BIOMECHANICS RESEARCH:
A Unique Perception
of the Human Body
BIOMECHANICS RESEARCH
By Robert Wm. Little, Ph.D.
Chairman, Department of Biomechanics

The term "biomechanics" carries different meanings to different individuals. The osteopathic physician assumes its definition is the equivalent to that of manipulative medicine, the allopathic physician associates the term closer to orthopedic surgery and the physical scientist sees it as the application of theoretical principles of Newtonian mechanics to biological problems. All realize that the field will involve the study of forces, motions and deformations in biological systems.

While medicine is itself a descriptive science, biomechanics is a quantitative science seeking the yardsticks, scales and numerical parameters that characterize the responses of the biological systems. The field is centuries old including basic studies of circulation and the musculoskeletal system. However, recently there has been a renewed interest on the part of the physical scientists in this subject. National and international societies have been formed and many journals are devoted to publishing research results in the field.

The MSU-COM Department of Biomechanics is primarily a research unit concentrating on the study of the musculoskeletal system. Basic science laboratories have been developed and are being used to investigate different aspects of this system. In particular, major studies are being conducted on spinal and extremity joint motion (kinematics), mechanical properties of soft tissues, histology, light scattering examinations of collagen structure, and computer simulation of the spinal system. Additional research in the areas of biochemistry, pharmacology and nutrition are active within the department.

For the year 1980-81, the department attracted more than $200,000 in gifts and grants from the National Osteopathic Foundation, the Michigan Osteopathic College Foundation, the Air Force, the National Institutes of Health, the National Science Foundation, as well as internal funds from the College of Osteopathic Medicine.

Although many of these programs are termed basic research, results from this work have direct applications to osteopathic medicine. The understanding of how forces are transmitted and the interaction of these forces with the motions produced is fundamental to medicine. Research will establish how the musculoskeletal system's response depends upon structure, neurostimulus and pathology. This knowledge will serve as a basis for evaluation of various diagnostic and therapeutic modalities as well as for development of programs in injury prevention.

To accomplish these goals, the Department of Biomechanics has assembled an interdisiplinary team of scientists and physicians. These include osteopathic physicians, physiologists, pharmacologists, physical anthropologists and bioengineers with specialties in electrical engineering, materials science, and theoretical and experimental mechanics. Students from the physical and life sciences cooperate in the research efforts, while pursuing their B.S., M.S., or Ph.D. degrees. The research laboratories and equipment are among the finest to be found anywhere and Michigan State University's three medical colleges and substantial basic science departments provide a strong research atmosphere. The department looks forward to continued growth and expects to remain one of the leading research units in osteopathic medicine.
TISSUE BIOMECHANICS LABORATORY

What happens when an athlete "warms up" before exercise? How does traction affect the patient with an acute low back injury? How much force should a physician apply when conducting a particular technique in osteopathic manipulative therapy?

Research being conducted in MSU-COM's tissue biomechanics laboratory is laying the necessary foundation for such applications and extensions of biomechanical concepts to clinical medicine.

The mechanical properties of soft tissue -- such as tendons or spinal ligaments -- is being investigated in cooperative studies by departmental chairman Robert Wm. Little, Ph.D., and Robert Hubbard, Ph.D. Little does the mathematical modeling for the projects; Hubbard designs and conducts the experimentation.

"Tissue biomechanics may be defined as the responsive characteristics of tissue to load (the force the material carries) or deformation (how the material changes in shape)," said Little. "Once we can characterize the responses of tissues by quantitative parameters, we can begin to be able to predict their behaviors under different diagnoses, therapies, or environmental factors."

The researchers use a specially-designed electrohydraulic testing machine, which, with a computer, is capable of generating a preselected program of mechanical events. Microscopes and a camera are used in conjunction with the machine, and the computer also handles data acquisition.

Developing and refining the equipment and testing techniques have been major concerns of their work, since biological tissues differ in response to other materials commonly tested on such machines.

Biological tissues have a "memory," Little said, meaning that their responses are affected by their histories. Under cyclic loading, for example, tissues tend to "creep" a little longer with each successive load, where a material such as a metal deforms the same amount with every loading. If a deformation history is imposed, however, the force required tends to drop as the material becomes softer and more pliable, he said.

"If the tissues are left alone after testing, their viscoelastic properties will cause them to 'regroup,' flowing back to their original state," Little said.

(more)
Studies on Spinal Ligaments

Studies on the mechanical properties of spinal ligaments are just being completed under a contract from the United States Air Force, Hubbard said. They tested the anterior longitudinal, posterior longitudinal, ligamentum flavum and supraspinous ligaments from four species of primates — baboons, chimps, rhesus monkeys and humans.

Experimentation involved testing the extension behavior of ligaments at different rates, ranging from 100% extension per second to 0.01% per second. In this final phase of the project, Hubbard said, the researchers are looking at the effects on the ligaments of many repeated cycles of load and ligament failure due to repeated loading.

Data obtained from the experiment are used by Little to develop a mathematical model of mechanical behaviors in the spine, utilizing the relationships of load and deformation and time.

Collagen Studies

Recently Hubbard received a two-year, $24,200 grant from the American Osteopathic Association to study the stability of response to repeated elongation of tendons.

"Tendons, which are almost entirely collagen, are a much simpler structure than ligaments," Hubbard said. "Ligaments, which are both collagen and elastin, are more geometrically complicated. Fiber proportions vary from site to site, the fibers are different lengths, and they are much less apt to be in parallel configurations. Thus tendons are a much better model for studies of collagen."

Little and Hubbard are assisted in their work by German doctoral candidate Lothar Borchers, by graduate students Dave Hyler, Mike Sacks, and Dan Selke, and by undergraduates Glenn Beavis, Janet Frahm, Rich Geist, Larry Milks, Dorothee Rometsch and Mary Verstraete.

The tissue biomechanics team (l to r): Little, Rometsch, Hubbard, Sacks and Verstraete (at computer console).

Jane Walsh

HISTOLOGICAL STUDIES

Histological and histochemical studies on tissues used in biomechanical research are conducted by laboratory research technician Jane Walsh.

Working with scientists Hubbard and Little on spinal ligaments and tendons, Walsh does the processing, slide preparation, and photography on all specimens.

Her work includes an initial series on unstressed tissue to obtain a baseline, and then analysis of specimens after the biomechanical experimentation.

The histological work allows visualization of factors such as fiber attachment to bone, orientation of fibers to each other, elastin content, and general morphology.

She has also been involved with histochemical analysis of cranial sutures, muscles, and muscle fiber regeneration.

Walsh is involved in the teaching of histological techniques to medical students, medical technologists and independent study students.
Herbert M. Reynolds

SYSTEMS ANTHROPOMETRY LABORATORY

What happens — kinematically — when the human body moves?

Two of the oldest branches of biomechanics — kinematics, the study of the possible motions of a body, and anthropometry, the study of size, weight and proportion of the human body — are being combined with great sophistication in MSU-COM’s Department of Biomechanics.

Under the direction of Herbert M. Reynolds, Ph.D., stereoradiology and advanced computer techniques are being used in the systems anthropometry laboratory to provide three-dimensional data on human movement.

Using tungsten-carbide markers at defined points on human cadavers, he takes a number of stereo x-rays of each motion. The computer then provides three-dimensional coordinates of each target and two-dimensional graphics of the area.

Initial research in the laboratory was directed toward finding theoretically stable axes systems in the pelvis based upon anatomical landmarks. These then allowed the researchers to document very small three-dimensional displacements of one bone relative to another with body movement.

Torso Linkage System

Current projects include investigation of the spatial linkage system of the human torso between the hip and shoulder — humeral/shoulder/spinal/pelvic/femoral.

The researchers are moving the sitting body through lumbar flexion, extension, and lateral sidebending.

"Because our techniques are new, a major portion of our efforts have been directed toward 'how-do-you-do-it?' problems," Reynolds said.

"Other questions we ask are what is the 'norm' and how do bones move with respect to this norm? If we consider the anatomical differences in persons, how do these variations relate to how we move? Because geometry constrains the motions possible, what are the limits? Where is 'bending' taking place? What are the axes of rotation?"

Reynolds’ research has been funded since 1976 by the U.S. Air Force, which also uses his data for mathematical modeling.

His co-workers include Sik-Chuen Leung, Ph.D., a theoretical nuclear physicist, June Lai, a computer science and statistics graduate student, and Laurie Batzer, a research assistant.
Richard Hallgren

COMPUTER SIMULATION OF THE SPINE

A unique computer simulation of the lumbar spine in motion is the focus of one of many projects being conducted by Richard Hallgren, Ph.D.

Hallgren recently received a two-year grant totaling $41,639 from the American Osteopathic Association to develop the videotaped simulation of movement in the second, third, and fourth lumbar segments.

"It's anticipated that the simulation will be useful not only to researchers, but also to physicians and their patients," Hallgren said. "We will be able to 'see' what happens within the body in a unique way as the spine is put through its range of motion."

Using a graphics generator, Hallgren will base the simulation on data received from both MSU-COM's systems anthropometry laboratory and tissue biomechanics laboratory.

"Output from Reynolds' research will provide the exact location of paths of motion and range of motion of the spine," he said. "The work done by Little and Hubbard will allow representation of time-dependent data on spinal ligaments. Since we know how the attachment points move, we also know the internal forces within the ligament when it is stretched."

Other Educational Projects

Hallgren has also recently completed some computer simulations on phenomena in membranes to supplement what biology students learn in their texts.

Students using the program can do "experiments," observe results, collect data and plot graphs without the elaborate facilities or time required in a laboratory.

Topics in the series range from passive diffusion and filtration to mass transfer relationships in the human kidney.

James Rechtien

USING THE LASER TO STUDY COLLAGEN

A view of how the structure of collagen may change with deformation may result from a study being conducted by James Rechtien, D.O., Ph.D., in the Department of Biomechanics.

A materials scientist, Rechtien is using laser optics to dynamically observe collagen during tissue biomechanical testing.
1982 HOODING INCLUDES COMMENCEMENT,
FEWER STUDENT AWARDS -- JUNE 11

The annual hooding ceremonies for 1982 graduates of the MSU College of Osteopathic Medicine will begin at 1 p.m. Friday, June 11, in the MSU Auditorium, with the reception to follow at the University Club.

For the first time the program will incorporate commencement and the awarding of token diplomas. Previously commencement exercises for professional students were held as part of the university-wide graduation ceremonies.

Awards for students at the ceremonies will be limited to the three College awards, with the remainder presented at the dinner/dance at Long's that evening.

Guest speaker for the ceremonies will be Dr. Walter Adams, former president of MSU and distinguished university professor.

The 1982 Graduating Class of the Michigan State University
College of Osteopathic Medicine
cordially invites
all faculty and staff to
1982 Commencement Ball and Awards Banquet
Friday, June 11,
at Long's of Lansing

Hors d'oeuvres and cocktails will begin at 6:15 p.m., dinner at 7 p.m., the awards presentation at 8:30 p.m., and dancing at 9:15 p.m.

Reservations must be received by May 28. Send a self-addressed envelope and a check made payable to "COM '82" for $15 per person to Shelly Friedman, 1302 Chartwell, Carriage Way South, East Lansing, 48823. Please indicate your choice of prime rib, marinated boneless breast of chicken, or sered almondine.

PEOPLE

Gaston E. Blom, M.D., professor of psychiatry and special education and medical coordinator for the University Center for International Rehabilitation, presented a workshop on "Handicap in Adolescence" at the second annual day in adolescent medicine held April 21 at St. Lawrence Hospital, Lansing. He also was a panelist on "Helping the Language-Disabled Child: Psychiatric and Educational Implication" for the International Reading Association in Chicago on April 27.

E. Michael Lodish, D.O. clinical assistant professor of oncology from Highland Park, discussed treatment of primary and metastatic liver tumor at a Detroit Osteopathic Hospital symposium.

Alan W. Morgan, D.O. clinical professor of osteopathic medicine from Rochester, was one of 80 invited urologists who attended a conference April 2-4 in Houston to study advanced surgical techniques involving the artificial urinary sphincter. He is among approximately 200 physicians worldwide using the prosthesis to treat urinary incontinence.

E. James Potchen, M.D., chairman of radiology, has been named to the Medical Radiation Advisory Committee of the Food and Drug Administration. The 13-member committee, appointed by the Secretary of Health and Human Services, assists the FDA commissioner in developing a program for reduction of population exposure to x-rays and for more effective use of x-ray procedures.

Donald Briner, D.O., chairman of internal medicine, was among the speakers to address "Health Maintenance for Older Adults" as part of a public lecture series at the MSU Clinical Center May 10.
CONTINUING MEDICAL EDUCATION

**NEUROMUSCULAR DISEASE SYMPOSIUM**
**JUNE 4 AT MSU'S KELLOGG CENTER**

The annual Neuromuscular Disease Symposium, held at MSU's Kellogg Center, is sponsored by the Muscular Dystrophy Association and the MSU College of Osteopathic Medicine and College of Human Medicine.

The program, scheduled this year for June 4, is approved for seven hours Category II credit for D.O.'s.

Faculty include Richard Moxley III, M.D., codirector of the University of Rochester Muscular Dystrophy Clinic, and Lewis Rowland, M.D., chairman of the Department of Neurology at Columbia University.

Osteopathic faculty are George Ristow, D.O., associate professor of internal medicine at MSU-COM and director of the MDA clinic at the MSU Clinical Center, and Michael Nigro, D.O., clinical professor of medicine at MSU-COM, and director of the MDA clinics at Martin Place Hospital and Children's Hospital of Detroit.

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**BASIC PRINCIPLES OF MANUAL MEDICINE:**
**JUNE 14 - 18 AT KELLOGG CENTER**

The application of basic principles of manual medicine for the spine, pelvis, and extremities will be taught in this week-long tutorial at MSU's Kellogg Center June 14-18. The program includes lectures, demonstrations, and practice sessions.

Faculty include John Bourdillon, F.R.C.S., former senior orthopedic surgeon, North Gloucester, who is now in private practice in Vancouver, B.C.; Philip Greenman, D.O., associate dean and professor of biomechanics, MSU-COM; Paul Kimberly, D.O., former Steunenberg Professor and chairman of the Department of Osteopathic Theory and Methods, Kirksville College of Osteopathic Medicine; and John Mennell, M.D., past president of the North American Academy of Manipulative Medicine and noted author of multiple texts on manipulative medicine.

The program is approved for 40 hours of Category I credit for both M.D.s and D.O.'s. It is sponsored by MSU-COM, the MSU College of Human Medicine and the North American Academy of Manipulative Medicine.

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WEDNESDAY, MAY 26, 1982

8 a.m. Departments of Medicine and Pathology colloquium: "Von Willebrand's Disease" by Richard Feret, M.D., and F.A. Kennedy, D.V.M. B205 Life Sciences.

THURSDAY, MAY 27, 1982

12 p.m. Perspectives on Pets and People Lecture Series: "Use of Animals in Therapy for Handicapped Persons" by Lida McCowan, executive director, Cheff Center for the Handicapped, Augusta, Michigan. A133 Life Sciences.

FRIDAY, MAY 28, 1982

8 a.m. Department of Family Medicine seminar: "How to Utilize the New Modalities in Radiology," by Richard White, D.O. B217 Fee Hall.

TUESDAY, JUNE 1, 1982

4 p.m. Department of Microbiology and Public Health and Department of Medicine seminar. Basil Williams, School of Medicine, Wayne State University. 146 Giltnar.

WEDNESDAY, JUNE 2, 1982

4 p.m. "Environmental Mutagens: Principles and Methods for Their Detection" by Chia-cheng Chang, Division of Human Genetics, MSU. Sponsored by the Center for Environmental Toxicology. 101 Biochemistry.

FRIDAY, JUNE 4, 1982


8 a.m. "Neuromuscular Disease Symposium." Sponsored by MSU Colleges of Human Medicine and Osteopathic Medicine, MSU Lifelong Education Programs, and Muscular Dystrophy Association. Contact Molly Karnitz, 616/459-4410. Kellogg Center for Continuing Education, MSU.

9 a.m. "Toxicology in Michigan Today." Second annual scientific meeting sponsored by MSU Center for Environmental Toxicology and Lifelong Education Programs. Contact Joan Martin Alam, Conference Coordinator, Lifelong Education Programs, MSU, East Lansing; 517/353-7822.

MONDAY, JUNE 7, 1982

7 p.m. Seminars on health maintenance for older adults: "Keeping a Keen Edge — Mental Health Concerns of the Aging" by James G. O'Brien, MSU College of Human Medicine, and Gerald G. Osborn, D.O., MSU College of Osteopathic Medicine. Sponsored by MSU-COM, MSU-CHM, MSU College of Nursing, MSU Executive Committee on Aging, in cooperation with Michigan Health Council. MSU Clinical Center.
WEDNESDAY, JUNE 9, 1982


FRIDAY, JUNE 11, 1982

8 a.m. Department of Family Medicine seminar: "Special Problems in the Care of Migrant Workers," by Linda Hernandez, D.O. B217 Fee Hall.

1 p.m. MSU College of Osteopathic Medicine hooding and commencement program. For the first time the ceremonies will include conferring of diplomas. Walter Adams, professor of economics, is guest speaker. Reception will follow immediately at the University Club. MSU Auditorium.


MONDAY, JUNE 14, 1982


WEDNESDAY, JUNE 23, 1982

"Beyond Competence: The Complete Physician," a joint educational conference sponsored by the American Association of Colleges of Osteopathic Medicine, the National Association of Advisors for the Health Professions, and the Central Association of Advisors for the Health Professions. Speakers will include C. Everett Koop, M.D., surgeon general of the United States. For information write AACOM, 4720 Montgomery Lane, Suite 609, Bethesda, MD, 20814. Excelsior Hotel, Tulsa, Oklahoma.

SATURDAY, JUNE 26, 1982

COMMUNIQUÉ

Please use this form for submission of material for the biweekly College of Osteopathic Medicine Communiqué. The editors and editorial advisory committee retain the right to edit or exclude any material. Please print or type, and do not include any information that is more than one month old.

Date of submission

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FRIDAY, JULY 2, 1982


SUNDAY, JULY 11, 1982


THURSDAY, JULY 22, 1982


THURSDAY, JULY 29, 1982


MONDAY, AUGUST 23, 1982


TUESDAY, SEPTEMBER 7, 1982


SATURDAY, SEPTEMBER 11, 1982


WEDNESDAY, SEPTEMBER 15, 1982

MONDAY, MAY 17, 1982


4 p.m. "The Control of Mutagenesis and Cell Differentiation by Chemicals which Initiate or Promote Tumor Formation" by Eliezer Huberman, Director, Division of Biological and Medical Research, Oak Ridge National Laboratory, Oak Ridge, Tenn. Sponsored by the Center for Environmental Toxicology. 158 Natural Resources.

TUESDAY, MAY 18, 1982

4 p.m. Microbiology and Public Health seminar: "Virus-Induced Deregulation of MHC Antigens: Role in Oncogenesis." Daniel Meruelo, Irvington House Institute, New York University. 146 Giltner.

WEDNESDAY, MAY 19, 1982

9 a.m. Departments of Medicine and Pathology colloquia: "Atrial Myxomas" by Raymond H. Murray, M.D. B205 Life Sciences.

THURSDAY, MAY 20, 1982


SUNDAY, MAY 23, 1982


MONDAY, MAY 24, 1982

4 p.m. Biochemistry colloquium: "Regulation of Cell Type in Yeast by Transposable Elements." James B. Hicks, Cold Spring Harbor Laboratory. 101 Biochemistry.

TUESDAY, MAY 25, 1982

4 p.m. Microbiology and Public Health seminar: "Gene Expression During Sporulation in Yeast." David Kaback, New Jersey School of Medicine, Jersey City, New Jersey. 146 Giltner.
UPDATE ON PULMONARY MEDICINE: JUNE 26
AT MSU's KELLOGG CENTER

Exercise-induced asthma, office management of chronic obstructive pulmonary disease, sleep disordered breathing, the problem asthmatic, and chronic cough are among the topics at a day-long update on pulmonary medicine at MSU June 26.

The program, sponsored by the MSU College of Osteopathic Medicine and MSU's Lifelong Education Programs, will be held at Kellogg Center.

Faculty include John Morlock, D.O., and James Yarnal, D.O., assistant professors of internal medicine (pulmonary diseases) at MSU-COM; Robert H. Brookman, D.O., medical codirector of respiratory therapy at Flint Osteopathic Hospital; James C. Giudice, D.O., professor of medicine and chief of the pulmonary division, New Jersey School of Osteopathic Medicine; and James P. Shinnick, D.O., associate staff, American Oncologic Hospital, Philadelphia.

The course is approved for 5.5 hours of Category I credit for D.O.s and Category II credit for M.D.s.

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INTERMEDIATE COURSE ON CRANIOSACRAL TECHNIQUE
JULY 22-26 AT KELLOGG CENTER

Intermediate training in craniosacral palpation techniques will be given in a program July 22-26 cosponsored by the MSU College of Osteopathic Medicine and College of Human Medicine.

Course content will include topics such as anatomy and physiology of the cranium, cervical spine, meningeal membranes, the relationship of the autonomic nervous system, clinical syndromes, brain dysfunction, endocrine disorders, pain, and diagnosis and treatment of dysfunctions.

Faculty include John Upledger, D.O., professor of biomechanics, MSU-COM; Richard MacDonald, D.O., private practitioner from Waterville, Maine; and John Peckham, D.O., associate professor of sports medicine and rehabilitation, Texas College of Osteopathic Medicine.

A prerequisite for enrollment is a basic course in craniosacral technique. The program is approved for 40 hours Category I CME credit for M.D.s and D.O.s.

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TUTORIAL ON DIRECT ACTION THRUSTING TECHNIQUE:
AUGUST 23-27 AT LANSING GENERAL HOSPITAL

A five-day intensive course in the fundamentals and use of direct action high velocity manipulative therapy will be featured August 23-27 at Lansing General Hospital. Primary emphasis will be on the spine, pelvis and thoracic cage.

Faculty include Philip Greenman, D.O., associate dean and professor of biomechanics at MSU-COM; Paul Kimberly, D.O., former Steunenburg Professor and chairman of the Department of Osteopathic Theory and Methods, Kirksville College of Osteopathic Medicine; and Fred Mitchell, Jr., D.O., professor of family medicine, MSU-COM.

A prerequisite for students in the program is the D.O. degree, or the M.D. with previous training in manual medicine.

The program is approved for 40 hours Category I credit for both D.O.s and M.D.s.
Special Activities of the MSU College of Osteopathic Medicine and its Alumni Association at the MAOP&S Convention Westin Hotel, Renaissance Center

Join us for fun and cheer in the Hospitality Suite!

- 5-7 p.m., Thursday, May 20
- and Friday, May 21
- Suite number to be assigned
- Look for directional signs posted at the convention

Join us at our exhibit!

- Thursday, May 20, and Friday, May 21
- In the main exhibit area
- Look for the MSU Green & White in that 'maize'

Everybody welcome!
RESEARCH ON LIPID CHEMISTRY

The biology, nutritional qualities and germicidal properties of lipids are among the major research interests of Jon Kabara, Ph.D.

Kabara has been involved in numerous collaborative studies on the fatty compounds, including such projects as identification of a lipid nerve-sprouting factor, the effects of lipid nutrition in muscular dystrophy, and the use of soaps for safe fungicides and pesticides in forestry.

His current work centers on monoglycerides, particularly monolaurin, an FDA-approved food-grade preservative with germicidal properties.

In preliminary double-blind studies conducted with MSU-COM's John Downs, D.O., D.D.S., Kabara determined that monolaurin was more effective than a placebo in treating herpesvirus. Initial research on its application for genital herpes infections is underway with George Gross, D.O., of MSU-COM.

Kabara, with Rachel Schemmel, Ph.D., of the Department of Food Science and Human Nutrition, has also been able to demonstrate the substance's effectiveness in oral hygiene. Their studies indicate that dental caries can be reduced 30 to 80% with use of monolaurin.

He is currently assisted by lab technician Vicky Shroeder and student Ann Pepp.

Two recent issues of the Journal of Food Safety have been devoted to monolaurin and its confirmation and extension of Kabara's work. He also is the editor of Recent Advances in Human Nutrition, Volume 3: Role of Lipids in Health and Disease, due for publication in July, and is editing a book on cosmetic preservation.

"We know that, at least for the simpler man-made fibers, the way in which a polymer scatters light is related to its structure," Rechtien said. "At this point we're doing only a feasibility study of the technique because collagen is such a complex polymer. Yet we are getting some patterning."

Rechtien employs laser because it is a non-divergent, single wavelength light source. He has chosen a wavelength of 6380 angstroms, a red light, because it is closest to the distance between bands in collagen structure, and thus maximizes light scattering.

The light is also cross-polarized to eliminate extraneous information and the effects of fluid media, he said.

The method allows tissue biomechanics researchers like Little and Hubbard to observe changes in structure during deformation, and does not destroy the tissue.

Rechtien anticipates the technique may also be useful in the study of more complex ligaments by reflection.

His work is currently being conducted under a seed grant from MSU-COM's Institute of Research and Graduate Study.
Ernest Retzlaff

CRANIAL SUTURES AND BONE MOTION

Challenging an age-old assumption about the complete ossification of the adult human skull, Ernest Retzlaff, Ph.D., has confirmed the presence of connective tissue in the cranial sutures of even elderly persons.

His research is particularly applicable in determining the physical mechanisms involved with the craniosacral system and osteopathic manipulative therapy.

Originally using squirrel monkeys and later human autopsy and surgical tissues, Retzlaff has found in the sutures collagenous, elastic and reticular connective tissue, as well as nerve fibers, blood vessels, and bone-producing and bone-destroying cells.

"The sutures are living joints," said Retzlaff. "They grow and decrease, though they always seem to maintain the same ratio of bone."

Working with MSU-COM's John Upledger, D.O., and Fred Mitchell, D.O., Retzlaff also tested the ability of the cranial bones to move. Again using monkeys they found minute (less than one millimeter) motions of these bones, particularly with increases in cerebrospinal fluid pressures caused by sacral movement, heartbeat changes, and respiration.

His most recent research is directed toward ascertaining the types of nerve fibers in the sutures, and tracing these fibers to the brain.

"We are particularly interested in looking for sensory fibers because craniosacral OMT seems to be effective against pain," Retzlaff said. "Some fibers seem to go to the thalamus and others to autonomic ganglia in the upper cervical region. But we must determine the type of fibers and how they make synaptic contact."

Retzlaff said that continued studies are also necessary on the chemistry of the system (adrenergic or cholinergic).

His research is being conducted under a four-year unrestricted grant from the Cranial Academy. He is assisted by research technician Jane Walsh and student Lisa Jones.

COMMUNIQUÉ

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