	$630	$730
Intern/Resident	$530	$630
AAO Non-Member	$730	$830

AAO accepts Visa or Mastercard

Credit Card # _____

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Signature _____

American Academy of Osteopathy
3500 DePauw Blvd., Sutie 1080, Indianapolis, IN
Phone: (317) 879-1881 or Fax: (317) 879-0563

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continued from page 7
President's Message

medical specialties within the profession. The AAO continues to represent the osteopathic philosophy that the use of OMT to treat neuromusculoskeletal and circulatory components of illness, enhancing physiology and mobilizing the body's own endogenous medications, is integral and essential to the DO identity. ACOFP leaders also promote this point of view in AOA sponsored meetings, and a positive and cooperative relationship now exists between the AAO, AOA and the ACOFP.

* Osteopathy continues to be listed as alternative or complementary medicine with many sources. While the medical establishment of the United States accepts DOs as trained in contemporary medicine, it has not endorsed osteopathic manipulation as standard-of-care medicine. The AAO is comfortable with the designation of complementary medicine, while many AOA members and leaders are not.
* The Healer Within® museum exhibit: The four tenets of osteopathic philosophy are taught through hands-on experiences. Created by KCOM and additionally sponsored by numerous osteopathic organizations, the exhibit is currently booked for eight major cities through the spring of 2003.

Advance

* The 2001 FIMM Congress in Chicago will assemble physicians who are leaders and researchers in neuromusculoskeletal approaches to injury and illness (sponsored by the AAO, KCOM, AAOM, and the University of Wisconsin)
* A virtual explosion of overseas osteopathic schools has created many models of osteopathic education, and unfortunately, much confusion
* Numerous countries are organizing and codifying osteopathic education and practice rights through legislation
* Educational standardization continues for two main models: American model of fully integrated osteopathic medicine and Littlejohn model of osteopathy as an alternative to contemporary medical care, without inclusion of surgery or obstetrics
* The AAO recognizes that osteopathic philosophy and principles serve as common ground for discussion among interested American DOs, MDs, and registry osteopaths. The first AAO International Osteopathic Forum in Atlanta in 1996 served as a center for international osteopathic networking
* At Convocation 2001, the sixth annual International Forum participants will continue dialog on osteopathy and the geopolitics of healthcare
* The Dominican Republic legislated full practice rights to American DOs on July 4, 2000, following dialog with Nova/Southeastern University on development of an American model osteopathic medical college outside of the U.S.

Explore and Research

Academy members continue to be disproportionately represented in OMM research:

* A new national center for osteopathic research will begin with AOA, AACOM, and other organizational funding, with the hope of obtaining government funding for further research efforts specifically concerned with osteopathic principles and OMT.
* Osteopathic residents will be trained to do research under an NIH grant in Texas
* A KCOM OMM resident has received a grant and been selected for NIH mentoring
* An NIH grant has been awarded to a DO to investigate the use of OMT in Chronic Obstructive Pulmonary Disease (COPD)
* Members are collaborating with FIMM to develop an evidence base for musculoskeletal medicine

Conclusion

We are making more progress than we sometimes realize. Seen separately in our practices or at an individual institution, progress seems limited and slow. However, the aggregate efforts of AAO members have produced an astonishing amount of progress in a relatively short period of time. Everyone sees a small part of this, but the person you elect to be your president gets a big picture as all the parts are assembled. Share this encouragement with your friends as we work to make this the osteopathic millennium of Terran healthcare.❒

Special Communication

Changes in the Traube-Hering Wave following cranial manipulation

by Nicette Sergueef, Kenneth E. Nelson, DO, FAAO, Thomas Glonek, DO

The Traube Herring (TH) wave is an oscillation in blood pressure and blood flow velocity with a frequency of 6 to 10 cycles per minute.[1] Multiple authors have commented upon its similarity to the cranial rhythmic impulse (CRI).[2-5] We have recently demonstrated that the CRI is palpably synchronous with the TH wave measured by laser-Doppler flowmetry.[6]

On two separate occasions, while working with the Transonic Laser-Doppler Monitor BLF21 Series, we had the opportunity to observe marked changes in the amplitude of the TH wave before and after manipulative treatment. Although these data are anecdotal, we believe that the marked changes that we have observed warrant reporting.

Both individuals were initially observed to have minimal amplitude TH wave fluctuations in blood flow velocity (Figure left, before treatment). Both individuals, however, were acquainted with osteopathic manipulation and had been treated on previous occasions. The placebo effect, therefore, cannot be ruled out. Both individuals gave verbal permission to treatment.

Individual no.1 is a 55-year-old male. Individual no.2 is a 25-year-old female. Neither individual had any physical complaint or medical condition requiring medication. The cranial examination revealed decreased CRI amplitude, most notable in individual no. 1. Treatment for individual no.1 consisted of equilibration of the cranio-cervical junction and global anterio-posterior cranial motion and was applied for approximately 10 minutes. Treatment for individual no.2 consisted of equilibration of the cranio-cervical junction and the cranial base and was applied for approximately 15 minutes.

The figure demonstrates laser-Doppler blood flow velocity records for both individuals before and after manipulation. The before and after records each represent approximately three minutes of continuous, unedited, recording and were recorded within 20 minutes of each other. The high-frequency waveform observed in all four recordings is the blood velocity variation with cardiac systole and diastole. The prominent low-frequency oscillation, absent in both pre-treatment records but prominently present in both post-treatment records, is the TH wave.

References

1. Akselrod S, Gordon D, Madwed JB, Snidman NC, Shannon DC, Cohen RJ. Hemodynamic regulation: Investigation by spectral analysis. Amer J Physiol 1985;249:H867-H875.

2. Fryman VM. A study of the rhythmic motions of the living cranium. J Amer Osteopath Assoc 1971;70:928-945.

3. Upledger JE, Vredevoogd JD. Craniosacral Therapy. Chicago: Eastland Press, 1983.

4. Geiger AJ. Letter to the editor. J Amer Osteopath Assoc 1992;92:1088-1093.

5. McPartland JM, Mein EA. Entrainment and the cranial rhythmic impulse. Alt Ther 1997;3(1):40-45.

6. Nelson KE, Sergueef N, Lipinski CL, Chapman A, Glonek T. The cranial rhythmic impulse related to the Traube-Hering-Mayer oscillation: Comparing laser-Doppler flowmetry and palpation. J Amer Osteopath Assoc 2001;101(3), in press.❐

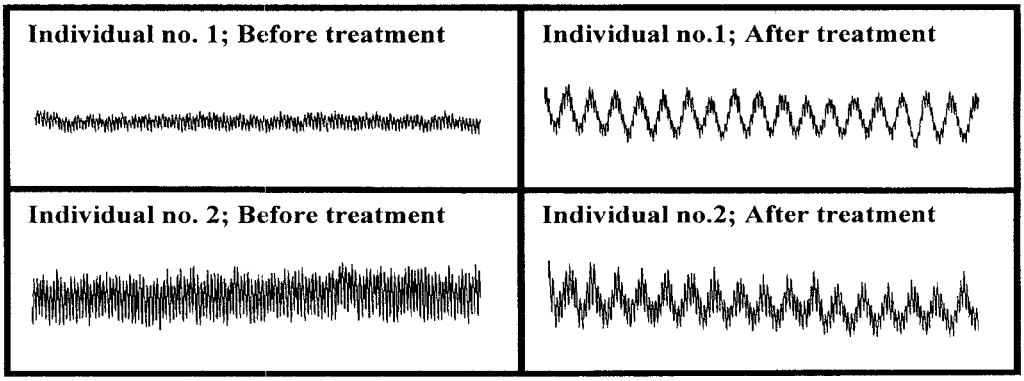

Figure: Laser-Doppler blood flow recording, before and after OMT

Review of Sacral Somatic Dysfunction

by Daniel D. Janiak, DO, FAAO, Pittsburgh, PA

Editor's Note: *Submitted in partial fulfillment of requirements for Fellowship in the American Academy of Osteopathy. Dr. Janiak was conferred status as Fellow in 2000.*

Introduction

For students and practicing physicians, the diagnosis and treatment of sacral somatic dysfunction is a challenge. Addressing this aspect of osteopathy thoroughly and systematically is key to success in clinical management of this crucial area. In this paper, the author presents a comprehensive survey of traditional osteopathic knowledge synthesizing established anatomic, biomechanical and clinical options. Included in this paper is a review of anatomical landmarks, planes of motion, some historical perspectives, and finally review of palpatory diagnosis and a few manipulative management techniques. By presenting the information in this format, the author has tried to facilitate the understanding of this difficult area.

I. Anatomical Landmarks

The sacrum is a large triangular bone situated on the lower part of the vertebral and at the upper and posterior part of the pelvic cavity forming the dorsal bony wall of the true pelvis[1]. The sacrum inserts like a wedge between the two ilia. A key landmark used by the osteopathic physician in diagnosing somatic dysfunction of the sacrum is the sacral sulcus. This is a depression just medial to the posterior superior iliac spine (PSIS) as a result of the spacial relationship of the PSIS to the dorsal aspect of the sacrum[2].

Another important landmark is the inferiolateral angle (ILA) which is the projection of the caudal half of the lateral surface of the sacrum[3]. Also of importance are the sacral tuberous and sacrococcygeal ligaments. The tubercles of the fourth and fifth sacral segments receive the attachments of these ligaments. The sacrotuberous ligaments (great or posterior sacrosciatic ligaments) insert into the inner margin of the tuberosity of the ischium. The sacrococcygeal ligaments (lateral sacrococcygeal ligaments; intertransverse ligaments) insert into the transverse process of the coccyx. These bilateral ligamentous landmarks are used by the osteopathic physician, palpating their relative tightness or laxity and comparing right to left, to diagnose the position of the sacrum[4].

At an early period of life, the sacral and coccygeal vertebrae consist of nine separate segments that in the adult are united to form two bones, five entering into the formation of the sacrum and four into the coccyx[5]. Adding to the challenge of diagnosis, the anatomical variations are many. The sacrum may consist of the remnants of six segments in which case a part of the last lumbar or first coccygeal vertebra is included (sacralization). More occasionally, the number is reduced to four. The bodies of the first and second may fail to unite[6].

There are differences in the sacrum of the male and female.

In the female, the true pelvic cavity is shallower and wider. Therefore, the sacrum is shorter, wider and less curved. In the male, the curvature of the sacrum is more evenly distributed over the whole length of the bone[7].

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[1]Gray, Henry: Anatomy of the human body, 38th American Edition, Ed. Carmine D. Clemente, Baltimore, Maryland, Williams & Wilkins, 1985, p.139

[2]1996 Yearbook and Directory of Osteopathic Physicians, 87th Edition, 1/96, published by the American Osteopathic Association, Chicago, Illinois, Glossary of Osteopathic Terminology, p.735

[3]Ibid, p.730

[4]Op cit. #1, p.141

[5]Ibid, p.146

[6]Ibid, p.147

[7]Ibid, p.273

The broad superior end of the sacrum is osteopathically important in that it articulates with the last lumbar vertebrae. This base as it is called projects ventrally and forms the prominent sacrovertebral angle when articulated with the fifth lumbar vertebra. This is also known as the Ferguson's angle or lumbosacral angle[8]. This is the angle of the lumbosacral junction as measured by the inclination of the superior surface of the first sacral vertebrae to the horizontal. On X-ray, this is usually measured from a standing lateral X-ray view.

The pelvic surface of the sacrum gives origin to the piriformis muscle as well as the insertion of the coccygeus muscle into the lateral aspect of the most inferior sacral segment. Also attached to the pelvic surface of the sacrum is the iliacus muscle[9].

The dorsal aspect of the sacrum gives origin to the multifidus muscle. This is surrounded by the U-shaped origin of the sacrospinalis muscle of the erector spinae group.

Also at the inferiolateral angle, the gluteus maximus inserts. The median part of the concave pelvic surface of the sacrum is crossed by four transverse ridges, the positions of which correspond to the original planes of separation between the five segments of the fetal bones. These four ridges represent the intervertebral discs of the immature sacrum, which become ossified and fused. Between these ridges are the bodies of the sacral vertebrae[10]. The first sacral segment is large and resembles that of a lumbar vertebral body. The succeeding bones beneath diminish in size and are flat and curved. The lateral aspect of the sacrum displays the "sacral ear" or auricular surface which is important when visualizing the functioning axis of sacral motion[11].

Four rounded pelvic sacral foramina are at the ends of the transverse ridges. These communicate with the sacral canal allowing the ventral divisions of the first four sacral nerves to coarse through them along with the lateral sacral arteries and veins. Among the landmarks on the dorsal surface of the sacrum are the midline median sacral crest which is an elevation or ridge onto which are mounted three or four tubercles which are the rudimentary spinous processes of the upper three or four sacral segments. It is on this median sacral crest that the origin of the multifidus occurs. It is interesting that some aponeurotic fibers of the origin for the latissimus dorsi muscle also arise from the medial sacral crest[12].

On either side of the body of the sacral base, a large triangular surface called the ala supports the psoas major muscle and the lumbosacral nerve trunk as well as receives the attachment of a few fibers of the iliacus muscle as noted above[13].

The apex is the caudal extremity of the sacrum and presents an oval facet, which articulates with the coccyx. The sacral canal, the vertebral canal of the sacrum, is incomplete inferiorly due to the nondevelopment of the laminae and spinous processes of the last one or two segments. This resultant widened opening into the caudal end of the sacral canal is called the sacral hiatus. This is used by anesthesiologists for the insertion of a flexible needle to produce caudal anesthesia. This canal lodges the sacral nerves of the lower spinal cord's cauda equina and its walls are perforated by the dorsal and ventral sacral foramina through which these nerves pass[14].

The anterior longitudinal ligament is attached to the anterior vertebral bodies from T2 to the second sacral segment. The posterior longitudinal ligament extends from the occiput to the coccyx. The supraspinal and interspinal ligaments and the ligamentum nuchae connect all of the spinous processes[15]. The dura attaches to the anterior aspect of the second sacral segment. This dural attachment superiorly is firmly attached at the basiocciput and the first two cervical vertebrae, then continues down the spinal canal without attachment until it reaches this second sacral segment. The importance of this ligamental and dural integration is apparent in the craniosacral techniques.

The intimate anatomic relations of these muscles and ligaments alone with their fascial coverings and the nerves and vessels that pierce them reveal how the leg is connected to the head and upper extremities through the sacrum and pelvis.

This anatomical overview gives credence to the osteopathic viewpoint that the body is a unit mechanism. As such, dysfunction in any area can have widespread effects on the biomechanics of this important sacral bone.

II. Planes of Motion

Confusion in terminology occurs because there are numerous synonyms for terms, several models or →

[8]Op cit. #2, p. 726.
[9]Op cit. #1, p. 139.
[10]Ibid, p. 140.
[11]Ibid, p. 141.
[12]Ibid, p. 140
[13]Ibid, p. 142.
[14]Ibid, p. 143.
[15]Ibid, p. 141

systems of nomenclatures used to define the biomechanics observed, different criteria describing dysfunctions in different systems and three ways of naming dysfunctions[16]. This thesis relies on "*Foundations for Osteopathic Medicine*" and "*Glossary of Osteopathic Terminology*", both published under the auspices of the AOA, to describe the most consistent criteria and accepted terminology[17].

W. F. Strachan defined sacroiliac mechanics in the HVLA system in 1938 and W. J. Walton also described this system in 1966. In this model, sacral dysfunctions are described as the sacrum in relation to the ilium. The plane of motion is around an oblique axis: motion may be restricted at either the upper or lower arm of the L - (C -) shaped SI joint[18]. The sacrum is either anterior or posterior to the ipsilateral ilium.

In 1958 Dr. Fred Mitchell, Sr. proposed seven hypothetical functional axes of the sacrum based on the walking cycle to explain the various planes of motion. These include three transverse axes. The X axis or anteroposterior axis or translational axis of the sacrum is formed at the line of intersection of a sagittal and transverse plane whereas the longitudinal axis or Y axis or vertical axis is the hypothetical axis formed at the line of intersection of the mid sagittal plane and a coronal plane. The two oblique or diagonal axes are the axes from the superior area of the sacroiliac articulation to the contralateral inferior sacroiliac articulation. These particular axes are designated as right or left relevant to their superior point of origin. The transverse or Z axis, also known as the inferior axis, is formed by the intersection of the coronal and transverse planes about which flexion and extension occur. The inferior transverse axis or innominate axis or hip bone axis or walking axis is that which passes from side to side on a line through the inferior auricular surface of the sacrum and represents the axis for movement of the ilia on the sacrum[19].

The middle transverse axis, or postural axis, is the hypothetical functional axis of sacral flexion and extension in the standing position and passes from side to side through the anterior aspect of the sacrum at the level of the second sacral segment. The superior transverse axis, or respiratory axis, is that hypothetical transverse axis about which the sacrum moves during the respiratory cycle. It passes from side to side through the articular processes posterior to the point of attachment of the dura at the level of the second sacral segment. Involuntary sacral motion occurring as a part of the craniosacral mechanism is believed to occur about this axis[22].

III. Types of Dysfunction

With the anatomy and planes of motion considered, it is possible to now see the wide range of somatic dysfunctions that involve primarily the sacrum. These dysfunctions include sacral torsion in which a torque occurs between the sacrum and the lumbar spine. Sacral flexions or extensions involve rotation of the sacrum about a middle transverse axis such that the sacral base moves either anteriorly or posteriorly relative to the pelvic bones.

Posterior sacrum is a somatic dysfunction in which the sacral base has rotated backward and sidebent to the side opposite the rotation. These dysfunctions are known for the side on which the backward rotation occurs. For example, a posterior sacrum left describes a condition in which the sacrum is rotated left and side bent to the right such that rotation left and side-bending right are freer motions and rotation right and side bending left are restricted.

Anterior sacrum is a somatic dysfunction in which the sacral base has rotated forward and sidebent to the side opposite the rotation. The dysfunction is named for the side on which forward rotation occurs[20].

Posterior sacrum and anterior sacrum are Strachan's (HVLA system) model while sheers, torsions, flexions (sacral base anterior), and extensions (sacral base posterior) are Mitchell's (muscular energy system) model. For clarification, the terms flexion and extension are actually opposite when speaking of what happens in Sutherland's (cranial system) model[21].

For further clarification, an anterior sacrum (Strachan) is probably one type of Mitchell's forward torsion. A posterior sacrum (Strachan) is probably a form of Mitchell's forward torsion in which the major joint motion restriction is on the side opposite the deep sulcus. Although there are similarities between the posterior sacrum and the forward torsion, there is no true Mitchell equivalent to Strachan's posterior sacrum. A posterior sacrum should not be confused with a backward torsion, a posterior sacral base or an extension of the sacrum[23].

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[16]Ward, Robert C.: Foundations for Osteopathic Medicine, First Edition, 1997, Williams & Wilkins, p. 619.
[17]Ibid, p. 618.
[18]Ibid, p. 619.
[19]Op. cit. #2, p. 734.
[20]Op. cit. #16.
[21]Ibid, p. 618.
[22]1997 Winter OMT Update program: AAO, 1997, p. 21.
[23]Op. cit. #16

Rotating dysfunction of the sacrum is a somatic dysfunction in which the sacrum has rotated about an axis approximating the Y or longitudinal axis. The motion is freer in this somatic dysfunction in the direction that rotation has occurred and is restricted in the opposite direction[24].

Sacral sheer, also known as unilateral sacral flexion, is a nonphysiologic sacral somatic dysfunction which is usually traumatically induced and is characterized by a deep sacral sulcus and ipsilateral ILA of the sacrum. Translated sacrum is a nonphysiologic sacral somatic dysfunction as a result of trauma in which the entire sacrum has moved forward between the pelvic bones (anterior translated sacrum) or backward between the pelvic bones (posterior translated sacrum).

Sacral sag is a descriptive term used by Dr. Sutherland. He used this term because the sacrum is suspended between the two ilia and relatively corresponds to another unit of the craniorespiratory mechanism, the sphenoid bone, which is suspended between and beneath two frontal bones. The term "sag" had his preference because there are no muscular agencies from the sacrum to the ilia to initiate articular mobility and none to be found from bone to bone in the cranial unit[25]. Historically and predating Strachan, sacral sag was designated as "anterior sacrum" by Dr. Anna Slocum of Des Moines among others. Dr. Sutherland distinguished craniosacral or respiratory dysfunction of the sacrum **between** the ilia and postural or iliosacral of the ilium **upon** the sacrum. Dr. Sutherland states that the articular surface, which provides the functioning of the craniosacral or respiratory type of dysfunction, is confined to a rather small area. This small articular area functions as a fulcrum, affording the flexion and extension movement of the sacrum in unity with the flexion and extension mobility at the sphenobasilar symphysis of the cranium. This area is located at the second sacral segment and is found, on the normal specimen, converging anteriorly and diverging posteriorly[26].

Long and short arm articular surfaces accommodate the movement of the sacral base posteriorly and the sacral apex anteriorly during the respiratory flexion and vice-versa during the extension mobility. The long and short arm accommodation surfaces may be pictured as functioning in the postural types as well.

IV. Diagnosis

There are a number of tests that can be approached in an algorithmic fashion to precisely diagnose the dysfunction.

First, the standing flexion test is determined. If positive with motion loss palpated at the iliosacral area, this would indicate an innominate dysfunction or iliosacral dysfunction. If the standing flexion test is negative, the seated flexion test is then determined. If positive, a unilateral sacral dysfunction is present. If negative, then the sacral rock test should be determined. If this is positive, a bilateral sacral dysfunction would be diagnosed. If this is negative, a false positive standing flexion test (probably carry-over effect from lumbar dysfunction) or normal pelvis is present. If a standing flexion test is positive, however, and is accompanied by normal motion on palpation of the iliosacral area, then a false positive standing flexion test would be considered[27].

Another method to diagnose sacral dysfunction would be to initially palpate the sacral sulci and the ILA. If a flexion is present, then it should be determined whether this is a unilateral flexion in which the posteroinferior ILA and the deep sulcus would be on the same side or a bilateral flexion in which both ILA are posteroinferior and both sulci are deep. If, however, a torsion is present, the lumbar spring test is performed. This is done to determine whether a forward or backward torsion is present. A positive test (no spring) indicates backward torsion. Negative indicates forward torsion.

For torsions (Mitchell's), we name the direction of rotation by the posteroinferior ILA. A forward torsion is left on left or right on right. A backward torsion is left on right or right on left.

V. Treatment

These techniques are the author's preference although many are possible. Treatment of forward and backward torsions is accomplished by this author using muscle energy techniques. The patient lies on the side of the involved axis. In the forward torsion, the top shoulder is forward. In the backward torsion, the top shoulder is back. As described by Dr. Fred Mitchell, Sr., muscle energy is used in the following positions:

For forward torsion, both hips are flexed and the patient raises both feet toward the ceiling. For backward tor-

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[24]Op. cit. #2, p. 734.
[25]Sutherland, William Garner: Contributions of thought, 1967, The Sutherland Cranial Teaching Foundation, Ed. Sutherland, Adah Strand and Wales, Anna L., p. 231.
[26]Ibid, p. 198.
[27]Greenman, Phillip E.: Principles of manual medicine, Second Edition, Williams & Wilkins, 1996, p. 312.

sion, the bottom hip is extended and the patient raises the top knee toward the ceiling[28].

For treatment of flexions, the unilateral flexion is easily treated by this author using respiratory cooperation while applying steady pressure to the ILA on the involved side[29]. For the treatment of bilateral flexion or extension, a high velocity thrust technique is preferred.

For sacral sag, craniosacral techniques include the anterior sacral alae contact technique. In this technique, the patient sits erect on the table or a chair so that the ischia can function as fulcrums to allow a lateral gliding away by the ilia from the sacral alae. The physician, sitting in front of the patient, passes his thumbs along the crests of the ilae backwardly near to the posterior iliac spines and then drops the thumbs downwardly to contact the front of the sacral alae. The thumbs hold these contacts firmly while the patient bends forward with hands resting upon the physician's arms. During this procedure, the iliac glide laterally away from the sacral alae. The patient is then instructed to resume the sitting position being careful not to extend the lumbar area. The ligaments thus draw the sacrum back into normal position and relieve the drag upon the intraspinal membrane.

Secondary fascial strains usually receive relief at the same time yet they should be given attention or observation. The above technique was lectured by Dr. Sutherland on numerous occasions. However, he does credit Dr. Anna Slocum who mentioned a slight push upon the sacrum during this technique[30].

One may also use the lateral sitting ischial tuberosity fulcrum method in the sacral fulcra sag strains. The patient sits on the table and both legs are raised to the level of the table to change the necessary rotation of the heads of the femora within the acetabula, the means of pulling directly on the ilia. As the physician places finger contacts on the sacrum, to merely observe the progress of movement, the assistant draws both legs forward. This rotates the ilia anteriorly and laterally in gliding motion away from the sacral alae. The patient is then requested to bend the body forwardly. At the balance degree, the patient resumes the sitting posture being careful not to extend the lumbar area[31].

During inhalation, the sacrum ascends and moves posteriorly at its base. During exhalation, it moves caudad and anteriorly at the base. Therefore, using a supine myofascial release technique with the physician sitting on one side of the patient facing his head, a sacral normalization or rocking utilizing myofascial release can easily be accomplished with the physician following the motion of the sacrum as it unwinds using the patient's respiratory assistance.

There are three significant anterior tender points generally related to the pelvis or sacrum: The low ilial sacroiliac tender point (located on the superior surface of the ramus of the pubes), the iliacus (or psoas) tender point (located in the lower quadrant of the abdomen and deep in the fossa, often a tender point of concern in dysmenorrheic women), and the inguinal ligament tender point (located on the inguinal ligament at its attachment to the pubes)[32].

Counterstrain techniques for treating each of these involve the classic wrapping around of the body in respect to each tender point for the count of 90 seconds and then the physician slowly returning the patient to the neutral position (the patient should not help) as defined by Lawrence Jones, DO.[33]

There are posterior tender points commonly associated with sacral dysfunction and frequently involved in sciatic radiation of pain owing to the close association with the sciatic nerve. These are known as the piriformis tender points[34]. These are treated with the patient prone with the involved leg dropped off the side of the table with hip and knee flexed. The leg is then externally rotated and may be rested on the physician's lap. The movement of flexion and external rotation may be modified to achieve maximal softening of the piriformis.

Mid pole sacral tender points are palpated by pushing medially on the lateral side of the sacrum at the mid point. Treatment is done with the patient prone and the physician standing or sitting at the side of the table next to the trigger point. The leg is abducted straight laterally. Occasionally, the thigh must be extended or flexed although this is not usual. The position, again, is held for 90 seconds with slow gentle return to easy normal.

Finally, the high flare-out sacroiliac tender point is about four inches below and medial to the PSIS[35]. This is frequently associated with coccydynia. Treatment has the patient in prone position with the physician

[28]DiGiovanna, Eileen L. and Schiowitz, Stanley: An Osteopathic Approach to Diagnosis and Treatment. J. B. Lippincott Company, Philadelphia, Pennsylvania. 1991, p. 222.
[29]Ibid, p. 221.
[30]Op. cit. #25, p. 200.
[31]Ibid, p. 201.
[32]Jones, Lawrence H., Jones Strain and Counterstrain, 1995, Jones Strain-Counterstrain, Inc., Boise, Idaho. p. 89.
[33]Ibid, p. 23.
[34]Ibid, p. 91.
[35]Ibid, p. 86.

standing at the side of the table. The leg nearest the tender point is extended. Some abduction may be needed, although occasionally adduction, with external rotation of the thigh is needed. The 90-second formula with gentle return to easy normal is again applied.

This diagnosis and treatment overview again shows that the body is a unit mechanism. Sacral somatic dysfunctions exert a fascial drag on the dura. The sacral range of motion with pulmonary respiration, sacroiliac and lumbosacral dysfunctions, the quality of the surrounding soft tissue structures and tender points (both anterior and posterior) must all be evaluated in order to relieve fascial stress.

VI. Sacral Base Unleveling

Dr. Nicholas Nicholas lectured on ipsilateral and contralateral scoliosis referral to sacral base unleveling. This is diagnosed with a postural film, which is an erect X-ray done in bare feet with the degree of sacral unleveling measured as well as the location of the convexity of the lower scoliotic curve. The protocol for taking the X-rays is important as outlined in *Foundations for Osteopathic Medicine* and their normal ranges. It is important to treat out all nonphysiologic (Sheer) dysfunctions before the X-rays or incorrect measurement will be obtained[36].

This is mentioned since in addition to the manipulative prescription, this is treated with a shoe lift correcting half of the amount of leg shortening on the side of the convexity of the lower scoliotic curve. A less arbitrary and more quantitative method of determining lift height utilizes the Heilig Formula also in "Foundations": $L < SBU \div (D + C)$ [37].

L	Lift Height	1	0 - 10 years	C	O for none
SBU	Sacral Base Unleveling	2	10 - 30 years	1	Lumbar rotation
D	Duration	3	+ 30 years	2	Wedging
C	Compensation				

VII. Common Compensatory Pattern (CCP)

Drs. Zink, Johnson, Ellestad, Cross and others noted the sacrum to often be malpositioned in left rotation on a left oblique axis. The base is tilted to the right[38]. This is mentioned for completeness and, of course, the goal of OMT is to normalize the fascial pull with manipulation so that the motion tests for fascial balance become as near to ideal as possible.

VIII. Conclusion

Although the facts as presented above are important in diagnosing and treating our patients, it is critical to get away from boxing or pigeonholing the individual. Integrate how the patient presents with a comprehensive care plan for the entire body as a unit mechanism, then you will be applying the philosophy of osteopathy.

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[37]Ibid, p. 987.
[38]Zink, J. Gordon, Lawson, William B.: Osteopathic Annals, An Osteopathic Structural Examination and Function Interpretation of the SOMA, 7:12 Dec., 1979.

The primary respiratory mechanism beyond the craniospinal axis

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Introduction

In *Osteopathy in the Cranial Field*, Magoun lists the five components of the primary respiratory mechanism. To paraphrase, these are as follows:

1) the fluctuation of the cerebrospinal fluid,
2) the mobility and reciprocal tension of the intracranial and intraspinal membranes,
3) the inherent motility of the central nervous system,
4) the mobility of the cranial bones, and
5) the mobility of the sacrum between the ilia.

Magoun then writes, "One might add a sixth, the effect of all these phenomena throughout the entire body."[1]

This paper proposes a theoretical model to explicate a mechanism for primary respiration outside the craniospinal axis and throughout the entire body, especially within its connective tissues, including the extracellular matrix. Using known physiological phenomena, the author "puts into motion", if you will, these processes for life as they might behave according to the palpatory experience of the clinician and student of the primary respiratory mechanism. The clinician and observer of primary respiration has historically led the way in the exploration of these subtle phenomena, leaving the scientists to explain it later. This paper is no exception; albeit scientific evidence from the medical and scientific literature is cited, many articles having been written without knowledge of primary respiration.

Although there is substantial evidence cited in this paper to support the existence of a mechanism for primary respiration outside the craniospinal axis, it is clear that, for the uninitiated, final proof of its existence, and, for that matter, the existence of the mechanism within the craniospinal axis rests with a carefully orchestrated, vigorous, prospective scientific endeavor. Nevertheless, the lack of solid proof for the existence of the mechanism does not diminish the clinical effectiveness of osteopathic manipulative treatment in the cranial field. In fact, holding a vision of a model for the mechanism enhances the work, in the author's experience. To quote A. T. Still, MD, the founder of osteopathic medicine and the teacher of W. G. Sutherland, who discovered the primary respiratory mechanism, ". . .we want the student to carry a living picture of all or any part of the body in his mind, as an artist carries the mental picture of the face, scenery, beast, or anything that he wishes to represent by his brush. I constantly urge my students to keep their minds full of pictures of the normal body."[2] The fineness of the image that is held in the mind of the clinician determines the fineness of his/her work, in the experience of the author. To this end, the author presents this model.

Acknowledgments

Another goal of this paper is to cite publications from European writers from which many of this author's ideas first gained support in print. Osteopathic medicine is now world wide, and foreign literature is becoming more and more important to the growth of the concepts and practices of the discipline. To recognize this important trend is another reason for writing this paper. These are the cited authors around which this paper is developed: 1) Bernard Gabarel, DO of Portugal and Michel Roques, DO of Belgium[3], 2) Jean-Pierre Barral, DO of France[4], 3) Alfred Pischinger, MD of Germany[5], and 4) Bjorn Nordenstrom, MD of Sweden[6].

[1]Magoun, Osteopathy in the Cranial Field, Third edition, Journal Printing CO, 1976, 367p.
[2]Still, The Philosophy and Mechanical Principles of Osteopathy, Osteopathic Enterprise, 1986, 3 l9p.
[3]Gabarel and Roques, Les Fasciae, Maloine, Paris, 1987, 254p.
[4]Barral, Visceral Manipulation, Eastland Press, Seattle, 1988, 278p.
[5]Heine, Ed, Matrix and Matrix Regulation, Haug, 1991, 221p.
[6]Nordenstrom, Biologically Closed Electrical Circuits, Nordic Medical Publications, 1983, 358p.

Discovery of PRM

This author believes that if Sutherland had not visually observed the effects, in the conformation of the sutures of the skull, of the subtle motion of the primary respiratory mechanism (PRM), he would have probably not discovered the PRM at all. At the moment of his self-described "guiding thought"[7], Sutherland perceived these effects of the PRM, in the one area of the body where the fluid dynamics of flexion and extension are recognizable by impressions left in bone: the skull. Nowhere else in the human form could this otherwise invisible motion of the PRM be detected, by observation. For one who has an inquiring mind and observes astutely, as did Dr. Sutherland, the conformation of the bony interdigitations at the sutures indicate an accommodation for a respiratory motion. Like the geologist, who reads what effects the fluids, wind and water have upon the structure of rock, over time, Sutherland read in the calcified memory of the sutures of the skull the influence of a respiratory fluid oscillation. As extraordinary as it was then, Sutherland's observation, being the first step in the scientific method, compels us, now, to "dig on" with equal brilliance, to investigate these phenomena that Sutherland called the PRM. After all, Sutherland expected that we would do so, when he said, "All I have done is to pull aside a curtain for further vision"[8].

Although this motion was discovered to exist in the cranium and spinal canal, first by Sutherland's observation of bone, and then through his detailed research into the motion of the fluid, membranes and brain[9], it does not absolutely follow by the application of logic, that this mechanism necessarily originates in the head, nor that it excludes the rest of the organism. In fact, osteopathic physicians, including Dr. Sutherland and his students, palpated and continue to palpate this undulation throughout the entire body.

To be sure, Sutherland's discovery extends Dr. Still's concepts into the head region, as Sutherland so graciously insisted to be the full extent of his contribution[10]. Dr. Still, himself, recognized that his system of therapeutics did not include the head, and he personally challenged Charlotte Weaver, DO, one of his promising students and a contemporary of Sutherland, to investigate how osteopathic principles and practice relate to the head region.[11] Dr. Weaver spent the rest of her life examining and describing the human skull and its relationship with the rest of the body. Her greatest contribution was her implication that the base of the skull is composed of modified vertebrae and is plastic.[12,13,14] The structural relationships of the head and the spine that she delineated are indeed valuable in considerations given to treating the region.

What distinguishes Sutherland's contribution, in addition to the type of anatomic information similar to Weaver's work is the discovery of a mechanism, of elegance, subtlety and profundity. The primary respiratory mechanism is also important for our considerations in treating the region of the head, but it is something much more. Beyond providing us detail about relationships of anatomical parts, the PRM adds to our conception of the **function** of the anatomy, and not of the head and spine alone, but of the whole body. The PRM reveals a physiological activity, a subtle motion, never before described. This paper casts some light upon functions of the entire organism as related to the PRM.

PRM outside the CNS

Some clinical observations that attract one to investigate the PRM in all its corporeal aspects are that 1) one can palpate the PRM in all the tissues of the body, 2) through palpating the PRM, one can identify fascial tensions and their effects upon this respiratory motion of the PRM between areas of the body that are distant from one another, 3) one can palpate what are termed by some clinicians, "energy sinks" and "force vectors". These are regions of fascial distortions of shape and mobility which clinically correlate with trauma, and 4) by palpation, one can distinguish between a) healthy tissue, on the one hand, where the PRM has a full amplitude, symmetry and a clinically recognizable quality of potency, and b) not so healthy tissue, on the other hand, where the PRM is diminished, distorted and/or disturbed.

Dr. Sutherland treated the whole body. On one of several occasions, he referred to this need to look at the whole organism when he spoke in 1953 on "The Fascial Drag and the Fulcrum"[15]. In this example from Sutherland, he related the importance

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[7]Sutherland and Wales, Contributions of Thought, Second edition, SCTF, Rudra Press, 1998, p. 146.
[8]Op. cit. #1.
[9]Wales, Teachings in the Science of Osteopathy, Rudra Press, 1990, 31lp.
[10]Op. cit. #1.
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[12]Weaver, Cranial Vertebrae, JAOA, 3 parts, 35:328, March; 35:3749, April; 35:421-4, May, 1936.
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[14]Weaver, Symposium on the Plastic Basicranium, JAOA, 37:298-303, March 1938.
[15]Op. cit. #7, p. 278-83.

of the continuity of the fascia from the mid thoracic spine to Sutherland's Fulcrum, that automatic, shifting suspended junction of the tentorium cerebelli with the falx cerebri. The deep prevertebral fascia, Sutherland indicated, extends from the basiocciput to the anterior longitudinal ligament of the thoracic spine. On its course there, it forms the posterior part of the compartment for the thyroid gland, larynx, pharynx and esophagus at the level of the cervical spine. It also contains the scalene muscles which insert into the first and second ribs and conduct important nerves and vessels at the thoracic outlet. With age and an increasing kyphosis or with trauma distorting these connective tissue components of the upper thoracic spine, a drag from there is imposed upon the occiput and therefore upon Sutherland's Fulcrum. Thus we have "The Fascial Drag and the Fulcrum". Many other similar scenarios may be described in all parts of the body.

The connective tissue of the body is unitary in structure as well as in function. Fascial continuity is utilized clinically, both diagnostically and therapeutically to relate, for example, an old knee injury to a complaint of headache. Tracing the continuity of the fascia we come across different names applied to different areas of the tissue, even though it is unitary. In this example, the knee is connected through the hamstrings to their origins on the ischium. This is continuous with the sacrotuberous ligament which connects to the sacrum. Dural attachments from the sacrum to the upper cervical vertebrae and the foramen magnum will be distorted by the drag imposed from the hamstrings, and, in turn will distort Sutherland's Fulcrum. Pain sensitive dura will report to the patient a headache, which results from this fascial drag.

Tracing connective tissue from the patella through the quadriceps femoris muscle offers just as plausible an explanation for tension in the dura, by means of the connections of the iliopsoas muscle to the diaphragm, mediastinum, anterior longitudinal ligament, prevertebral fascia, occiput and dura. Many other sometimes bizarre relationships can be cited to demonstrate distant connections within the structure of the body. These connections do not have to relate to the head for them to be relative to primary respiration.

Visceral manipulation

Clinically, one observes, and classically, students of the cranial concept are taught that the PRM involves a motion similar to, if not the same as, that of pulmonary respiration, albeit on a more subtle level than breathing. The works of Jean-Pierre Barral, DO describe respiratory motions of the organs of the body based upon their relationships to their fascial containers (e.g. liver capsule) and interconnections (e.g. pulmonary ligament). These motions are defined in terms of primary respiration [PRM] ("inspir" and "expir") and secondary respiration [pulmonary] ("inhalation" and "exhalation"). Barral recognizes effects from both the PRM and pulmonary respiration in all organs and fascial planes.[16]

Histological structure and function

Beyond the long, gross, anatomical relationships cited in the previous paragraphs, the microanatomy and microphysiology also bear consideration when investigating the PRM outside the central nervous system. As Dr. Still said, "The osteopath must remember that his first lesson is anatomy, his last lesson is anatomy, and all his lessons are anatomy"[17]. The microanatomy of the **extracellular space** is critical to our understanding of function there. It contains 1) the elements of the connective tissue (fascia), including the extracellular matrix, formerly referred to as the "ground substance"; 2) the extracellular fluid; 3) the capillaries, lymphatics and nerve endings that all influence cellular functions. When taken together, all these elements are fundamental to what osteopathic medicine refers to as "self-healing"[18].

Much of the information we have acquired in the fields of physiology and medicine in the last century has focused upon the mechanisms within or on the surface of the cell. As described later in this paper, the extracellular space impacts cellular function, too. We know that the embryological tissue or *mesenchyme* creates the space for the other tissues and organs for the developing organism. In the adult, the connective tissue acts as the medium which organizes structure and much more. In the human anatomy dissection laboratory, the connective tissue is usually discarded in order to find what most believe to be the "important structures". However, we learn upon closer examination, that the connective tissue serves functions that are essential, not only structurally, but also physiologically. As we shall see, it performs functions of a filter, a primitive nervous system, a whole body registry, an immune system, a storage compartment, a system for integrating structure, a unifying system, a detoxifying system, a medium for regulating cell function by hormones, polypeptides, inflammatory intermediates, and so forth.[19]

Connective tissue can be divided

[16]Op cit. # 4.
[17]Op. cit. # 2.
[18]Op. cit. # 3.
[19]Ibid.

into its components of 1) cells, 2) fibers, and 3) ground substance or extracellular matrix. Other elements include the lymphatics, nerve endings, blood vessels and fibrous specializations in certain regions, e.g.: aponeuroses.[20]

The cells

The cellular constituents of the connective tissue include those that are a permanent part of the structure: the fibroblasts, fat cells, mast cells and macrophages; and those which migrate into and out of the connective tissue: the plasma cells, monocytes, lymphocytes, PMNs, eosinophils and basophils. A review of the various functions of these cells is beyond the scope of this paper. Suffice it to state that immune, inflammatory, structural and detoxifying functions are inherent by the presence of these cells. The fibroblast is the source of the fibrous components of the connective tissue, and the leukocytes are the source of the chemotactic and inflammatory elements that regulate the function of the matrix.[21]

The fibers

Several types of fibers can be classified within the connective tissue. Collagen represents 50-60 percent of the mass of the connective tissue and 10 percent of the body weight. The fiber exhibits a polarity, one end being relatively positive and the other relatively negative in charge. Collagen is produced by the fibroblast which manufactures many varieties of collagen for various functions. There are also reticular fibers that form a meshwork and elastin which provides a flexibility to the tissues. The function of elastin and collagen together determine important characteristics of connective tissue according to the ways in which these fibers are laid down. If collagen is laid down transversely to elastin, this arrangement allows collagen to spread and return. If collagen is laid down so that it wraps around the elastin and inserts with it, a synergy between the two types of fibers determines the mechanical properties of fascia.[22]

If a force which impacts the fascia creates a stretching of the elastin/collagen matrix which is less than 30 percent of its original length, the elastic fibers will lengthen, but the collagen fibers will resist stretching, permitting a return of the fascia to its original length without the elastic fibers. This occurs over time. Only the collagen fibers, which do not have elastic properties, retain an altered function for the duration of the deformation. If a force is applied to the fascia which stretches it beyond 30 percent or for a prolonged time, the imprint upon the collagen fibers will persist, despite the cessation of the force.[23]

Nordenstrom recorded "*injury potentials*" in areas of local injury to tissues. He states, "local injury in an organ will produce a local accumulation of charges ('injury potential'), e.g.: by diffusion of ionic products of decomposition. A potential is then created between the injured tissue and the surrounding noninjured tissues, each possessing its own metabolic potentials."[24] Some osteopathic clinicians have used the term "energy sink" to describe areas of soft tissues that have a different quality/quantity of motion to palpation. These areas usually correspond to traumatic incidents in the patient's history.

Collagen retains patterns of injury, because it has the property of piezoelectricity, that is, the property of transducing forces of electric charge (polarity) and mechanical patterns (shape). Like quartz crystal, collagen's electric polarity is distorted when it is mechanically distorted. A force of injury is absorbed by these collagen "liquid crystals", and the force is retained in the shape which that force creates in the texture of the tissue, in what could be called "tissue memory". The change in conformation of the tissue can be defined by the force that changed it: its direction and amplitude, that is, its vector. A rotary force of injury is registered as a series of vectors, each one requiring the skilled hands of the osteopathic physician to aid in its resolution.[25]

The matrix

The extracellular matrix, or simply "matrix", formerly known as the ground substance, is a very homogeneous and coherent milieu in which the cells and fibers of the matrix exist between a) the nutrient-supplying capillaries and b) the energy-consuming parenchymal cells. Pischinger has expanded upon the model of Virchow, in which the cell is conceived to be the functional unit of biological tissues, and added the extracellular matrix to create a triad of function: 1) the capillary, 2) the matrix, and 3) the parenchymal cell.[26]

The matrix forms a meshwork of 1) proteoglycans (PGs), 2) glycoaminoglycans (GAGs), and 3) structural glycoproteins (collagen, elastin, fibronectin, etc.). These components create a molecular sieve through which the entire metabolism →

[20]Ibid.
[21]Ibid.
[22]Ibid.
[23]Ibid.
[24]Op. cit. #6
[25]Op. cit. # 3.
[26]Op, cit. # 5.

of the parenchymal cells percolates. The size of the "pores" of the sieve is determined by a) the molecular weight of these PG/GAGs (formerly called mucopolysaccharides), b) the concentration of electrolytes, c) the pH, and d) the electrical potential.[27,28]

The *proteoglycans* (PGs) are formed of short ramified chains of various sugars, branched on a common structural polypeptide axis. Fairly hydrophobic, these play a role in the formation of intermolecular bridges and in the orientation of protein fibers, in that they permit and guide the assemblage of future fibers of the interstitial matrix.

The *glycoaminoglycans* (GAGs) are macromolecules composed of polypeptide chains on which are branched long oligosaccharides. These include hyaluronic acid, chondroitin 4 sulfate, chondroitin 6 sulfate, dermatame sulfate, heparin, heparin sulfate and keratin sulfate. The sulfate moieties on these oligosaccharides contain an excess of electrons and provide a negative charge to their filamentous arrangement, like "bristles of a brush" upon the PG "brush handle". The "bristles", all negatively charged, stand out erect against the repulsion from all the neighboring negatively-charged filaments in the matrix. A field rich in electrons is established within the extracellular matrix by these negatively-charged strands. This lends a character of stability, impermeability and hydrophilia to the matrix.[29]

Although the GAGs represent 1-5 percent of the matrix, they assure the matrix, because of their special structural characteristics, a great potential for plasticity and modifiability under the right conditions. Hyaluronic acid is the most central fiber in this structural "brush", and must be considered as the most likely element determining the organizational level of the polymerization of the GAG. The level of polymerization/depolymerization of the GAG effects the viscosity and permeability of the matrix. This is based upon the action of **hyaluronidase** to facilitate the fixation of free water to bound water and back to free water again by its action on the polymerization/depolymerization of the matrix. These modifications of permeability are necessary for the movement of metabolic products from the blood to the parenchymal cells, and from the parenchyma to the blood and lymph. The level of activity of hyaluronidase and other depolymerizing enzymes depends upon a) the concentration of the enzymes, themselves, b) the change in pH, c) the concentration of electrolytes, and d) the presence of inhibiting substances such as antibodies and enzymes.[30]

Matrix as colloid

Colloid is subject to two extreme states. The first state, sol, is more permeable, which has a) a relative excess of free water (not bound to the matrix); b) a relative deficiency of colloids (depolymerized macromolecules); and c) a relative mobility of electric fields that also display a disorganization of negative charge, thereby supplying a relative attraction for negatively charged ions: C1, HCO3, PO4, and SO4.[31,32]

The second state of colloid, gel, is less permeable, which has a) a relative deficiency of free water (more is bound to the matrix), b) a relative excess of colloids (polymerized macromolecules), and c) a relatively static electric field, which becomes more negatively charged, and attracts cations: Na, K, Ca, and Mg. It is the binding of the dipole, water, to the macromolecules of the matrix which creates the electric field. As binding decreases, the more the field can flow. As binding increases, the more static the field.[33]

The negative charge of the PG/GAGs renders an important functional characteristic to the matrix. Water binding to these very large fields of negative charge allows for a differential exchange of monovalent versus bivalent cations according to various influences (pH, ion concentration, etc.) upon the potential energy of the matrix. These alterations in potential, if strong enough, will be transmitted to the cell membrane, which leads to depolarization (in the case of the nerve and muscle cells) or to activation of secondary messengers (cyclic AMP, inositol triphosphate, and others) in all other cells. Such information can then influence the nucleus and the genetic material with its effects upon protein and enzyme production.[34]

The mechanical integrity of the tissues rely upon PG/GAGs in the matrix. The lubricating action of these enormous molecules acts like a shock absorber which will become more rigid with repeated mechanical demands. This change from the "sol" to the "gel" phase is an energy consuming reaction, which also encodes

[27]Op, cit. # 3
[28]Op. cit. # 5.
[29]Op, cit. # 3.
[30]Ibid.
[31]Ibid.
[32]Op. Cit. # 5.
[33]Op. Cit. # 3.
[34] Ibid.

information into the matrix.[35] Mechanical trauma reorganizes the matrix into the gel phase according to the amount and direction of the force applied. This "information" is what the expert in palpation reads in the tissues as an "energy sink".

Structured water

This "information" can be in the form of "structured water". The manner in which hydrogen bonding occurs as water dissolves a particular molecule of a substance in question, organizes the water molecules specifically for that solute. This has the effect of carrying information, a "footprint" or an "image" of the dissolved molecule. Structured water is known to exist in regions of the living organism where there are transitions between more lipophilic and more hydrophilic areas, such as at the surface of the cell membrane and around enzymes.[36]

Structured water facilitates the activity of enzymes and receptivity of cell membranes to activators of cellular function. It also is located around the membranes of the nucleus and the endoplasmic reticulum. It is known that structured water carries information of the ``images" of molecules.[37] It is postulated here that this type of information plays a critical role in all metabolic activities of the body. This information may explain the action of homeopathic remedies. This type of information may also explain, in part, the potency of the cerebrospinal fluid and the exchange of information between all the fluids of the body, including the CSF.

Matrix as control mechanism

The matrix relates with central control mechanisms of the body, such as 1) the endocrine system, through transmission of substances generated by cells in both the matrix and the endocrine glands communicating through the capillaries, and 2) the central nervous system, through communications mediated by nerves whose endings are located within the matrix. As a result of the stimulation of triggering substances within the matrix, macrophages, mast cells and PMNs release into the matrix prostaglandins, cytokines, lymphokines, proteases, and so forth, creating a vast, complex humoral meshwork.[38]

Such a complex meshwork is, of itself, a central controlling mechanism, as are the endocrine, immune and nervous systems. These mechanisms offer the advantage of buffering changes of a severe or radical nature. They compensate for the failure of individual components within the organism by their shear volume. Phylogenetically, the matrix is the oldest information and defense system in the oxygen metabolizing organism, preceding the nervous, endocrine and immune systems as we know them. The matrix stores and transmits information by binding water to sugar polymers (GAGs) and influencing the exchange of ions (calcium fluxes), thereby regulating homeostasis.[39]

These sugar polymers (GAGs) and the associated water molecules are also responsible for detoxification by their quenching activity of the singlet oxygen and hydroxyl radicals which are the natural products of metabolic reactions. The resulting heat is usable in further biological processes.[40] It offsets the energy requirements of the gel phase of the matrix. The balance between disorganization and organization, the sol and gel phases, of the matrix are partly influenced by the production and consumption of heat by the matrix.

I. The Tide

The generation of the tide

The phenomenon of the circulation of the cerebrospinal fluid has been generally accepted. Sutherland was the first to propose that the CSF fluctuates as well as circulates. This fluid fluctuation, a hallmark of the cranial concept, could be applied in a more general sense to the physiology of the organism, as a whole. In this section of the paper, the topic of fluctuation of fluids throughout the body is addressed.

According to the model presented here, with the inhalation phase of the PRM, the volume of the cerebrospinal fluid increases in the subarachnoid space and within the ventricles, as the brain substance compacts, like a squeezed sponge, expanding the relative volumes of these fluid-filled spaces within the less-compliant vault.[41,42,43] With the exhalation phase, the brain substance expands, compressing these fluid-containing com- →

[35]Op. cit. # 5.
[36] Mikesell, The Mikesell research papers on structured water and cellular biology, self published, Norman deLauder Mikesell, 732 N Perry, Tucson, AZ 85705.
[37]Ibid.
[38]Op. Cit. # 3.
[39]Op. Cit. # 5.
[40]Ibid.
[41]Op. cit. # 1.
[42]Bering, Demonstration of the choroid plexuses as the generator of the force for flow of fluid and ventricular enlargement, J Neurosurg 1962; 19:405-413.
[43]Feinberg, Modern concepts of brain motion and cerebrospinal fluid flow, Radiology 1992; 185:630-2.

partments and creating a fluid wave that expands outwardly. This is palpated by the osteopathic physician as the Tide, as Sutherland called the fluid fluctuation of the PRM.[44]

To paraphrase A.T. Still, the waters of the brain irrigate the withering fields to create the harvest of health.[45] This irrigation, under the influence of the PRM, which Sutherland added to the model given to him from Still, has a periodicity. We know this to be true by palpation. One can feel the Tide move in and move out. Theoretically, in the model presented here, this Tide impacts the matrix in a functional sense.

In this model, if the Tide indeed originates from the CNS, it is essential to recognize, that water may move through all the tissues of the body from the depths of the ventricles of the brain out to the extremes of the skin, without limitation.[46] Semipermeable membranes, by definition, do not limit the flow of water.[47] We observe the behavior of water in the ocean demonstrating a principle that is useful in this regard. More than one force operates at once upon a molecule of water in the ocean. As a wave passes, the water molecule bobs up and down with only minor lateral movement. Under the influence of the ocean tide, this same water molecule with all its neighbors will move laterally, sometimes great distances. These two forces of the wave and the tide happen simultaneously.[48]

The tide in the matrix

One can postulate how water at the cellular level also operates under at least two simultaneous forces: 1) under the influence of osmotic forces, water tends to remain compartmentalized, 2) under the influence of the Tide, water tends to move freely throughout the organism without limitation by semipermeable membranes or any other influence. Swabb confirms that there is indeed a measurable phenomenon of water movement in the tissues, what he calls "tissue hydraulic conductivity". He has measured that this flow of water seems to express an inverse relationship with the concentration of glycoaminoglycans (GAGs).[49] As described above, the gel phase is consistent with an increased concentration of glycoaminoglycans (that is, repolymerized matrix) and more bound water (less free water to flow). These phenomena are explored in more detail in the next section.

Keeping in mind the foregoing, the impact of this fluctuating volume of fluid upon the extracellular matrix can be theorized as follows:[50]

A.) Inhalation phase of PRM

1) Expansion of the volume of CSF in the ventricles and subarachnoid space.
2) The Tide is out in the extracellular fluids of the body, creating a relative increase in the concentration of electrolytes in the matrix.
3) The increased electrolyte concentration stimulates the secretion of hyaluronidase and other depolymerizing enzymes within the matrix.
4) These enzymes depolymerize the hyaluronic acid backbone and the GAGs of the macromolecules of the matrix.
5) The matrix becomes more fluid and permeable (sol phase).
6) There is a resulting disorganization and relative diminution of the negative charge of the matrix.
7) This relative positive charge attracts anions into the ECF and repels cations, like calcium, from the ECF.
8) **Movement of water and cations proceed into the cells from the ECF.**
9) Like the macromolecules of the matrix, intercellular fibers become depolymerized and more mobile, permitting the opening of the fenestrations between the lymphatic endothelial cells, which line the lymphatic vessels.
10) **Movement of water, metabolites and proteins proceed into the lymphatic system.**

B.) Exhalation phase of PRM

1) Flushing of CSF from the ventricles and subarachnoid space creates a tide. The Tide is in, in the ECF.
2) This dilutional effect decreases the electrolyte concentration in the matrix.
3) The secretion of hyaluronidase and other enzymes is consequently reduced.
4) Repolymerization of and binding of water to the PG/GAGs ensues.
5) The matrix becomes more stable and less fluid and permeable (gel phase).
6) Negative charge becomes a well-organized, static field in the matrix.
7) Cations are attracted to the ECF.
8) There is a firming of the en-

[44]Op. cit. # 7
[45]Op. cit. # 2
[46]Lecture, Coughlin, Cranial Academy Conference, Chicago, 1997.
[47]Guyton, Textbook of Medical Physiology, Fourth Edition, W.B. Saunders Company.
[48]Carson, The Sea Around Us, Oxford University Press, 1951, 250p.
[49]Swabb, Wei, and Gullino, Diffusion and convection in normal and neoplastic tissues, Cancer Research, 34:2814-2822, 1974.
[50]Op. cit. #3

dothelial cell connections of lymphatics.

9) Proteins remain in the ECF and lymph fluids.
10) Osmotic forces pull water into the ECF.
11) **Water and dissolved substances leave the cells.**

The scenario presented above, enriches the understanding of the influence of the Tide upon the tissues of the body and how it functions in cellular respiration to regulate the central control mechanisms of the matrix. As the Tide goes out, with respect to the matrix, in the inhalation phase of the PRM, the sol phase of the matrix is initiated. An increased electrolyte concentration stimulates secretion of the depolymerizing enzymes. Water, nutrients, and cations move into the parenchymal cells, while water, dissolved substances and solids, like proteins, move into the lymphatics (and venous capillaries, as permitted).[51]

As the dilutional effect of the Tide arrives in the exhalation phase of the PRM, water, nutrients and cations flow into the ECF. This initiates the gel phase of the matrix by inhibiting the depolymerizing enzymes so that repolymerization of the matrix occurs, restricting the flow of water and binding it to the matrix. The intercellular bridges between the lymphatic endothelial cells become firm, thereby closing and retaining their fluid contents within the lumen of the lymphatic vessels. With the next inhalation phase of the PRM, the endothelial fenestrations open again, permitting osmotic forces to pump waste products up the lymphatic channels.[52]

We know that the distance from the nutrient capillaries to the parenchymal cells averages 20 microns. The distance water moves as a result of the hydrostatic force generated by cardiac activity is estimated to be something in the range of 3-5 microns.[53] Therefore, it appears that the PRM could be the force necessary to fill this essential role in carrying nutrients to and waste products from the parenchymal cells through the matrix.

Measurements possibly demonstrating the tide

Cellular Oscillators

Pischinger recognized, before cellular oscillators were described in the literature, that the extracellular matrix is inherently capable of electromagnetic oscillation.[54] Extracellular calcium waves have been demonstrated by many investigators.[55,56,57,58,59] Oscillators operating in cell cultures have been discovered which seem to effect fluctuations of calcium ions. These calcium waves seem to be under the control of 1) the concentration of calcium ion, itself, 2) mechanical stimulation from a probe, which can be extrapolated to the mechanical effects of cell swelling, as well as concentrations of 3) glutamate and 4) albumen.[60] Relationship of calcium waves to the Na+/K+ pump have also been demonstrated *in vitro*.[61] Shifts of concentrations of calcium ion in the extracellular fluid are followed by spontaneous oscillations of calcium ion concentrations within the cell, which can be self-perpetuating. These phenomena have yet to be elucidated *in vivo*.

Mechanical changes of cell size are associated, *in vitro*, with the Na+/H+ exchange system influencing myosin light-chain phosphorylation. This Na+/H+ exchange system is not related to [Ca2+], however, it is related to cell swelling.[62] Mechanical stimulation of the cell membrane, however, has been shown to induce calcium waves within that cell and then to be communicated to neighboring cells. This seems to be coupled with dependency upon the presence of glutamate.[63] Long-lasting changes of calcium oscillations, believed to be

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[51] Ibid. 52 ibid.

[53]Aukland and Nicolaysen, Interstitial fluid volume: Local regulatory mechanisms, Physiological Reviews, Vol. 61, No. 3, July 1981.

[54]Op. cit. # 5.

[55]Strumwasser and Vogel, Cellular oscillators and biological timing: The role of proteins and Ca2+, Progress in brain research, vol. 92, Ed. Jnosse, Buiss, Tilders, l99l.

[56]Reetz, Weisinger, Reiser, ATP-induced oscillations of cytosolic Ca2+ activity in cultured astrocytes from rat brain are modulated by medium osmolarity indicating a control of [Ca2+] oscillations by cell volume, ATP-induced [Ca2+] oscillations in astrocytes, Neurochemical research, vol. 22, no. 5, 1997, pp.621-8.

[57]Nadal, Fuente, Pastor, McNaughton, Plasma albumen induces calcium waves in rat cortical astrocytes, GLIA (1997) 19:343-51.

[58]Hassinger, Guthrie, Atkinson, Bennett, Kater, An extracellular signaling component in propagation of astrocyte calcium waves, Neurobiology, Proc Natl Acad Sci USA (1996), vol.93, pp. 13268-13273.

[59]Zanotti, Charles, Extracellular calcium sensing by glial cells: Low extracellular calcium induces intracellular calcium release and intercellular signaling, J Neurochemistry, vol. 69, no. 2, 1997.

[60]Berridge, Rapp, A comparative survey of the function, mechanism and control of cellular oscillators, JExp Biol (1979), 81:217-279.

[61]Golovina, Bambrick, Yarowsky, Krueger, Blaustein, Modulation of two functionally distinct Ca2+ stores in astrocytes: Role of the plasmalemmal Na/Ca exchanger, Ca2+ regulation in astrocytes, GLIA (1996) 16:296-305.

[62]Schrode, Klein, O'Neil, Putnam, Shrinkage-induced activation of Na+/H+ exchange in primary rat astrocytes: role or myosin light-chain kinase, Am J Physiol, 269 (Cell physiol 38): C257-C266, 1995.

[63]Charles, Merrill, Sanderson, Intercellular signaling in glial eells: Calcium waves and oscillations in response to mechanieal stimulation and glutamate, Intercellular Ca2+ signaling in glial cells, Neuron, vol. 6, 983-992, June 1991.

associated with memory functions, are associated with glutamate.[64]

Studies at the University of Illinois, Chicago, in recent years revealed oscillations in cytochrome oxidase activity in the brain at a rate consistent with the PRM. Also observed are oscillations of hemoglobin concentration that occur at the same rate, approximately 7 times a minute.[65,66] This substantiates that cellular activity, ATP production in this case, follows a respiratory rhythm.

II. Visceral Motility

Although cardiac, pulmonary and gut motion have been generally accepted, the notion of inherent motion of the brain originates with Sutherland. Oscillations in the brain tissue and of the CSF, thought to be dependent upon cardiac activity by researchers who are unaware of the cranial concept, have been seen on magnetic resonance imaging in real time. Fluctuations of CSF demonstrate significant shifts of volumes between the cranium and the spinal canal, as well as contradictory movements that remain unexplained by the present literature, involving the central structures of the brain and the base of the brain.[67,68,69,70] An unexplained oscillation at the rate consistent with the PRM was observed in continuous ventricular pressure recordings on hydrocephalic infants. This oscillation was noted by the authors to be independent from the influence of cardiac or pulmonary activity.[71] Oscillations of the spinal cord have also been observel.[72]

To generalize regarding inherent motion in other organs, beyond the brain and spinal cord, palpation is the main indicator of such motion. One can feel such organs as the liver and kidneys oscillate, though ordinarily one considers them to be in a static condition, in much the same manner as the brain was considered, before Sutherland. Barral, as described earlier in this paper has not only observed motion, but has utilized it for the purposes of both diagnosis and treatment. Of course, some of the most massive organs in the body, the muscles and joints of the axial and appendicular skeleton all demonstrate inherent motion by palpation. What Barral has contributed significantly to our awareness is that all the tissues of the body exhibit inherent motion not only from cardiac and pulmonary activity, but also from activity of the PRM. These motions are similar to those in the brain, although the organs all have their own rates. Just as primary and secondary respiratory rates may become synchronous, so may other organs' rates synchronize with the PRM.

Bjorn Nordenstrom measured electric potentials of tissues in an effort to understand the electrochemical properties of tumors and discovered that the electrical potentials of normal tissues fluctuate. He found fluctuations in the potentials of the liver, the pancreas, the kidney, and the serosa of the stomach, at a rate of 3-5 cycles per minute, and at an amplitude of 1mV, in the anesthetized dog. These fluctuations were independent of peristalsis or of cardiac or pulmonary activity. He had no explanation for this phenomenon except to speculate that the fluctuations are under neuronal control.[73]

III. Reciprocal tension

The tensegrity model of human structure (Levin applied Buckminster Fuller's engineering concepts to the human structure)[74,75] states that the biological organism remains integrated because connective tissue acts like a suspension bridge in which constant tension of suspending fibers balance each other. Without this balance between the forces of expansion and contraction, we would end up in a heap on the floor. Tension triangulating from one side to the other, from front to back, from top to bottom and angling in all directions is essential to maintain the structural integrity of the body. Tensegrity operates without the influence of gravity, as demon-

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[64]Paste, Pozzan, Carmignoto, Long-lasting changes of calcium oscillators in astrocytes, a new form of glutamate-mediated plasticity, Long-term changes in astrocyte response to glutamate, J Biol Chem, vol. 270, no. 25, June 23, 1995, pp. 15203-15210.

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[66]Biswal, Hudetz, Yetkin, Haughton, Hyde, Hypercapnia reversibly suppresses low-frequency fluctuations in the human motor cortex during rest using echo-planar MRI, J Cereb Bl Fl and Met, 17:301-308, 1997.

[67]Feinberg, Mark, Human brain motion and cerebrospinal fluid circulation demonstrated with MR velocity imaging, Radiology, 1987;163:793-99.

[68]Enzmann, Pelc, Cerebrospinal fluid flow measured by phase-contrast cine MR, AJNR, 14: 1301-7, Nov/Dec 1993.

[69]Feinberg, Modern concepts of brain motion and cerebrospinal fluid flow, Radiology 1992,185:630-2.

[70]Poneelet, Wedeen, Weisskoff, Cohen, Brain parenchyma motion: Measurement with cine echo-planar MR imaging, Radiology 1992; 185:645-651.

[71]Hayden, Shurtleff, Foltz, Ventricular fluid pressure recordings in hydrocephalic patients, Arch Neurol 23: 147- 154, Aug 1970.

[72]Levy, Chiro, McCoullough, Dwyer, Johnson, Yang, Fixed spinal cord: Diagnosis with MR imaging, Radiology 1988;169:773-778.

[73]Op. cit. # 6.

[74]Levin, Continuous tension, discontinuous compression, a model for biochemical support of the body, Bulletin of structural integration, Rolf Institute, Boulder, pp.31-33, 1982.

[75]Levin, A different approach to the mechanics of the human pelvis: tensegrity in movement stability and low back pain, Ed. Vleeming, Mooney, Snijders, Dorman, Stoeckart, Pub: Churchill Livingstone, 1997.

strated by the persistent structural integrity of the astronauts in space. However, within the field of gravity, tensegrity accommodates.

A look at an x-ray of the trochanter of the femur reveals calcified fibers laid out in the bone along lines of stress, representing a good visual example of the tensegrity model. The reciprocal tension membranes, described by Sutherland are a very good example of such tensegrity. The point to be made here is that such reciprocal tension is universal within the human connective tissue, not isolated to the cranium and the dural membranes.

The icosahedron appears to be the basic structure of biomechanical support.[76] Integrins are a part of a group of cooperating molecular elements that express a tensegrity architecture.[77] These structural proteins have been shown to create a mechanotransduction from the extracellular matrix across the cell surface into the cytoskeleton.[78] Pienta and Coffey discovered that tensegrity is responsible for information transfer and relies upon vibrational characteristics of the filamentous complex of the extracellular matrix, cytoskeleton and cellular and nuclear membranes. They identified many cycles of activity having periods from diurnal to thousands of times a second that related to cellular functioning. Among these cycles is the calcium wave which has a rate consistent with the PRM.[79]

Summary

Sutherland identified **bony mobility** in the cranium and the sacrum as important elements of the cranial concept. These motions appear to be passive. Of course, subtle inherent bony motion can be palpated across any joint in the body, as any osteopathic physician who engages the PRM for diagnosis and treatment will attest.

Sutherland identified **organ motility** within the cranium and spinal canal as inherent motility of the central nervous system. Organ motility also exists generally, on a subtle level, consistent with the PRM, as the field of visceral manipulation describes.

Sutherland identified **fluid fluctuation** within the craniospinal compartment as fluctuation of the cerebrospinal fluid. There is also fluctuation of fluid in the rest of the body, as palpated by osteopathic physicians. Further, measurements have been made of fluctuations of polarities and ion concentrations as enumerated in this paper.

Sutherland identified **tensegrity** within the craniospinal compartment as a reciprocal tension membrane. There is also tensegrity evident throughout all the connective tissues of the body as described by the model of tensegrity presented in this paper.

Conclusions

Considering the previously presented information, the author proposes that the cranial concept may be distilled into three basic precepts and applied to the body in general:

1) Inherent motility of organs.
2) Reverberation of water and its dissolved, biological and electrical elements.
3) Tensegrity and passive mobility of all connective tissues.

The motive power for all this activity is the remaining question. Sutherland refers to what he calls the "Breath of Life" as the generator for the PRM.[80] The origin of the term, Breath of Life comes from the passage in Genesis, in the Bible, which states, "And God breathed into the nostrils of man the breath of life", referring to how the inanimate clay became vivified at the moment of the creation of the human being. The divine impulse for life characterizes what Sutherland referred to, with the use of the term, the Breath of Life. It is the life force, the creative potential moving through the tissues, the force of spirit motivating the body to express the original force behind material manifestation in as many aspects as can be conceived. Metabolic activity of cellular respiration is a physicochemical aspect that the organism can express as life is continually recreated. Vibration and fluctuation, contraction and expansion are active forces and tensegrity the restraining, counterbalancing force. The generative forces would create unusable forms without some restraint to maintain an integrated entity. So, it is the connective tissues that contain the forces for life which are manifested by the fluid and organ motion and the chemical activity. The connective tissues retain the individual as an identity. These tissues unify and segment at the same time. These are the tissues of the earth, the substance of life. The fluids transduce the energy of the celestial, the spirit of life. As Still said, "The celestial worlds of space or ether-life give forms wisely constructed in exchange for the use of the material substances. Reciprocity through the governments of the celestial and terrestrial worlds is ever

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[76]Levin, The icosahedron as the three-dimensional finite element in biomechanical support, Proceedings of the society of general systems research symposium on mental images, values and reality, G14-26, Society of general systems research, St. Louis, 1986.
[77]Heidemann, A new twist on integrins and the cytoskeleton, Science, vol.260: 1080-1081, 21 May 1993.
[78]Wang, Butler, Ingber, Mechano-transduction across the cell surface and through the cytoskeleton, Science; 260:112~1127, 21 May 1993.
[79]Pienta and Coffey, Cellular harmonic information transfer through a tissue tensegrity-matrix system, Medical Hypothesis 34:88-95, 1991.
[80]Op, cit. # 7.

the same, and human life, in form and motion, is the result of conception by the terrestrial mother from the celestial father. Thus we have a union of mind, matter, and life, or man.''[81]

Sutherland did more than proffer five components of a mechanism existing in the head and spine. He described a previously unrecognized physiological phenomenon. Combining the aspect of cellular respiration with the dynamic fluid fluctuation of the PRM given to us from Sutherland, we achieve a greater understanding of both. It is clear that Sutherland properly named this phenomenon a characteristic of **respiration**.

The model presented here provides a greater level of appreciation for the relationship of the connective tissues with various bodily systems. The immune, neuronal and endocrine functions relate to tissue structural considerations. This *holistic* marriage of *structure-function* relationships gives greater insight into the osteopathic concepts of how the *body heals itself* and of how these normal processes can be disrupted in the case of *somatic dysfunction.*

If the model of the PRM presented herein represents reality, cellular respiration does not only rely upon biochemistry but also upon biomechanics, at both the levels of the cell and of the body as a whole, simultaneously. The substances that are exchanged by this oscillation are numerous, not just oxygen and carbon dioxide as generally taught in basic courses of physiology. Electromagnetic forces are equally important to chemical ones. The cerebrospinal fluid plays a role that is fundamental to the functions of the blood, extracellular fluid, and lymph; and they all flow into each other. Truly, *the body is a unit.*

Dr. Sutherland addressed the entire organism, using his system of diagnosis and treatment. He made the point repeatedly that he was only extending the osteopathic principles of Dr. Still to the head region. This paper is intended to demonstrate the broad scope of the discoveries of Still and Sutherland, and to honor them more fully. Some day, these discoveries may finally be appreciated for what they are: some of the greatest observations in the history of anatomy, physiology and medicine.❐

[81]Op. cit. # 2.

Book Review

by Michael A. Seffinger, DO, FAAFP, CSPOMM

The Muscle Energy Manual:
Evaluation and Treatment of the Pelvis and Sacrum, Volume Three

by Fred L. Mitchell, Jr., DO, FAAO, FCA and P. Kai Galen Mitchell, BA

In the 1950s, inspired by the work of T.J. Ruddy, DO and Carl Kettler, DO, Fred Mitchell, Sr., DO developed a system of evaluation and treatment he called "muscle energy" techniques. His first application was to treat movement impairment of pelvisacral joints. He later developed applications to other areas of the body. In the 1960s and early 1970s, Fred Mitchell, Jr., DO collaborated with his father and developed the muscle energy concept into a refined learning module inclusive of functional anatomy, neuromusculo-skeletal physiology and biomechanics, visual and palpatory diagnosis and psychomotor skill development. This refinement is still evolving into the 21st century as Fred has collaborated with his son, Kai, to produce a superb instructional manual on muscle energy concepts, evaluation and treatment methods.

F.L. Mitchell, Jr., P.S. Moran and N.A. Pruzzo wrote the initial muscle energy treatise and published it in 1973 under the title "An Evaluation and Treatment Manual of Osteopathic Manipulative Procedures". That manual was used for 25 years in hundreds of tutorials held worldwide on muscle energy technique. This new series of Volumes significantly upgrades and replaces that manual. Volume III is in a way a return to the roots of muscle energy technique in that it addresses pelvic somatic dysfunction. The current Mitchell model of pelvic function and dysfunction is, however, a considerable expansion from the original journal article by Mitchell, Sr. in 1958 entitled "Structural Pelvic Function". Additionally, this text has updated scientific references, engaging historical perspectives throughout, and is the most comprehensive treatise in print on pelvic somatic dysfunction and its evaluation and treatment with muscle energy techniques.

As stated in the preface, Muscle Energy Treatment (MET) "is more than a method of treatment or therapy; *it is also a biomechanics-based analytic diagnostic system, using precise physical diagnosis evaluation procedures designed to identify and quantify articular range-of-motion restriction.*" Like Volumes I and II, Volume III also succinctly covers pertinent articular anatomy and biomechanics, respiratory motion as it relates to the pelvis, and evaluation and treatment procedures using muscle energy concepts developed by Fred L. Mitchell, Sr. and Jr. Key concepts are summarized in well-designed tables. Kai Mitchell's graphic drawings are innovative, accurate and clear. They complement and facilitate comprehension of the concepts described concisely and eloquently in the text. The manual has a detailed table of contents and is well organized. Black and white photos depicting evaluation and treatment procedures enhance the text and drawings well. Explanations of procedures are very articulate and easily understood. Flow charts and differential diagnosis tables are helpful in making the material palatable and practical.

The manual is quite readable due to the matter-of-fact down to earth writing style and interesting historical references and discussions of controversies in the current medical literature that are seamlessly woven throughout. A unique aspect is that there are recommended treatment sequences, including their rationales; true pearls from the master himself. Since muscle energy procedures enlist the patient's activation of muscle force, it is necessary to use very accurate commands to get the patient to move exactly how the practitioner wants in order to increase the effectiveness of the procedure. Again, as in previous volumes, Dr. Mitchell provides effective and succinct commands to use to instruct patients properly. The techniques are outlined in a step-wise fashion and are super easy to follow. The descriptions are as accurate as possible, stating positions →

in three planes, amount of movement in millimeters, amount of force in pounds and the duration of activity in seconds.

Volume III is far from merely a technical manual. It is a scholarly treatise on pelvic somatic dysfunction. It includes a detailed discussion of the gait cycle as it relates to the Mitchell model of pelvic mechanics It also addresses the relationship between somatic dysfunction of the lumbar spine and lower extremities on pelvic mechanics and dysfunctions. Clinical cases, mechanisms of injury, problem solving, differential diagnosis and organization of examination and treatment procedures are additional components of this manual that set it apart from any other book on manual medicine in print today. Clinical indications and precautions are clearly delineated and clinical pearls derived from Dr. Mitchell's 40 years of intimacy with these procedures in clinical practice are abundant.

Most of the diagnostic and treatment procedures in this manual have been adopted as standard in all of the American osteopathic medical schools. They are also taught around the world and formulate integral components of the curricula at foreign osteopathic colleges and institutions as well. They have been taught to physical therapists and have made their way into the curriculum at their institutions as well. They are rationally based, logically sequenced and easily learned and reproduced.

I have been using these procedures for 15 years in clinical practice. They are amongst the most useful and effective procedures ever designed for evaluation and treatment of patients of all ages with pelvic and sacral somatic dysfunction. Their utility and effectiveness is readily experienced when applied to patients with acute as well as refractory and recurrent mechanical low back pain. The procedures taught in this manual are non-invasive, non-traumatic, safe, efficient, and a rapidly effective alternative to joint mobilization by thrust or HVLA.

If you have been confused about pelvic mechanics and applications of muscle energy evaluation and treatment procedures to the pelvis, this manual will surely straighten you out. It is **the** authoritative text on muscle energy evaluation and treatment procedures of the pelvis and sacrum. I highly recommend this manual for practitioners and instructors using manual diagnostic and treatment procedures.❐

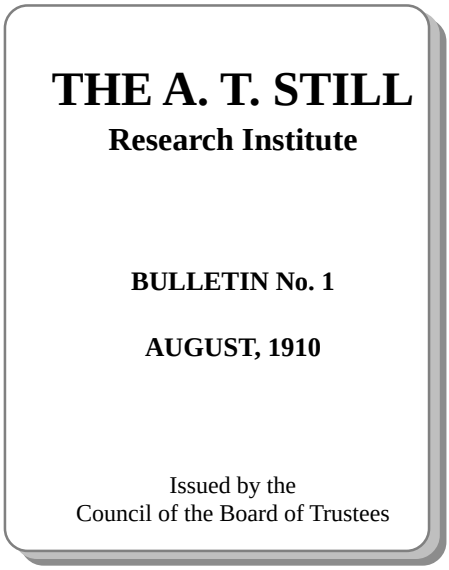
Editor's note: Volume III of The Muscle Energy Manual can be ordered from the publisher: MET Press, P.O. Box 4577, East Lansing, Ml 48826-4577. Fax: (517) 332 4196.

From the Archives

Introduction

In 1908 the Council of the A. T. Still Research Institute appointed three committees, as follows: Dr. C. P. McConnell and Dr. Louisa Burns on Spinal Lesions; Dr. N. A. Bolles and Dr. C. W. Proctor on Diet and Metabolism; Dr. J. M. Littlejohn and Dr. C. A. Whiting on Neoplasma. Those appointed had their own practice to look after, and no funds were available to compensate them for the time or labor required to perform systematic research work. Notwithstanding the fact that their work would have to be at the sacrifice of their personal interests, they proceeded with commendable zeal. Drs. McConnell and Burns were asked to conduct a preliminary course immediately after the meeting of the American Osteopathic Association at Kirksville in August, 1908, and the expense was guaranteed by individuals independent of the resources of the Research Institute. Both of them had their work carefully planned. A violent opposition suddenly manifested itself, and it was decided to postpone the work till a more opportune time, or leave the members of the committee to carry it on in their own laboratories and report as they progressed. This they have done from time to time.

Some of the results of Dr. Burns' work appeared in "*The Journal of the American Osteopathic Association*" for November 1906, March 1907, April 107, September 1907, October 1907, March 1908, November 1908, August 1909, July 1910, and in her addresses at the Minneapolis meeting of the American Osteopathic Association in August 1909, and at the San Francisco meeting in August 1910. Her final report in condensed form is presented in this issue of the *Bulletin of the Research Institute*, and the more detailed data of her findings, in form suitable for the layman as well as the scientist, will be found in Volumes II and III of her "Studies in the Osteopathic Sciences," now in preparation for publication.



Reports of the work of Dr. McConnell have appeared in the Journal at frequent intervals since September 1905. The latest completed data were reported to the Council in February, 1910, presented to the New York Osteopathic Society in March, and printed in the Journal of the American Osteopathic in April. These were supplemented by his address at the San Francisco meeting of the American Osteopathic Association in August, 1910.

In this, the first Bulletin of the A. T. Still Research Institute, are found the condensed reports of these two self-sacrificing and indefatigable workers, and reports of the other researchers showing progress. Few know the labor they have performed in their attempt to arrive at the truth. No one will claim at the present time that the last word relating to the important subjects presented has been spoken. That a good beginning has been made is evident. May this pioneer work, the most difficult step, be an inspiration to others to show the same devotion to science!

The articles herewith presented by Drs. McConnell and Burns present most of the definite results of their research work during the last two years, and the technique of their experiments in sufficient detail to enable others who are interested to follow up the work and prove or disprove their findings. The average mind resents a new truth, and

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the scientific mind is rightfully skeptical. If either is to be convinced, the truth must be presented in unmistakable terms and with unquestionable data to support it.

It will be observed that the two members of the committee worked independent of each other, but the conclusions seem to harmonize, although there are some apparent contradictions.

Dr. McConnell has presented the ultimate but direct effects of bony lesions. He has dealt with what may be considered chronic and more permanent disturbances to the spinal column, discovered where the structural disturbance is, traced the direct line of connection between the lesion and its effects, and shown that the symptoms are a direct result of the lesion caused by mechanical procedures. (See page 8.)

Dr. Burns has presented the immediate effects of bony lesions. She has dealt with what may be considered acute and temporary disturbances to the spinal column, their generally immediate effects, and the effects following almost immediately upon the restoration to the normal. She has thus traced the relation of primary cause to effect as shown in acute symptoms, and her clinical findings indicate the more or less permanent results when the normal condition is not restored. (See page 30.)

Both demonstrators have confirmed by laboratory methods the general contention made more than a third of a century ago by Dr. A. T. Still as to the effects of abnormalities in the spinal column, and the possibilities of the results claimed in practice by thousands of osteopaths upon tens of thousands of human beings afflicted with acute or chronic ailments. Their results will, however, make it evident that many osteopaths should be more careful in explaining the relations between real or supposed causes and the abnormal conditions from which the patient seeks relief. The human body is a very complicated machine. To say that a given condition is caused by direct pressure at the place where the symptom appears or upon the nerve or blood vessel that supplies that part may express a common fact, but it may often be far from the truth. Both papers will help to eradicate some of the errors into which many have unwittingly fallen.

Drs. C. W. Proctor and N. A. Bolles, of the Committee on Diet and Metabolism, have not been able to arrive at any definite conclusion as a result of their direct work. They have, as will be seen by reading their reports, clear ideas as far as their investigations go, but what is new remains to be proven by verified results, in a great many cases, under the most careful guidance, observation, and comparison as a basis upon which to found conclusion.

Dr. Proctor's report deals with the subject from viewpoints already presented by specialists. Anything that can be done to dethrone some of the fads exploited by so-called dietarians will be no less serviceable to the profession and the public than the proving of new and untried theories. There is probably no field in which there is a greater admixture of wheat and tares than in dietetics, and in separating them care will be necessary to destroy only what is worthless. (See page 45.)

Dr. Bolles is working along what seems to be a new line of thought, namely, the relationship between diet and the means by which it is secured, and the mental and ethical ideals toward which man is growing by the slow processes of evolution. These surely are worthy of consideration as well as the chemical and physical needs of a mere animal organism. (See page 48.)

Readers of osteopathic papers are more or less familiar with what Dr. J. M. Littlejohn has been doing along the line of neoplasma. The unchecked increase in the number of deaths from malignant tumors makes this one of the most important fields of research. The fact that the old schools of practice have practically nothing to offer in such cases but the knife, which is so often ineffective, and the further fact that numerous apparently well authenticated cases of spontaneous recovery have been reported, point to the necessity for more rational procedures than have been devised by the older schools of medicine. Osteopathy seems to have done much in that direction, and it is to be hoped that the self-sacrificing efforts of those interested in and qualified for such work will demonstrate either how much or how little can be done. (See page 52.)

Dr. C. A. Whiting has also been at work along lines closely allied with the work of Dr. Littlejohn, The use of the "Opsonic Index" as a reliable means of determining metabolic conditions is bearing fruit. Dr. Whiting has also investigated, during the past year, a number of cases of amoebic dysentery and applied osteopathy in their treatment. The results have been most gratifying, but the investigations have not been extended far enough to warrant conclusions. (See page 61.)❐

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