THE UPPER CERVICAL
MONOGRAPH

Vol. 2, No. 4 January, 1978

Biomechanics of the Upper Cervical Vertebrae

by Daniel C. Seemann
NUCCRA Research Adviser

The more we begin to understand the relationships between the cervical vertebrae (C-1 through C-7) the more we find the relationships between the vertebrae can be described using terms from the study of physics. Earlier descriptions (Gregory, 1971) of the upper cervical vertebrae using the frontal, sagittal, and transverse planes have been helpful in establishing the skull line, rotatory excursions and lower angle.

With a system of rotatory measurement coupled with a reliable system of taking low distortion x-rays it is possible to predict with reasonable accuracy into which of the planes the subluxation will occur, given the direction of the angular rotation from the fixed point. The disequilibrium produced by the angular rotation causes the gravitational stresses which are the precursors of the misalignment factors of the Atlas Subluxation Complex.

To understand this concept it is necessary to review two laws from physics: the center of gravity, and first and second class levers.

CENTER OF GRAVITY

The center of gravity is a point about which a single downward force equals the weight of the body. Because of the influence of the earth's pull of gravity, every body tends to assume a position in which its center of gravity is as low as possible. Within the skull there is a vertical line with a single downward force which is the sum of all the downward forces of the skull which is equal to the weight of the skull. A force equal to the weight of the skull is necessary to maintain the skull in a vertical position.

If the skull is in a **state of equilibrium,** the resultant of all forces acting on the skull is zero.

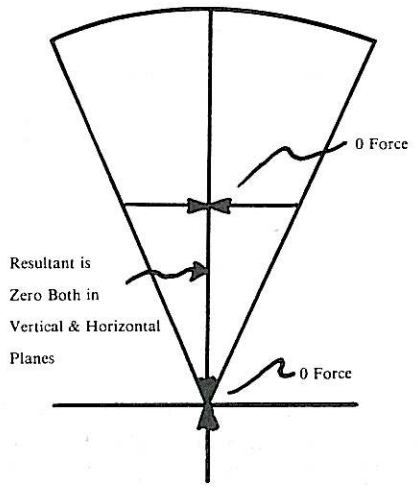

Figure 1
Equilibrium

When the center of gravity is in a state of equilibrium, the center of gravity is at its highest level on the vertical plane. As the center of gravity becomes unstable, it will lower and move further from the original vertical center.

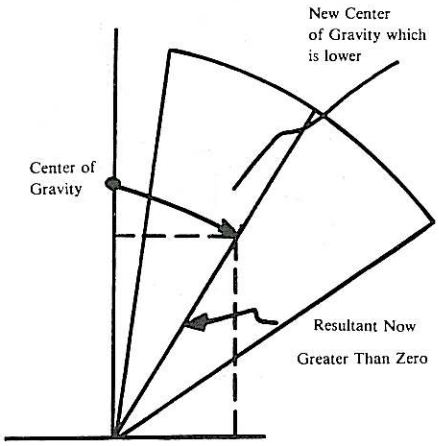

Figure 2
Unstable Equilibrium

An **unstable equilibrium** causes the resultant of forces necessary to maintain the skull in the vertical plane to

Continued on Page 2

NUCCA Convention 1978

By order of the NUCCA Board of Directors, the 1978 NUCCA Convention and Educational Program will be held at the Howard Johnson Motor Lodge, 1440 North Dixie Highway, Monroe, Michigan 48161. The Convention opens Saturday, April 29, 1978 at 9:00 a.m. and concludes on Tuesday, May 2, 1978 at 4:00 p.m. The NUCCA Banquet will be at the Colonial House, Monday at 7:30 p.m.

The theme of the Convention is, **"The ASC (C-1) as a Principal Stress Producer."** All lecturers, including the scheduled academicians, will speak on subjects related to the theme. Adjusting technique and biomechanics will be stressed with film analysis presented as part of the biomechanics.

SPEAKERS AND SUBJECTS

Professor Daniel C. Seemann's subject will be **"The Relationship Between C-1 and Spinal Distortion Factors including the Pelvis."** This lecture will be a statistical study on the distortion effects of a C-1 subluxation on the spinal column.

Dr. Harriet G. Williams' subject, **"A Further Anatomical-Functional Review of Selected CNS Motor Control Structures"** will continue her 1976 address before the NUCCA Convention.

The Assistant Director of the Kinesiotheraphy Clinic at the University of Toledo, Aaron Mates, will discuss **"Kinesiological Concepts In Adjusting C-1"** and Dr. Robert Deck, Physicist at the University of Toledo, will talk on the subject, **"The Adjustment In Terms of Physics."**

The new biomechanical research conducted over the past three years

Continued on Page 5

shift in the same direction as the center of gravity. The resultant of forces now becomes greater than 0 because there are vertical and horizontal stresses attempting to compensate for the skull which is misaligned.

Therefore the goal of the adjustment is to reduce all of the misalignments and return the skull to a **state** of equilibrium where the resultant forces needed to maintain the skull upright are zero.

It would seem this understanding of the center of gravity and unstable equilibrium would be helpful in analysing pre and post X-rays.

THE LEVER

An understanding of the principles of the first and second class levers will help with the adjustment. A brief review of levers follows.

A lever is a rigid rod which turns about some fixed point. The tendency to turn depends on the amount of the force and the distance it is from the fulcrum. For purposes of clarification, the three components of the lever will be identified in the following way. The fulcrum, or pivot point, will be (F). The effort required to move the object will be (E) and the object to be moved, or the resistance, will be (R). With a first class lever the fulcrum (F) is located between the (E) effort and (R) resistance. An example of a first class lever is a teeter-totter or a pair of scissors. The mechanical advantage depends on the distance between the fulcrum (F) and the (E) effort. The greater the distance between (F) and (E), the more the mechanical advantage. As (F) shifts toward (E), the mechanical advantage gets smaller.

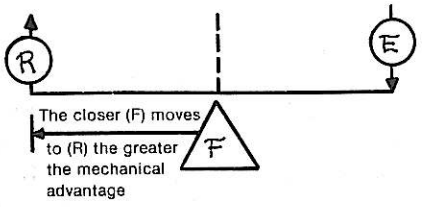

Figure 3
First Class Lever
(Fulcrum in Middle)

The fulcrum (F) in a second class lever is located at one end of the lever. The resistance (R) is positioned between the effort (E) and the fulcrum (F). An example of a second class lever is a wheelbarrow or a nutcracker. There always is a mechanical advantage greater than one because the distance between (F) and (E) is always greater than the distance between (F) and (R). As the resistance (R) shifts toward the fulcrum (F), the greater the advantage for (E).

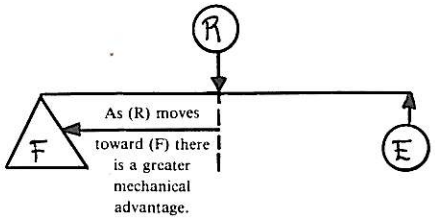

Figure 4
Second Class Lever
(Fulcrum on End)

First and Second class levers are used in adjusting the atlas. The atlas (C-1) is the lever or rod. The transverse processes of the atlas are the points where the effort (E) is applied. The skull is the resistance (R) and the fulcrum (F) is the superior articulating surface of the axis vertebra.

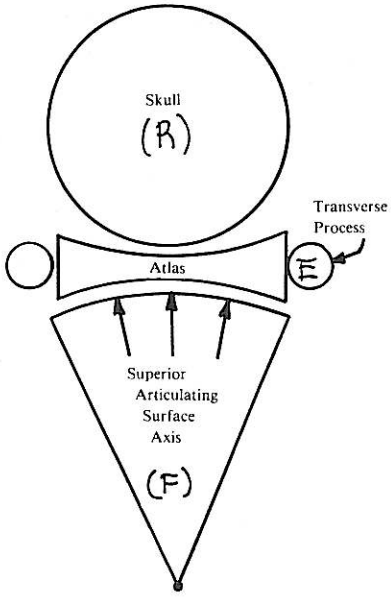

Figure 5
Atlas as a Lever

If a kink of large magnitude occurs, laterality will usually be opposite the kink. When this occurs, the adjuster will use a first class lever in the adjustment because the fulcrum (F) on the articulating surface of axis will be located between the transverse process (E) and the skull (R). The lever arm is short from (F) to (E) with little mechanical advantage for the adjuster.

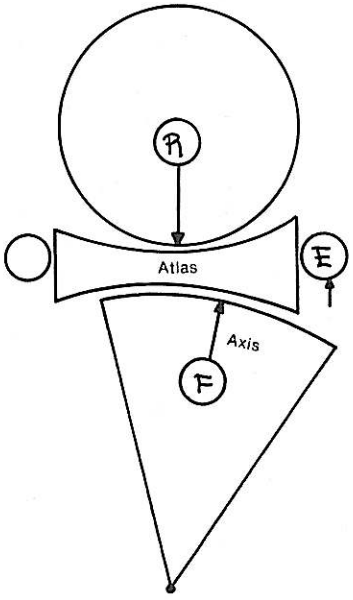

Figure 6
Atlas as a First Class Lever

A second class lever usually is found with into the kink type subluxations. In this type subluxation, the head will be turned toward the side of the kink. The skull (R) is located between the transverse (E) and the fulcrum (F). With this type of misalignment, the mechanical advantage is good for the adjuster because the distance between the transverse process (E) and the fulcrum (F) is longer, permitting greater leverage on the articulating surface of the axis vertebra.

Earlier in this paper it was stated that with a reliable system of measurement and low distortion x-rays, it is possible to predict with reasonable accuracy the frontal plane in which the subluxation will occur. The next article will be devoted to the biomechanics involved with predicting into the kink, opposite the kink, and no kink misalignments.

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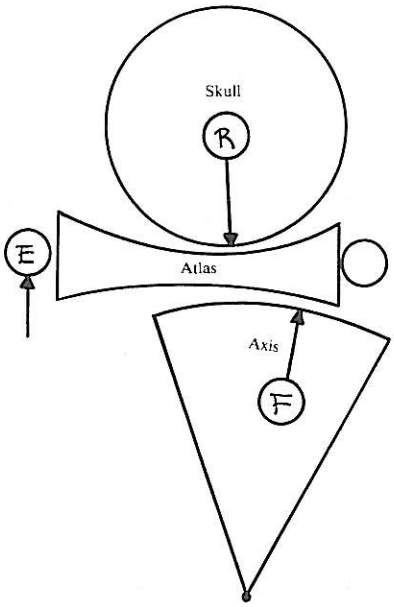

Figure 7
Atlas as a Second Class Lever

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How to Adjust the Atlas Subluxation Complex

(Con't. from Vol. 2, No. 3)

THE TRICEPS' PULL PHASE

The Triceps' Pull Phase is the final adjustic phase (Phase #8) in the series on adjusting the Atlas Subluxation Complex (ASC). The **purpose** of this phase is to **activate** the 7 previous phases; to convert potential into kinetic energy. The pulling action of the triceps' muscles is not for the purpose of re-setting cervical vertebrae; it is solely to set the adjustment into motion, to activate the levers of the adjustor. In other words, the one descriptive act involved in this phase is the pulling of the triceps' muscles, an act that provides the force that sets in motion the bodily levers of the adjustor. Muscular contraction is the force that moves a body lever.

The concept of Functional Reversibility states that muscles may pull from either direction, from origin to insertion or vice versa. In the triceps' pull action, the triceps' muscles are contracted from a point approximately ¼ of an inch below the centers of the glenoid cavities. The heads of the humeri must properly articulate with the centers of the glenoid cavities when the muscles are contracted. The triceps' muscles are pulled from a point, then, ¼ inch below the centers of the glenoid cavities and the direction of the pull is slightly upward and inward against the shoulder lever, compressing the shoulder lever or squeezing it inward. This medial and equal compression of the shoulder lever toward the upper dorsal spine, activates the shoulder lever.

The position of the adjustor when he executes the triceps' pull phase is exactly over point C *(see schema, page 1, Vol. 1, No. 4 MONOGRAPH).* He has just completed Phase 7, the Pelvic Lever Phase, and his parallel forces *(page 6, Vol. 1, No. 3, MONOGRAPH)* are collinear with his notch-transverse resultant.

Positioned over point C, the adjustor contracts his triceps' muscles, pulling them upward from a point ¼ of an inch below the centers of the glenoid cavities. The insertions of the triceps at the olecranon processes of the ulnar bones are the points from which the triceps are pulled. This muscular contraction creates a magnitude of force sufficient to set in motion all of the adjustor's body levers essential to the adjustment, starting with the shoulder lever. As movements at the glenoid cavities, initiated by the triceps' pull, are accompanied by movements of the clavicles and scapulae, the entire shoulder is activated.

The importance of the concept of moving the shoulder lever first in the sequence of motion of the adjustment is substantiated by the kinesiological fact that in overcoming inertia the largest lever must be the first to move. As the shoulder lever is the largest lever, it must be set in motion first. The belief that a rapid movement of the arms of the adjustor — a snapping together of the elbows — can accurately and effectively correct a misaligned C-1 vertebra is kinesiologically erroneous because the elbows are **not** the largest lever; therefore, should not be moved first in the sequence of motion. While this adjusting error is universally taught, its acceptance by chiropractic colleges does not make it valid. For that matter, the equally wrong concept that a push or thrust on the upper cervical spine will efficiently and accurately correct cervical misalignments is practiced by many misinformed chiropractors. Efficient motion is essential to effective corrections of the misalignment factors of the vertebral subluxations of the upper cervical spine; and, as an adjustic force must not be excessive, the shoulder lever must be the first lever to be set in motion in the adjustment complex. Each body lever must make its contribution to the adjustment at the moment of impact: shoulder lever first, elbows, second, and then the follow through.

Light studies have shown that the muscular contraction (force) of the triceps' muscles must originate from a point about ¼ of an inch below the centers of the glenoid cavities. If

Continued on Page 4

Continued from Page 3

muscular action is initiated from the muscles' belly or from a point too near to the triceps' insertions at the elbows, a curving of the adjustor's parallel forces will result at their distal ends. In other words, the parallel forces will not remain collinear with the notch-transverse resultant, and inaccuracy of the direction of the resultant of force will occur. Inaccuracy of direction destroys the possibility of obtaining vertebral reductions as it will lock the vertebra in its malpositions, defeating the objective of obtaining maximal correction.

Inefficient motion in an adjustment results in failure to maximally reduce the misalignment factors of the subluxation. It also introduces excessive force and effort into the adjustment because the adjustor will subconsciously use more force and effort in an attempt to gain his objective of vertebral reduction. The use of too great an effort acts as an added resistance to the adjustor, and can cause trauma to himself and to his patient. If the adjustor expends too great an effort, he is inclined to make unnecessary movements, some of which will be translated into excessive force to the patient which force can be traumatic to the patient.

The adjustor should remember always that the **direction** of the force of an adjustment is medialward into his own body, and confined to setting in motion his largest body lever, the shoulder lever, in a compressive action. So executed, an adjustment of the Atlanto-axial area of the cervical spine cannot be detrimental to the patient. Its force is always controlled.

In terms of a lever system, the ASC adjustment is a first class lever: the contractions of the triceps' muscles are the effort, the glenoid cavities are the fulcra, and the shoulder lever is the immediate resistance. The ultimate resistance to the lever is the roll-in of the adjustor's hands *(see Roll-In Phase, Pg. 6, Vol. 1, No. 10 MONOGRAPH)*. Forces in the adjustment can be further controlled by the degree of contraction of the roll-in hand engaged in the fossa of contact hand; the greater the contraction of the roll-in hand, the less the force generated by the triceps' pull. The roll-in hand thus provides further resistance to the lever. This can be demonstrated by simply eliminating the roll-in phase in which situation the triceps' pull is ineffective in compressing the shoulder lever, or by varying the degree of contraction of the roll-in hand and observing its effect on the shoulder lever.

Excessive force in the ASC adjustment, or C-1 adjustment, is traumatic to the patient because it will produce kinking of the cervical spine. When the patient is placed on the adjusting table in proper position for an adjustment, his atlas transverse process becomes the point of effort of another first class lever. The resistance of this lever is represented by the patient's head, a weight of approximately 10 pounds. The superior articulating surface of the axis vertebra is the fulcrum of the lever. If the force of the adjustment exceeds the resistance of the weight of the head, the fulcrum or superior articulating surface may be forced to the opposite side of the vertical axis of the patient's spine, kinking his cervical spine and rotating the subjacent vertebral segments into the transverse plane. The result will be a patient who is more greatly misaligned than he was prior to the adjustment.

SPEED IN THE ADJUSTMENT

The generally accepted adjusting concept that the greater speed or velocity of muscular contraction used in the adjustment, the more effective will be the results in terms of moving the vertebra is not kinesiologically sound. The principle is: the speed at which a muscle contracts is inversely related to force. The greater the speed at which the triceps contract, therefore, the less will be the force that they generate in the adjustment.

Speed, like force, can be controlled by the roll-in phase. If the roll-in hand is contracted to a degree where its resistance to the triceps' contraction is equal to the force generated by the muscles, the speed is zero. By reducing the roll-in hand's contraction, the velocity of muscular contraction of the triceps' muscles is speeded up. Excessive speed, however, is to be avoided. Every motor skill has its correct velocity of muscular action.

FOLLOW-THROUGH IN THE ADJUSTMENT

When the triceps' muscles contract (pull) to overcome the inertia of the adjustor's shoulder lever, setting the adjustment in motion, the parallel forces that emanate from the adjustor's center of gravity (pelvis) and from his episternal notch must be collinear with the notch-transverse resultant. This resultant represents in a straight line the abnormal rotatory misalignments of the patient's x-ray films and the rotatory movements of the adjustic phases and steps through which the adjustor must move in the potential aspect of the adjustment. Therefore, this straight line, known as the notch-transverse resultant, is the correction pathway for any given ASC or C-1 subluxation. It is along this straight line or correction pathway that the adjustor must follow-through with his body immediately **after** he contracts his triceps' muscles to their maximum if he is to achieve linear volocity. This action, properly performed, strengthens the adjustic action because there is no stopping of the linear velocity.

The mechanism for follow-through — the completion of the adjustic motor act — is to maximally contract the triceps' muscles until the shoulder girdle is compressed to a point where the episternal notch is slightly extended. This action pulls the adjustor's body into the correction pathway. If he drops into the correction pathway **before** he contracts his triceps' muscles to their maximum, he will in effect shorten the correction pathway which is equal to reducing the length of the notch-transverse resultant. The result is the same as if he had mis-read the patient's x-ray films, preventing a maximal correction of the subluxation.

COMMENT

It is frequently argued that the ASC or C-1 adjustment is too difficult to perform effectively. This is definitely not the case. The adjustor who thoroughly understands the kinesiological principles that apply in adjusting the upper cervical spine, both as they apply in the adjustment and in the analysis of the x-ray films, can soon become a very efficient adjustor, a reducer of vertebral mis-

alignments. That too few have achieved the motor skill does not imply other than that they were not trained properly in the art.

Many comments are heard from time to time that the ASC or C-1 adjustment is harmful to the adjustor. This, also, is not true. To the few who have perfected themselves in this motor skill, the C-1 adjustment is not strenuous or physically harmful. In fact, the triceps' pull adjustment is easier on the adjustor who understands it than is the so-called "recoil" adjustment which is universally taught and practiced. Such arguments and comments are, however, invalid. They miss the point in that they fail to recognize that the triceps' pull adjustment is the most efficient and effective adjusting method yet devised to correct the upper cervical vertebral subluxation without traumatizing the patient, and maximal reduction of the subluxation is the essential nature of chiropractic.

Bibliography

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Continued from Page 1

by the National Upper Cervical Chiropractic Research Association, Inc. (NUCCRA) will be taught by Dr. Ralph R. Gregory. His subject will be **"Upper Cervical Biomechanics,"** and will include practical work in film analysis, stressing the new concepts in analysing x-ray films.

The new application of kinesiological principles to adjusting upper cervical subluxations will be explained and taught, making vertebral reductions easier to accomplish.

FEES

The Convention fee for professionals is $300.00. Doctors who have been in practice for two years or less will be admitted for $150.00; Students for $100.00. These fees include all convention activities, including membership dues in NUCCA for the ensuing year and the banquet. Analytical instruments are not included in the fee, but instruments will be rented to those who request them for an additional charge of $10.00.

Attendance at the Convention will be limited, and no applications will be accepted after March 10, 1978. Further information and applications may be obtained by writing the MONOGRAPH Editor, 221 West Second Street, Monroe, Michigan 48161.

NOTE: ***This educational program is designed to satisfy license-renewal requirements.***

NUCCA Scholarship Awards

At its October 22, 1977 meeting, the NUCCA Board received with thanks the $500.00 donation sent by Mrs. Upton X. Furman of Neenah, Wisconsin in memory of her late husband, Dr. Upton X. Furman, who died April 22, 1977. Dr. Furman was a supporter and long time member of NUCCA. The NUCCA Board voted to use the donation to help fund the Scholarship Awards as Dr. Furman often expressed his interest in college students and their financial problems. This is also in accordance with Mrs. Furman's wishes.

The NUCCA Board approved a continuation of the $250.00 scholarship grant-in-aid for the next three years, and that this sum be paid to any chiropractic student currently enrolled in a chartered college of chiropractic who submits to the **Monograph** editor an acceptable article pertaining to the upper cervical spine.

Submitted articles may deal with any aspect of the Occipital-atlanto-axial area of the cervical spine: mechanics, neurological manifestations, analyses of cervical subluxations, corrective techniques for cervical subluxations, detrimental effects of upper cervical subluxations on the human organism, and the like.

All entries will be judged by the NUCCA Directive Board and by Professor Seemann. Their judgment will be final. Accepted articles become the property of the National Upper Cervical Chiropractic Association, Inc. Winners will be announced at the following NUCCA Convention.

NUCCA will attempt to return all manuscripts that are accompanied by a self-addressed, stamped envelope. NUCCA will not be responsible for lost or mislaid material. Further information is available by writing the **Monograph** editor, 221 West Second Street, Monroe, Michigan 48161.

—Announcement—

Dr. Steven Goodman is presently associated in practice with Dr. R.R. Gregory at 217 West Second Street, Monroe, Michigan. Dr. Goodman is a 1975 graduate of the National College of Chiropractic, receiving his B.S. and D.C. degrees at National. A native of New York, Dr. Goodman received his preliminary education at Kingsborough Community College and at the New York Institute of Technology.

A diplomate of the National Board of Examiners, Dr. Goodman holds the South Dakota basic science certificate and is licensed to practice in the states of Michigan, Pennsylvania, New Jersey, and Delaware.

In Memoriam

Dr. Patricia Plunkett Clark

It is with deep regret that we learned of the death of Dr. Patricia Plunkett Clark of 1213 Santa Fe, Corpus Christi, Texas. Dr. Clark passed away last October.

Born and raised in Viola, Illinois, Dr. Clark graduated from Augustana College in Rock Island, Illinois and from the Palmer College of Chiropractic in Davenport, Iowa.

After serving her internship in the Palmer Clinic, Dr. Clark accepted a position as a staff doctor in the Cardiovascular and Encephlograph Departments of the B.J. Palmer Research Clinic. While residing in Davenport, Dr. Clark conducted a dramatic and poetic radio program for nearly four years from station W.O.C.

In 1937, she married Dr. John B. Clark, an instructor at the Palmer College of Chiropractic. They conducted a joint practice before leaving Davenport and moving to Corpus Christi. In Corpus Christi, the Clarks continued in joint practice until her death.

A member of the Weber Road Baptist Church, Dr. Clark taught Sunday School for several years. She was a member of the Chiropractic Society of Texas.

Dr. Clark is survived by her husband, Dr. John B. Clark, who is a member of the NUCCA Board of Directors.

Keith Brian Moon

It is with great sadness that the MONOGRAPH Editor learned of the air crash last December of the DC 3, chartered to carry the entire Evansville University basketball team and its coach and trainer. In all, twenty-nine persons perished in the plane accident.

When these tragedies are broadcast, our hearts momentarily reach out in sympathy to the families and friends of the victims, but not knowing them, we are like, as the poet Longfellow wrote, "Ships that pass in the night, and speak each other in passing/ Only a signal shown and a distant voice in the darkness;/ So on the ocean of life we pass and speak one another,/ Only a look and a voice; then darkness again and a silence."

Keith Brian Moon, age 20, was one of the victims of that DC 3 crash. A sophomore at the University of Evansville, Evansville, Indiana, Keith, six feet, nine inches in height, played center for the basketball team. He was an exceptional young man, and considered the most improved player on the team. Indeed, he was gifted in many ways.

To those of us who knew Keith so well, his memory will always remain. He is not "a distant voice in the darkness," one of those who "on the ocean of life" we passed and spoke with. In our hearts and minds, Keith will never be a "silence," there he will forever remain.

Keith, the son of Dr. and Mrs. Donald Moon, 3731 Blossom Heath Road, Kettering, Ohio is also survived by a sister, Deanne, and a brother, Mark. Our heartfelt sympathies are extended to the Moon family.

Certificates Awarded for Anatometer Development

Mr. Peter Benesh and Dr. Ralph R. Gregory were each awarded a certificate "as a token of esteem" by the Monroe County American Revolution Bicentennial Commission for contributing to the development of the ANATOMETER.

Mrs. Mary Daume, Chairman of the Bicentennial Commission, wrote: *"As a token of our pride in Monroe County and its residents, the Monroe County Bicentennial Commission presents a Souvenir Bicentennial Stock Certificate to those who are cited for special achievements in business, church, community, family or school. We are proud that we can so honor you. Through the quality of your citizenship you exemplify the ideal of American democracy upon which the future of this great nation depends."*

The names of Monroe County persons so honored will be listed and preserved as part of the record of achievement of the Bicentennial Commission.

Change of Address

Many MONOGRAPH copies and other NUCCA and NUCCRA materials are returned because of the subscriber's change of address. Please notify the NUCCA Editor, 221 West Second Street, Monroe, Michigan 48161, of any change of address.

The Upper Cervical
MONOGRAPH
Published by
THE NATIONAL UPPER CERVICAL CHIROPRACTIC ASSOCIATION, INC.
EDITOR:
Dr. Ralph R. Gregory
221 West Second Street
Monroe, Michigan 48161

The Twelfth Annual NUCCA Convention

Dates: April 29 & 30; May 1 & 2, 1978

Place: Howard Johnson Motor Lodge
1440 N. Dixie Highway
Monroe, Michigan 48161

Theme: The ASC (C-1) as a Principal Stress Producer.

Convention Chairman:
Dr. Thomas R. Elliott, Sr.

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Education Program Under Supervision of
Professor Daniel C. Seemann
University of Toledo.

☆ ☆ ☆

Designed to satisfy license-renewal requirements

Saturday, April 29, 1978

8:00 - 8:45
Registration

8:45 - 9:00
Invocation
Rev. H.B. Fehner
Pastor Emeritus
Trinity Lutheran Church, Monroe

9:00 - 10:00
Opening Address
Dr. Thomas R. Elliott, Sr.
Convention Chairman

10:00 - 12:00
Upper Cervical Biomechanics
Dr. Ralph R. Gregory

12:00 - 2:00
LUNCH

2:00 - 4:00
A Further Anatomical-Functional Review of Selected CNS Motor Control Structures
Harriet G. Williams, Ph. D.

4:00 - 6:00
Upper Cervical Biomechanics (con't)

Application Form for 1978 NUCCA Convention

Name _____ Address _____ Zip _____
(please print)

Have you made your Motel reservations (Card enclosed)? _____ Yes _____ No

Registration Fee: Professionals $300.00. Doctors (2 years or less in practice) $150.00. Students enrolled in college $100.00. (Make checks payable to NUCCA and send in full with this form).

Note: No applications will be accepted **after** March 10, 1978. Attendance limited to 100 applicants and full convention fee must accompany this application form.

S/S _____

Detach, fill out form, and send with full fee to R.R. Gregory, D.C., 221 West Second St., Monroe, Mich. 48161

Sunday, April 30, 1978

9:00 - 10:00
Upper Cervical Biomechanics (con't)

10:00 - 12:00
The Relationship Between C-1 and Spinal Distortion Factors, Including the Pelvis.
Prof. Daniel C. Seemann
NUCCA Executive Director
Research Adviser, NUCCRA

12:00 - 2:00
LUNCH

2:00 - 4:00
Kinesiological Concepts in Adjusting C-1
Aaron Mattes, M.A.
(Ass't. Director of the Kinesiotherapy Clinic, University of Toledo)

4:00 - 6:00
Upper Cervical Biomechanics (con't)

Monday, May 1, 1978

9:00 - 10:00
Upper Cervical Biomechanics (con't)

10:00 - 12:00
Demonstration and Application of New Kinesiological Concepts in Adjusting the ASC.
Dr. Ralph R. Gregory

12:00 - 2:00
LUNCH

2:00 - 4:00
The Adjustment in Terms of Physics
Robert Deck, Ph.D.
Physicist, University of Toledo

4:00 - 6:00
NUCCA Annual Business Meeting

• • •

Tuesday, May 2, 1978

9:00 - 12:00
Practical Work in Adjusting Technique

12:00 - 2:00
LUNCH

2:00 - 4:00
General Review of Biomechanics and Adjusting Technique