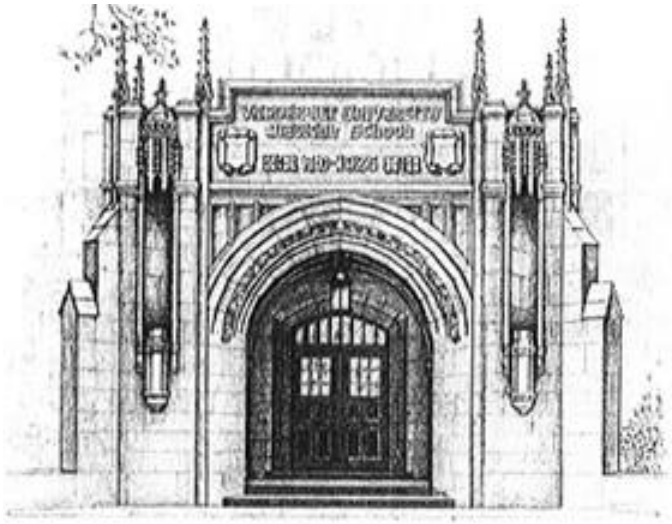
The 18th Annual Meeting of the American Association of Clinical Anatomists



June 19-22, 2001
Nashville, TN

jointly sponsored by

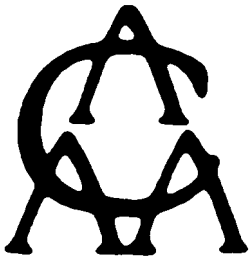
Vanderbilt University School of Medicine
and the
American Association of Clinical Anatomists

About the Cover Illustration

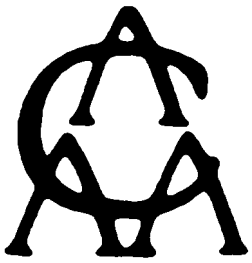
The 1925 Medical School Entrance

The Vanderbilt University School of Medicine (VUSM) was founded in 1874, the result of a merger between Vanderbilt University and the University of Nashville College of Medicine. As a result of the Flexner Report, Vanderbilt was designated responsibility for medical education in Tennessee and received its first grant for medical education in 1913. The new medical school and hospital building opened September 16, 1925 on the west campus of Vanderbilt University. This gothic academic arch was the north (campus) and main entrance to the new building. It was felt that interaction among faculty and departments was promoted by its physical design. The building took the form of a 'tic, tac, toe' double cross with intersecting hallways. This entrance was flanked by wings that housed the physiology and gross anatomy laboratories on the ground floor - the latter remaining in that location to this day. Following years of growth the north approach was converted into a closed court which served as the sight of the medical school's graduation ceremony for many years - the arch serving as the stage for speakers and the awarding of diplomas. Although these ceremonies have outgrown the court, a full size replica of the entryway was created, and thus the arch continues to serve in effigy as the backdrop for Vanderbilt's graduation and white coat ceremonies. The medical school building has been renamed 'Medical Center North', and is now one of more than twenty buildings, including five hospitals. that constitute the Vanderbilt University Medical Center. The old "1925 Medical School Entry" remains intact and is currently being re-landscaped and designated the ***Judy Jean and John E. Chapman Quadrangle***, to honor America's longest-serving medical dean and his wife. Dr. John Chapman retired in March, 2001 following 25 years as Dean of Vanderbilt University School of Medicine.

The
American Association
of
Clinical Anatomists



The object of the Association shall be to advance the science and art of Clinical Anatomy, to encourage research and publication in the field and to maintain high standards in the teaching of Anatomy.



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Clinical Anatomy

Official Journal of the
American Association of Clinical Anatomists
and the
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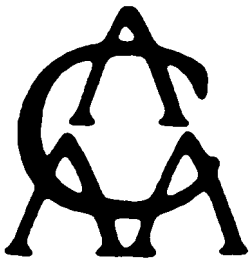

Annual Banquet

Thursday June 21, 2001

Presentation of ***Honored Member Award***
to
David G. Whitlock, M.D., Ph.D.

Jack Daniels Old No. 7 Suite
Gaylord Entertainment Center

6:15 pm - Reception (cash bar)

7:00 pm - Dinner and presentation of ***Honored Member Award*** to David Whitlock

The $195 registration fee paid by members includes the cost of the Scientific Program and the Banquet. The spouse or guest of a registrant is welcome to attend the banquet. Additional tickets are available at a cost of $50

Previously Honored Members

W. Henry Hollinshead, 1984
Chester B. McVay, 1985
Donald James Gray, 1986
Russell T. Woodburne, 1987
Oliver Beahrs, 1988
N. Alan Green, 1989
Frank H. Netter, 1990
Ralph Ger, 1991
M. Roy Schwartz, 1992
Carmine D. Clemente, 1993
Keith L. Moore, 1994
Roy J. Scothorne, 1995
Robert A. Chase, 1996
Tatsuo Sato, 1997
John E. Skandalakis, 1998
Donald R. Cahill, 1999
Sandy C. Marks, Jr., 2000

Honored Member, 2001

The American Association of Clinical Anatomists

recognize and award Honored Membership to

David G. Whitlock, M.D., Ph.D.

Anatomist * Scholar * Educator * Visionary

For his distinguished career in, and enthusiasm for, clinically-applied anatomy, and particularly in recognition of his efforts in anatomical imaging and in realizing the National Library of Medicine's ***Visible Human Project***.

At the 18th Annual Meeting of the **AACA**, Nashville, TN, June 21, 2001.

Sponsors/Commercial Exhibitors

Generous donations and/or commercial exhibitor fees paid by the following companies and organizations have substantially reduced the Association's expenses in presenting this meeting. You are encouraged to visit the exhibits available for viewing in the ***Crockett Ballroom***. Please refer to the loose materials in your registration packet for an up-to-date listing, including sponsors who have registered after the date of this printing.

Lippincott, Williams & Wilkins
Icon Learning Systems (publishers of Frank H. Netter, M.D.)

The 18th Annual AACA Scientific Session

SCHOOL OF MEDICINE CME ACCREDITATION

The 18th Annual Scientific Session of the American Association of Clinical Anatomists has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of Vanderbilt University School of Medicine and the American Association of Clinical Anatomists.
Vanderbilt University School of Medicine is accredited by the ACCME to sponsor continuing medical education for physicians.

DESIGNATION OF CME CREDIT

Vanderbilt University School of Medicine designates this continuing medical education activity for 12.5 credit hours in Category 1 of the Physician's Recognition Award of the American Medical Association.

18th Annual Scientific Session
of the
American Association of Clinical Anatomists

June 19 – 22, 2001
Vanderbilt University School of Medicine
Nashville, TN

Tuesday, June 19, 2001 - All events at *Hilton Suites, Nashville*

8:00 a.m. **Journal Committee Meeting** - (members of Journal Committee) – ***Ryman Meeting Room 1***
9:30 a.m. **Council Meeting** - (AACA Officers and Councilors) ***– Ryman Meeting Room 1***
3:00 p.m. Set-up for Commercial Exhibits – ***Crockett Ballroom***
5:30 p.m. **Registration** - ***Pre-function area outside Ballrooms***
6:00 p.m. **Welcome Reception** with cash bar (for all meeting attendees & their accompanying persons) ***– East Terrace (weather permitting)***

Wednesday, June 20, 2001 - All events at *Hilton Suites, Nashville*

7:00 a.m. **Editorial Board Breakfast Meeting** - breakfast hosted by John Wiley & Sons, Inc. (for Editors/Associate Editors of ***CLINICAL ANATOMY***) – ***Ryman Meeting Room 1***

8:00 a.m. **Registration - *Pre-function area outside ballrooms***
Commercial Exhibits – ***Crockett Ballroom***

Poster Session I - ***Crockett Ballroom***

Poster Session I: ***All posters listed below will be on display throughout Wednesday, 8:00 a.m. to 4:30 p.m. Presenters of even-numbered posters must be present at their posters during the morning refreshment break, those presenting odd numbered posters must be present during the afternoon refreshment break.***

***** ***preceding the poster number indicates the presentation is in the Predoctoral Award Competition.***

01 - ***In vivo*** anterior and posterior soleus muscle architecture: a dynamic ultrasonographic study. **Anne AGUR**, Nancy McKEE*, and Roger LEEKAM*. Department of Surgery, Institute of Medical Science, University of Toronto, CANADA.

02 - Early experience on systemically integrated measurements in freehanded 3-dimensional ultrasonography. **Hans CLEMENT***, Norbert P.TESCH*, Wolfgang GRECHENIG*,Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy, Department of Trauma Surgery,Karl-Franzens-University of Graz, AUSTRIA. (sponsored by A.H.Weiglein)

***03 -** Conal artery, morphology, topography and clinical implications. **Chris DIMOPOULOS**, Marios LOUKAS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, POLAND.

04 - Endoscopic anatomy of the connective tissue of the orbita. **Ulrike FIRBAS***, Wilhelm FIRBAS, and Manfred TSCHABITSCHER*. Department of Anatomy, University of Vienna, Vienna, AUSTRIA.

05 - 3-dimensional sonographic anatomy of the palmar aspect of the metacarpo-phalangeal joint. **Wolfgang GRECHENIG***, Hans CLEMENT*, Gerolf PEICHA*, Norbert P.TESCH*, and Friedrich ANDERHUBER*. Institute of Anatomy, Department of Trauma Surgery,Karl-Franzens-University of Graz, AUSTRIA. (sponsored by A.H.Weiglein)

06 - The ultrastructure of human pineal body in the last stages of prenatal ontogenesis. **Gohar P. KYALYAN**. Department of Human Anatomy, Yerevan State Medical University, ARMENIA.

07 - Dual innervation of the brachialis muscle. **Pasuk B. MAHAKKANUKRAUH**, and Vichit SOMSARP*. Department of Anatomy, Faculty of Medicine, Chaingmai University, Chiangmai, THAILAND.

***08 -** The clinical anatomy of the membranous septum. **Marios LOUKAS**, Chris DIMOPOULOS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, POLAND.

09 - A case of bilateral asymmetrical deficiency in pectoralis major muscles. **S. KAMATH**[1], T. MOSCONI*[1], E. REGA*[1], R. ROCKWELL*[2], K. SHIRIKJIAN*[2], U. SCHNEIDER*[2], and J. TAJUNA*[2]. [1]Department of Anatomy, Western University of Health Sciences, Pomona, CA; [2]College of Physical Therapy, Western University of Health Sciences, Pomona, CA.

10 - The demonstration of variations of the human coronary arteries. **A. HASANOVIC**. Department of Anatomy, University of Sarajevo, BOSNIA and HERZEGOVINA.

11 - Unilateral variation of the branching pattern of the external carotid artery. **Neil S. NORTON**, Margaret A. JERGENSON, Laura C. BARRITT*, and Thomas H. QUINN. Departments of Oral Biology and Biomedical Sciences, Schools of Dentistry and Medicine, Creighton University, Omaha, NE.

12 - Experimental investigation of intracompartmental pressure in the compartments of the foot. **Gerolf PEICHA***, Norbert P.TESCH*, Gunther WINDISCH*, Wolfgang GRECHENIG*, and Hans CLEMENT*. Department of Trauma Surgery, Institute of Anatomy, Karl-Franzens-University of Graz, AUSTRIA. (sponsored by A.H. Weiglein).

13 - Occupational injuries enhance compression abnormalities of the brachial plexus [thoracic outlet syndrome (TOS)] as displayed by MRI and MRA. **Ernestina H. SAXTON***, James D. COLLINS, Samuel S. AHN*, Theodore Q. MILLER* and Alfred CARNES. Departments of Neurology and Radiological Sciences, UCLA School of Medicine, Los Angeles, CA.

14 - Sonoanatomy of the distal radius during growth. **Norbert P. TESCH***, Wolfgang GRECHENIG*, Hans CLEMENT*, Johannes MAYR*, and Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy,Department of Trauma Surgery, Department of Pediatric Surgery,University of Graz, AUSTRIA. (sponsored by A.H. Weiglein).

15 - Sonographic anatomy of the pectoral region. **Norbert P. TESCH***, Wolfgang GRECHENIG*, Hans CLEMENT*, Johannes MAYR*, Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy,Department of Trauma Surgery, Department of Pediatric Surgery,University of Graz, AUSTRIA. (sponsored by A.H. Weiglein).

8:30 a.m. **Opening Ceremonies and Remarks**: ***Armstrong/Boone Ballrooms***

R. Benton Adkins, M.D., AACA President, Vanderbilt University, TN;
representing Vanderbilt University School of Medicine:
John E. Chapman, M.D., Associate Vice Chancellor and former Dean
John Clinton, M.D., Forshee Distinguished Chair in Surgery and Director of Surgical Services
Arthur F. Dalley, Local organizing Committee

8:45 a.m. ***Bus departs Hilton Suites for Accompanying Persons' Program*** - sightseeing full day trip.

9:00 a.m. **Scientific Platform Session I** - Dr. R. Benton Adkins – Moderator.
Armstrong/Boone Ballrooms

******* ***preceding the time of presentation indicates it is in the Predoctoral Award Competition.***

9:00 - Visualization and documentation of the fiber architecture of the cadaveric soleus muscle using B-spline modelling. **Anne AGUR**, Victor NG-THOW-HING*, Eugene FIUME*, and Nancy McKEE*. Departments of Surgery and Computer Science, Institute of Medical Science, University of Toronto, CANADA.

9:15 - Compartment syndrome of the thigh. **Irwin M. BEST**. Department of Surgery, Morehouse School of Medicine, Atlanta, GA.

9:30 **-** Compartment syndromes of the leg: pitfalls and prejudices. **Ralph GER**. Great Neck, NY.

9:45 - Modified volar advancement flap for composite digital end losses: the anatomical basis. **Somes GUHA**, and Stephen MILNER*. Department of Family Medicine, LSUHSC- Shreveport, Shreveport, LA.

10:00 - Posterior tibial tendon dysfunction with relationship to the location of the tendon tear. **Steven J. KAVROS**. Mayo Medical School, Department of Orthopedic Surgery, Mayo Clinic and Mayo Foundation, Rochester, MN.

10:15 - Is distal friction (or entrapment) necessary to cause bending fractures of the leg at relatively low speeds? **David J. PORTA**[1-3], and Tyler A. KRESS[3*]. [1] Department of Biology, Bellarmine University, Louisville, KY. [2] Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. [3] Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN.

10:30 a.m. **Refreshment Break** – browse the posters/demonstrations and commercial exhibits - ***Crockett Ballroom.***

11:00 a.m. **Presidential Presentation:** "***Current and Future State of Anatomical/ Embryological Imaging***". ***Dr. Robert Trelease***, Department of Pathology and Laboratory Medicine, UCLA School of Medicine (embryology) and ***David G. Whitlock***, Department of Cellular and Structural Biology, University of Colorado School of Medicine (gross anatomy). ***Armstrong/Boone Ballrooms***

12:00 p.m. **Lunch** (on your own)
Browse the posters and commercial exhibits – ***Crockett Ballroom***

1:30 p.m. **Scientific Platform Session II** - Dr. Mark E. Seifert – Moderator.
Armstrong/Boone Ballrooms

1:30 - *The vascularized sural nerve - a reliable nerve graft. **Colin L. RIORDAN***, Lillian B. NANNEY, Joseph UPTON* and Sean F. WOLFORT*. Department of Plastic and Reconstructive Surgery, Vanderbilt University School of Medicine, TN, and Department of Plastic and Reconstructive Surgery, Beth Israel Deaconess Medical Center, Boston, MA.

1:45 - *Multilamellar bodies as potential scattering centers in human age-related nuclear cataracts. **Kurt O. GILLILAND**, Christopher D. FREEL, C. Wesley LANE*, and M. Joseph COSTELLO*. Department of Cell and Developmental Biology, University of North Carolina, Chapel Hill, NC.

2:00 - *Mast cell detection in walls of coronary arteries. **Chris DIMOPOULOS**, Marios LOUKAS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, POLAND.

2:15 - *Sinutubular ridge and the beginning of atherosclerosis in human aorta. **Marios LOUKAS**, Chris DIMOPOULOS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, POLAND.

2:30 - The onset of bitter and sweet taste transduction as revealed by αgustducin immunohistochemistry in the developing lingual and palatal epithelium of rat. **Ashraf A. EL-SHARABY***, Katsura UEDA*, Satoshi WAKISAKA*, and Kojiro KURISU*. Department of Oral Anatomy & Developmental Biology, Osaka University Graduate School of Dentistry, Osaka, JAPAN. (sponsored by B.R. MacPherson).

2:45 - Replacement of muscle fibers by adipose tissue in the soleus and gastrocnemius muscles. **Carlos F. SONEIRA**, and Jonathan S. CARLOS*. Department of Clinical Science, University of Wisconsin-La Crosse, La Crosse, WI, and Department of Anatomy, Southern California University of the Health Sciences, Whittier, CA.

3:00 p.m. **Refreshment Break** – browse the posters/demonstrations and commercial exhibits – ***Crockett Ballroom***

3:30 p.m. **Annual AACA Business Meeting** – ***Armstrong/Boone Ballrooms***
(for AACA members, including membership applicants)

4:00 p.m. Bus returns to ***Hilton Suites*** from Accompanying Person's Program trip

5:00 p.m. Adjourn

Dinner – on your own.

Thursday, June 21, 2001 - Daytime events at ***Hilton Suites, Nashville***

7:00 a.m. **Past President's Breakfast Meeting**, ***Ryman Meeting Room 1***
7:00 a.m. **Financial Affairs Committee/Treasurer Breakfast Meeting**

7:30 a.m. **Registration - *Prefunction area outside ballrooms***
Commercial Exhibits - *Crockett Ballroom*

Poster Session II - ***Crockett Ballroom***

Poster Session II: ***All posters listed below will be on display throughout Thursday, 7:30 a.m. to 4:30 p.m. Presenters of even-numbered posters must be present at their posters during the morning refreshment break, those presenting odd numbered posters must be present during the afternoon refreshment break.***

***** ***preceding the poster number indicates the presentation is in the Predoctoral Award Competition.***

01 - Neuroanatomical changes in the visual cortex following chronic endothelin-1 administration. **Olga E. MALAKHOVA***, Dennis E. BROOKS*, Richard L. CANNON*, Maria E. KALLBERG*, Elen E. KUEKUERICHKINA*, Andras M. KOMAROMY*, Frank, J. OLLIVIER*, William W. DAWSON*, Mark B. SHERWOOD*, and George N.LAMBROU* Departments of Anatomy and Cell Biology, Neuroscience, Ophthalmology, Small Animal Clinical Science. University of Florida, Gainesville, FL. and CIBA Vision, Basal Switzerland. (sponsored by Kyle E. Rarey).

02 - Application of 3D CT to craniometrics, volumetrics and densitometrics in cleft palate surgery: 1. Trials with pediatric skulls. **Geoffrey D. GUTTMANN**, David M.L. COOPER*, Garnet V. PACKOTA*, and Dennis T. LANIGAN*. Department of Anatomy and Cell Biology, College of Medicine and Department of Biological, Diagnostic and Surgical Sciences, College of Dentistry, University of Saskatchewan, CANADA.

03 - A simple approach for dissection of the anterior forearm. **Pamela P. THOMAS**, and Charles R. THOMAS*. Department of Anatomy, University of Health Sciences-College of Osteopathic Medicine, Kansas City, MO and Department. of Anatomy and Cell Biology, University of Kansas Medical Center, Kansas City, KS.

04 - An analysis of gross anatomy exam questions (single-answer vs. multiple-multiple choice) and student performance. **Ronald L. SHEW**, and Mark F. SEIFERT. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN.

05 - Interactive tutorial designed to help develop a three-dimensional perception of mitral valve anatomy and to aid in the evaluation of transesophageal echocardiography. **Jason D. MAZZURCO***, and Robert M. DEPHILIP. Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH.

06 -** Easing the transition: Decreasing the physical and emotional reactions to anatomy laboratory with senior medical students. **Catharine A. KRAL, A. Nicholas KURUP*, Joshua P. KOLLARS*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Department of Anatomy, Mayo Medical School, Rochester, MN.

07 - Building clay models as an anatomy learning tool for advanced dental students. **Kenneth H. JONES**. Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH.

08 - An annotated translation of Vesalius' De humani corporis fabrica (1543, 1555: from Book II, on the muscles of the head and neck. **Malcolm H. HAST**[1], and Daniel H. GARRISON*[2]. Department of Otolaryngology-Head and Neck Surgery[1] and Department of Classics[2], Northwestern University, Chicago and Evanston, IL.

09 - Human structure and function: an integrated course in anatomy, histology and physiology. **John T. HANSEN**, and Barbara DAVIS*. Department of Neurobiology and Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, NY.

10 - Delivery of web-based dissection videos. **Thomas R. GEST**, William E. BURKEL, Gerald CORTRIGHT, Jay CURKENDALL*, Geraldine DURKA-PELOK*, Neal ELKIN*, and Sun-Kee KIM*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, MI.

11 - Digital images for computerized anatomy laboratory and make-up exams in an integrated system-based curriculum. **Rustin E. REEVES**, David J. BARKER*, John A. ASCHENBRENNER*, Harold J. SHEEDLO*, and Rouel S. ROQUE*. Department of Pathology and Anatomy, University of North Texas Health Science Center, Fort Worth, TX.

12 - Peer presentation/evaluation technique during gross anatomy labs: New measures for enhancing its effectiveness. **Ameed RAOOF**, Thomas R. GEST, William E. BURKEL, and Tamara STEIN*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, MI.

13 - The procedural skills laboratory: building a bridge between anatomy dissection and procedures used in clinical and surgical practice. **Ruth L. PEDERSEN***, Karen M. MILLS*, Dean R. FISHER, Terry REGNIER*, Duane K. RORIE*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Department of Anatomy, Mayo Clinic, Rochester, MN.

14 - Access analysis of a gross anatomy course web site. **Gary L. NIEDER**, and Frank NAGY. Department of Anatomy, Wright State University School of Medicine, Dayton, OH.

15 - Navigating 2-D anatomical data using a 3-D interface: A novel web-based approach for teaching sectional human anatomy. **Timothy J. CAIN***, John K. KIM*^, and Raymond H. HO*, Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH and ^ Stanford University Medical Media & Information Technologies, Stanford, CA. (sponsored by Robert J. Leonard).

8:00 a.m. **Scientific Platform Session III** - Dr. Todd R. Olson – Moderator.
Armstrong/Boone Ballrooms

- ***preceding the title of the presentation indicates it is in the Predoctoral Award Competition.***

8:00 - Anatomy instruction for physicians. Which road? **Simon WAPNICK**. Director Postgraduate Clinical Anatomy Courses, New York Medical College, NY.

8:15 - Addition of clinical relevance to a first year medical gross anatomy course. **William E. BURKEL**, Walter CASTELLI, Gerald CORTRIGHT, Geraldine DURKA-PELOK*, D. Lowell FISHER*, Thomas R. GEST, Sun-Kee KIM*, Ameed RAOOF, and Tamara STEIN*. Division of Anatomical Sciences, Office of Medical Education, University of Michigan Medical School, Ann Arbor, MI.

8:30 - Introducing integrated clinical teaching techniques to gross anatomy curriculum. **Ameed RAOOF**. Division of Anatomical Sciences, Office of Medical Education, University of Michigan Medical School, Ann Arbor, MI.

8:45 - Longitudinal study of the effects of decrease in lecture length in a medical gross anatomy course. William E. BURKEL, Walter CASTELLI, Gerald CORTRIGHT, D. Lowell FISHER*, **Thomas R. GEST,** Sun-Kee KIM*, Ameed RAOOF, and Tamara STEIN*. Division of Anatomical Sciences, Office of Medical Education, University of Michigan Medical School, Ann Arbor, MI.

9:00 - Creating instructional software packages that are course specific. **Bruce E. MALEY*** (sponsored by D.J. Gould). Educational Technology Development Group, Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY.

9:15 - The cranial cavity and meninges; a digitized lecture. **Douglas J. GOULD** and Thomas J. DOLAN*. Educational Technology Development Group, Department of Anatomy and Neurobiology and Medical Arts and Photography, University of Kentucky College of Medicine, Lexington, KY.

9:30 - A tutorial for explaining the anatomical basis of referred pain. **Brian R. MacPHERSON**[1], Thomas DOLAN*[2], and Kathryn WONG-RUTLEDGE*[2]. [1]Educational Technology Development Group, Department of Anatomy and Neurobiology and [2]Medical Arts and Photography, University of Kentucky College of Medicine, Lexington, KY.

9:45 - A digital approach to laboratory instruction in medical neuroanatomy. **Jennifer K. BRUECKNER**, and Harold H. TRAURIG*. Educational Technology Development Group, Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY.

8:45 a.m. **Bus departs *Hilton Suites* for Accompanying Person's Program.** Sightseeing short day trip.

10:00 a.m. **Refreshment Break** – browse the posters/demonstrations/ commercial exhibits – ***Crockett Ballroom***

10:30 a.m. **Scientific Platform Session IV** - Dr. Brian R. MacPherson – Moderator.
Armstrong/Boone Ballrooms

**** preceding the title of the presentation indicates it is in the Predoctoral Award Competition.***

10:30 - *Digital Dissection Course of Orbital Anatomy. **Aaron PORTER***, Louise A. MAWN*, and Arthur F. DALLEY II. Department of Ophthalmology and Visual Science and Department of Cell Biology, Vanderbilt Medical Center, TN.

10:45 - *Lotus Notes QuickPlace as a web tool for anatomy education in a multi-site medical school. **Craig W. GOODMURPHY** [1], Peter H. ABRAHAMS[1], Robert L. JORDAN[1], Don E. WHEELER[2]*, and Anthony J. SCHMIDT[2]*. St. George's University Medical School, [1]Department of Anatomical Sciences, GRENADA, West Indies [2]St. George's University, Department of Information Technology, Bay Shore NY.

11:00 - *A student online dissector and course guide. **Ariel S. MOUFFLET***, Jennifer MOORE*, Christopher CIMINO*, and Todd R. OLSON. Albert Einstein College of Medicine, NY.

11:15 - *Cadaver based anatomy reports on the internet (ARI). **Zachary M. GRINSPAN***, Christopher CIMINO*, and Todd R. OLSON. Albert Einstein College of Medicine, NY.

11:30 - A case-based approach to teaching the clinical anatomy of the neck to first-year medical students. **John M. COOKE**, and Jeanne D. KELLER. Departments of Cell Biology and Radiology, University of Massachusetts Medical School, Worcester, MA.

11:45 - Imagemaps: Making digital atlases dynamic and exciting! **Geoffrey D. GUTTMANN.** Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, CANADA.

12:00 p.m. **Lunch** (on your own)
Browse the posters and commercial exhibits – ***Crockett Ballroom***

1:30 p.m. **Scientific Platform Session V** - Dr. F. David Aker - Moderator.
Armstrong/Boone Ballrooms

1:30 - Teaching hand anatomy with the Anatomical Workbench. **Sakti SRIVASTAVA,** William L. HEINRICHS*, Jean HEEGAARD*, Robert CHENG*, and Parvati DEV*. Stanford University School of Medicine, Division of Human Anatomy, Stanford University Medical Media and Information Technology group (SUMMIT), and Department of Mechanical Engineering, Stanford, CA.

1:45 - Use of interactive web-based practice test system in dental gross anatomy. **Terence P. MA**. Department of Anatomy, University of Mississippi Medical Center, Jackson, MS.

2:00 - Relationship of spatial reasoning test scores and performance in gross anatomy. **Larry J. PETTERBORG**, Randall BRYANT*, and Sean MILLER*. School of Physical Therapy, Texas Woman's University, Dallas, TX.

2:15 - Gelatin as a suspending medium to create three-dimensional images of the internal structure of hollow viscera. **Robert D. ACLAND**. University of Louisville, Louisville, KY.

2:30 p.m. **Refreshment Break** - Posters/Demonstrations/Commercial Exhibits – ***Crockett Ballroom***

2:30 p.m. **Bus returns to *Hilton Suites* from Accompany Person's short day trip**.

3:00 p.m. **Educational Affairs Symposium** -***Armstrong/Boone Ballrooms***
(All interested registrants are invited to attend)

How Do We Teach Anatomy To the Computer?

Structural Informatics Group, Department of Biological Structure, University of Washington, Seattle, WA.

- The Digital Anatomist Information System. **James F. BRINKLEY*,** and Cornelius ROSSE.

- The Foundational Model of anatomy. **Cornelius ROSSE,** and José L.V. MEJINO*.

- Correlation of the Foundational Model with traditional sources of anatomical knowledge. **Augusto V**.* **AGONCILLO*,** José L.V. MEJINO* and Cornelius ROSSE.

- Anatomical relationships in the Foundational Model of anatomy. **José L.V**. **MEJINO*,** and Cornelius ROSSE.

- ***general discussion***

Evening events at the Gaylord Entertainment Center

6:00 p.m. Walk to **Jack Daniel's Old No. 7 Suite** in the **Gaylord Entertainment Center** (directly across 5th Avenue from the hotel)

6:15 p.m. Reception (cash bar)
7:00 p.m. **Annual AACA Banquet** and presentation of Honored Member Award to ***David G. Whitlock***, Professor Emeritus, Department of Cellular and Structural Biology University of Colorado.
9:30 p.m. Adjourn

Friday, June 22, 2001 - All events at ***Hilton Suites, Nashville***

7:30 a.m. **Registration - *Pre-function area outside ballrooms***
Commercial Exhibits - ***Crockett Ballroom***

7:30 a.m. **Meeting of Educational Affairs Committee** (All interested are invited to attend) – ***Ryman Meeting Room 1***

8:30 a.m. **Scientific Platform Session VI** - Dr. Lawrence M. Ross - Moderator
Armstrong/Boone Ballrooms

8:30 - Repetitive and stretch injuries of the upper extremity cause thoracic outlet syndrome (TOS) in musicians and golfers: MRI/MRA. **James D. COLLINS**, Ernestina H. SAXTON*, Samuel S. AHN*, Theodore Q. MILLER* and Alfred CARNES*, Departments of Neurology and Radiological Sciences, UCLA School of Medicine, Los Angeles, CA.

8:45 - Endoscopic visualization of Vieussen's valve. **Arkadiusz PIETRASIK***, Michal ZAWADZKI*, Michal MARCHEL*, Kamil PIETRASIK, Bogdan CISZEK*. Department of Anatomy, Center of Biostructure Research, The Medical University of Warsaw, POLAND.

9:00 - Cystic dilatation of peribiliary glands, a rare cause of obstructive jaundice. **Luis A. GARCIA*,** and Mark O. JENSEN. University of North Dakota, School of Medicine, Department of Surgery, Fargo, ND.

9:15 - Regional variance of fiber orientation in human lumbar anulus fibrosus. **Georg FEIGL***, Christian A.J. SCHULZE-BAUER*, and G. A. Holzapfel*. Institute of Anatomy, KFU-Graz and Institute for Structural Analysis, Division of Computational Biomechanics, University of Technology, Graz, AUSTRIA. (sponsored by A.H. Weiglein)

9:30 - Peroneal intraneural ganglia. The importance of the articular branch: a unifying theory. **Robert J. SPINNER**, John L. D. ATKINSON*, David G. KLINE*, and Robert L. TIEL*. Department of Neurologic Surgery, Mayo Clinic, Rochester, MN.

9:45 - Planning of oral endo-osseous implant surgery based on inferior alveolar nerve anatomy. **Andreas H. WEIGLEIN**, Lumnije KCIKU*, and Christoph PERTL*. Institute of Anatomy, Department of Dental Surgery and Radiology, Karl-Franzens-University, Graz, AUSTRIA.

10:00 - Kinking or aneurysms in the cerebral arterial circle. Ruth KREYER*. **Sepp E. POISEL**, Peter OBRIST*, and Wolfgang DORINGER*. Institute of Anatomy and Histology and Department of Pathology, University of Innsbruck, and Department of Radiology, District Hospital, Feldkirch, AUSTRIA.

10:15 - Anatomic considerations of the cervical tube pharyngostomy. **Michael L. KENDRICK***[1], Michael G. SARR[1]*, Arlen R. SEVERSON[3], and Wojciech PAWLINA[2]. [1]Department of Surgery and [2]Department of Anatomy, Mayo Medical School, Rochester, MN. and [3]Department of Anatomy and Cell Biology, University of Minnesota Duluth, School of Medicine, Duluth, MN.

10:30 - Evaluation of patient positioning and inter-fraction organ motion using an infrared positioning system serial CT, and mutual information image fusion in the treatment of prostate cancer. **Victor C. ARCHIE***, Susanna R. GORDON*, John J. DEMARCO*, Robert G. PARKER*, H. Rodney WITHERS*, and Timothy D. SOLBERG*. Department of Radiation Oncology, UCLA School of Medicine, Los Angeles, CA. (sponsored by James Collins).

11:00 a.m. **Special Interest Group: Directors of Willed-Body Programs *Armstrong/Boone Ballrooms*** (All interested registrants are invited to attend)

1:00 p.m. **Meeting of new Council** - ***Ryman Meeting Room 1***

Saturday, June 23, 2001 – AACA and Vanderbilt University School of Medicine jointly sponsored Postgraduate Course

"***Surgical Anatomy and Embryology of the Liver and Biliary System***"

Room 202, Rudolph Light Hall and Medical Center North

Separate registration fee required
For a description of the program, please see the following page

18th Annual Meeting Postgraduate Course

Surgical Anatomy and Embryology of the Liver, Gall Bladder and Bile Ducts

Saturday, June 23, 2001

Room 202, Rudolph Light Hall
Vanderbilt University School of Medicine
Nashville, TN

Jointly sponsored by
Vanderbilt University School of Medicine
and the
American Association of Clinical Anatomists

VANDERBILT UNIVERSITY SCHOOL OF MEDICINE CME ACCREDITATION

The Postgraduate Course on Surgical Anatomy and Embryology of the Liver, Gallbladder and Bile Ducts has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of Vanderbilt University School of Medicine and the American Association of Clinical Anatomists. The Vanderbilt University School of Medicine is accredited by the ACCME to sponsor continuing medical education for physicians.

DESIGNATION OF CME CREDIT

The Vanderbilt University School of Medicine designates this continuing medical education activity for 6.5 credit hours in Category 1 of the Physician's Recognition Award of the American Medical Association.

Schedule of Postgraduate Program

7:30 – 7:45 a.m. Shuttle bus departs ***Hilton Suites, Nashville*** for Vanderbilt University
7:30 – 8:00 a.m. Registration and continental breakfast on 1st floor lobby

Session I - Embryology and Anantomy (Room 202) – Benton Adkins, moderator

8:30 – 8:40 a.m. Welcome, Introductory remarks Benton Adkins, MD, FACS
8:40 – 9:05 a.m. The History of Anatomy and Surgery of the Liver John Skandalakis, MD, PhD, FACS
9:05 – 9:30 a.m. Embryology of Liver and Bile Ducts Gary Wind, MD
9:30 – 10:00 a.m. Basic Anatomy of the Liver and Biliary Tree Art Dalley, PhD

10:00 – 10:30 a.m. Break

10:30 – 10:45 a.m. Congenital Anomalies of the Liver and Biliary System Benton Adkins, MD, FACS
10:45 – 11:00 a.m. Segmental Surgical Anatomy of the Liver Benton Adkins, MD, FACS
11:00 – 11:30 a.m. Vascular Anatomy of the Liver Ralph Ger, MD, FRCS, FACS
11:30 – 12:00 a.m. Anatomic Exhibit. Gross Anatomy Lab Ralph Ger, et al.

12:00 – 1:30 p.m. Lunch (provided) – Light Hall North Lobby, 3rd floor landing

Session II – Clinical Correlations (Room 202) – Ralph Ger, moderator

1:30– 2:00 p.m. Radiologic Anatomy of the Liver and Biliary Tree Ronald Arildsen, MD
2:00 – 2:45 p.m. Eastern vs. Western Methods of Liver Resection Ralph Ger, MD, FRCS, FACS

2:45 – 3:15 p.m. Break

3:15 – 3:45 p.m. Laparoscopic Liver and Biliary Tree Anatomy Carol Scott-Conner, MD,PhD, FACS
3:45 – 4:15 p.m. Anatomic Basic of Liver Transplantation Wright Pinson, MD, FACS
4:15 – 4:45 p.m. Surgical Correction of Anatomic and Technical Surprises William Chapman, MD, FACS
4:45 – 5:00 p.m. Closing remarks, adjourn (shuttle buses return to ***Hilton Suites, Nashville***)

Abstracts

ACLAND, Robert D. University of Louisville, Louisville, KY. Gelatin as a suspending medium to create three-dimensional images of the internal structure of hollow viscera.
When a thin-walled viscus is opened it collapses. Delicate features of its lining are obscured by the effects of surface tension and gravity. In making a video presentation of the internal organs a technique was developed to overcome these problems. The cleaned viscus is filled with 3.5% de-ionized gelatin that is allowed to set. The filled viscus is suspended in a cylindrical clear acrylic container which is filled with liquid gelatin that is also allowed to set. When viewed in air, the curved wall of the container distorts the view of the specimen. This refractive problem is overcome by immersing the cylinder in a glass tank filled with water. Accurate images can be made of the viscus, using a camera placed just outside the tank. A flat bearing beneath the cylinder allows it to rotate, giving video images that convey a three-dimensional appreciation of the specimen. A detailed internal view is obtained by cutting the gelatin-filled viscus in half longitudinally before suspending it. This presentation shows the technique and presents some of the resulting video images. These include views of the internal structure of the small and large intestine that reveal an unexpected richness of transverse mucosal folding.

AGONCILLO, Augusto V.*, José L.V. MEJINO*, and Cornelius ROSSE. Structural Informatics Group, Department of Biological Structure, University of Washington, Seattle, WA. Correlation of the Foundational Model with traditional sources of anatomical knowledge.
The Foundational Model of anatomy (FM) is a machine-understandable representation of the structural organization of the human body. The FM was developed in accord with sets of rules and principles for defining anatomical entities from a structural viewpoint and for grouping them together into classes of an inheritance hierarchy or ontology. We have encountered and resolved a number of conceptual problems in order to reconcile the logical consistency demanded by the FM with traditional sources of anatomical knowledge. Such sources more readily tolerate ambiguities for which the human mind can readily compensate. These inconsistencies relate to both semantic specificity and expressivity. Assurance of semantic specificity required the clear distinction between different meanings of such terms as 'base of heart' and 'muscle'. Semantic expressivity in the FM called for the establishment of classes of anatomical entities that have not been previously defined, or have been classified on the basis of shared function rather than similarity of structure. However, in addition to a structural organization, the FM also accommodates regional and systemic anatomy in order to process queries based on these traditional views. Expressivity was also enforced by a rule requiring that if a structure has one named part, the remaining part of the structure must also be named (e.g., we had to name the part of the right ventricle that is not the infundibulum). Explicit definitions formulated in a structural context were critical for assuring both semantic expressivity and specificity. (Supported by Contact No. LM03528 and Grant No. LM06822 from the National Library of Medicine.)

AGUR, Anne, Nancy McKEE*, and Roger LEEKAM*. Department of Surgery, Institute of Medical Science, University of Toronto, Canada. ***In vivo*** anterior and posterior soleus muscle architecture: a dynamic ultrasonographic study.
The purpose of this study was to document ***in vivo*** posterior and anterior soleus architectural parameters in relaxed and contracted states, using ultrasonography Thirty five normal volunteers

(16 females and 19 males) were scanned (mean age 44 - 22 years/range: 10 - 92 years). At each of 5 sites site, the leg was scanned with the muscle relaxed and then in maximal voluntary contraction (full plantarflexion). From each scan the length and angle(s) of pennation of a fibre bundle was measured. Average angle of pennation and fiber bundle length was calculated. Percentage change in architectural parameters were determined. Gender differences were analysed. The results of this study indicated the longest average fiber bundle length was in the midline of the middle third of posterior soleus, whereas the anterior soleus has more uniform fiber length with smaller pennation angles. The percentage of shortening of fiber bundles and percentage increase in pennation angle upon contraction is also greatest in the central region of the posterior soleus and least in the central anterior soleus. The soleus of females has significantly longer fiber bundles, smaller angle of pennation and is not as thick as the soleus of males. It appears that the architectural characteristics are non-uniform throughout the volume of soleus muscle and vary between genders. More detailed architectural studies can lead to improved understanding of soleus function and force generation.

AGUR, Anne, Victor NG-THOW-HING*, Eugene FIUME*, and Nancy McKEE*. Departments of Surgery and Computer Science, Institute of Medical Science, University of Toronto, Canada. Visualization and documentation of the fiber architecture of the cadaveric soleus muscle using B-spline modelling.

The purpose of this study was to visualize and documents the fiber bundle arrangement throughout the volume of a cadaveric soleus muscle in 3-dimensions. The 3D coordinates of the ends of hundreds of muscle fiber bundles from each of the marginal, anterior and posterior parts of the muscle were obtained by digitizing the points from serially dissected specimens. A new volumetric model based on B-spline basis functions was designed to reconstruct and document the internal fiber architecture throughout the muscle. The computer model allowed documentation of the architectural parameters in three-dimensional space, with a 3-D angle of pennation being measured relative to the tangent plane of the point of attachment of a fiber bundle. The architectural parameters recorded to date have been two-dimensional. A database of the fiber bundle length and angle of pennation through out the three parts of soleus was created. Fiber bundle arrangement was found to vary between and within muscle parts. Three-dimensional reconstruction provided not only an architectural database but also allowed visualization of each fiber bundle ***in situ*** from any perspective. This technique provides a novel approach to the study of muscle architecture. Knowledge of the ***in vivo*** architectural parameters provides us with the opportunity to convert our cadaver based soleus computer model into a model capable of contraction and dynamic function.

ARCHIE*, Victor C., Susanna R. GORDON*, John J. DEMARCO*, Robert G. PARKER*, H. Rodney WITHERS*, and Timothy D. SOLBERG*. Department of Radiation Oncology, UCLA School of Medicine, Los Angeles, California, USA. (Sponsored by James Collins). Evaluation of patient positioning and inter-fraction organ motion using an infrared positioning system serial CT, and mutual information image fusion in the treatment of prostate cancer.

Knowledge of anatomy, pathophysiology, and patient positioning are important for delivering radiotherapy. Authors have addressed internal organ motion, for prostate cancer, and suggest bladder and rectal filling. We evaluated internal organ motion using the ExacTrac patient positioning system. Patients with prostate cancer had 4-6 reflecting spheres affixed to their surface. The spheres established the reference for targeting. Planning was transferred to a positioning system installed in the treatment room. Patients position was monitored daily. Patients received a weekly CT scan, which was fused with the planning CT using a mutual information algorithm. The

prostate and landmark organs were contoured on each CT. Variation in prostate position and bladder and rectum volume was determined. Our observations on prostate motion are in line with previously reported studies. To further reduce treatment ports, in-room-imaging technologies are necessary.

BEST, Irwin M. Department of Surgery, Morehouse School of Medicine, Atlanta, GA. Compartment syndrome of the thigh.

Compartment syndrome of the thigh is a poorly recognized clinical condition that may follow reperfusion of acutely ischemic thigh muscles. It is characterized by intense pain and swelling of the affected muscle, elevated compartment pressures, and myoglobinuria. The anterior-lateral muscle group appears to be at greatest risk. This condition was treated in a patient following a gunshot wound to the left thigh. A 29-year-old man presented to the Emergency Room with a single GSW to the lateral left thigh and a large scrotal hematoma. His Glasgow coma scale was 15. He had palpable pedal pulses in both lower extremities. The superficial and common femoral veins as well as the profunda femoris artery were reconstructed and prophylactic leg fasciotomies were performed. Post operatively he developed myoglobinuria and tense swelling and congestion of the left thigh. Lateral compartment pressures were 65 mmHg. He was taken to the operating room and a lateral thigh incision was made through the tensor fascia lata to the lateral epicondyle. Non viable muscle readily protruded through this incision. The necrotic muscle was debrided. He was returned to the operating room on several occasions for additional debridement. He had a delayed closure of his wound at four months and intense rehab for ischemic neuropathy for two years. At 3.5 years after his injury he is fully ambulatory with only a mild peroneal nerve dysfunction. The following conclusions can be outlined regarding compartment syndrome of the thigh: 1. Thigh compartment syndrome may follow ischemic vascular injury to the profunda artery and vein. 2. Clinical findings occur late. Therefore, routine monitoring should be considered in patients with ischemic thigh injuries. 3. Early exploration of the involved muscles allows the clinician to confirm this diagnosis and to debride any necrotic muscle. 4. Because of its construction, the lateral muscles of the thigh appear to be most susceptible to this syndrome. Prior lateral thigh surgery may increase this risk.

BRINKLEY*, James F., and Cornelius ROSSE. Structural Informatics Group, Department of Biological Structure, University of Washington, Seattle, WA. The Digital Anatomist Information System.

Teachers, students and health care providers are making increasing use of anatomical information distributed through CD-ROMs and the World Wide Web. These programs incorporate multimedia navigation capabilities but tend to duplicate the same type of image and text-based information as the numerous versions of anatomy textbooks and atlases; like these books, each program is intended for a particular audience. We have taken a fundamentally different approach by developing a distributed, Internet-based framework of interacting components for organizing and delivering anatomical information. These components constitute the Digital Anatomist Information System (DAIS), which allows the ongoing incorporation of new technologies and content, as well as different presentation methods best suited for meeting the needs of different kinds of users. The information resources of DAIS consist of an image repository (which stores and organizes a variety of 2D images, image volumes, 3D models and animations) and the Foundational Model of anatomy (FM), which describes the structural organization of the body in machine-understandable form. New contents generated by authoring programs (Knowledge Builder, Model Builder, Annotator) are delivered to these resources through a fleet of servers (e.g., FM server, graphics

server). Information is made available in response to user requests submitted to the resources by client programs through the same set of servers. Digital Anatomist web atlases (http://sig.biostr.washington.edu) are the most widely used client programs through which more than 20,000 requests are received per day from 95 countries (Supported by Grant No. LM06316 and LM06822 from the National Library of Medicine.)

BRUECKNER, Jennifer K., and Harold H. TRAURIG*. Educational Technology Development Group, Department of Anatomy and Neurobiology, University of Kentucky, Lexington, KY. A digital approach to laboratory instruction in medical neuroanatomy.

Historically, health professions students have relied solely upon text-based laboratory manuals and photographic atlases to guide their study of gross and sectional neuroanatomy. Toggling between these resources can be awkward when identifying these structures for the first time or in reviewing for an examination. In order to streamline laboratory instruction, we have developed a digital atlas using the multimedia-authoring program Authorware 5 (Macromedia, Inc.). The atlas is designed to facilitate student learning in the laboratory (at a computer workstation) as well as during independent study at home or in the library. In addition, the atlas is used by the faculty in class to present pre-laboratory demonstrations of the material to be covered each day. An interactive quiz module is being developed currently to facilitate periodic self-evaluation. The impact of incorporating the digital atlas into the medical neuroanatomy course will be assessed using pre- and post-use surveys. The initial survey will assess the students' previous experience with instructional technology in other classes, while the exit survey will measure student use and satisfaction with the digital atlas in neuroanatomy laboratory. Quantitative and qualitative results from the post-use survey will be used to modify the multimedia atlas to better suit student needs.

BURKEL, William E., Walter CASTELLI, Gerald CORTRIGHT, Geraldine DURKA-PELOK*, D. Lowell FISHER, Thomas R. GEST, Sun-Kee KIM*, Ameed RAOOF, and Tamara STEIN*. Addition of clinical relevance to a first year medical gross anatomy course.

Over the course of the past eight years, we have added clinical relevance to the medical gross anatomy course in a number of ways. Although radiology had always been a part of the anatomy course, lectures by radiology faculty were added to the course schedule. As well, lectures by clinical faculty were added to the schedule at the end of each anatomical region studied. Three years ago, we developed brief written clinical cases for each dissection laboratory session. These cases were made available on our course web pages, and students were assigned cases to present to their dissection table group as part of the peer teaching system. The following year, we developed a new set of clinical cases to correlate with each laboratory session, and these were deployed in the same manner. During this past year, one of our faculty (Raoof) offered optional clinical overview and discussion sessions at the conclusion of each body region. We have altered the format of our quiz and exam questions to phrase each question in clinical terms and focus on clinically relevant questions rather than anatomical detail. We are currently involved in a project of adding clinical relevance by using the medical histories of the cadavers used in dissections. Detailed medical histories for each of the cadavers used for our course this coming fall will be collected. These data will be organized and presented via a web-based database. Since our gross anatomy labs contain 16 computers, students will be able to access this database within the gross anatomy lab, and they will be able to add notes concerning their findings as they dissect. The medical histories and the dissection findings will be searchable, so that students will be able to quickly locate specimens of special interest.

BURKEL, William E., Walter CASTELLI, Gerald CORTRIGHT, D. Lowell FISHER, Thomas R. GEST, Sun-Kee KIM*, Ameed RAOOF, and Tamara STEIN*. Longitudinal study of the effects of decrease in lecture length in a medical gross anatomy course.

Over the past three years, we have been reducing the length of lectures delivered in our first year medical gross anatomy course. Prior to the beginning of this experiment, lectures were 50 minutes or more in length, and presented the subject in intricate detail. Three years ago, we began to make a significant amount of didactic course material available via our course web pages. At the same time, we began to install computers within the gross anatomy laboratories, to enable student access to web assets during dissection. Concurrentwith the increase in web courseware, we have decreased the length of time for individual lectures. The purpose of decreasing lecture time was to make more laboratory time available, and to change the focus of the gross anatomy course from teacher-centered, passive learning to student-centered, active learning. The average lecture length is now approximately 30 minutes, and we refer to these "mini-lectures" as lab introductions. A lab introduction will typically consist of overview of general concepts, an orientation to the dissection procedure, highlighting key relationships, and common anatomically relevant clinical correlations. Shortening the time spent in lecture has also made available more class time for peer teaching, in which individuals within dissection table groups have rotating responsibility to present either a review of the preceding dissection or the assigned clinical case. The shortened lectures have not had a deleterious effect upon student examination performance. Indeed, this past year, we recorded the best course scores within the past nine years. Student opinions on the shortened lecture format have been somewhat mixed, but on the most part positive. The gross anatomy course rating for this past year is the third highest within the past nine years. Student evaluations of faculty who have shortened their lectures have been positive, and anatomy faculty members have continued to receive teaching awards, despite some fears of repercussions of limiting lecture time.

CAIN*, Timothy J., John K. KIM*^, and Raymond H. HO*, Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH and ^ Stanford University Medical Media & Information Technologies, Stanford, CA. (Sponsored by Robert J. Leonard). Navigating 2-D anatomical data using a 3-D interface: A novel web-based approach for teaching sectional human anatomy.

Many web-based applications are being used to enhance anatomical instruction. Apple's ***QuickTime*** technology had been used, for example, to present anatomical structures that can be manipulated and rotated. While ***QuickTime*** allow users to explore surface features, the approach we present provides a novel means to demonstrate internal structures and relationships, which is often difficult to do with ***QuickTime***. Using Virtual Reality Markup Language (VRML) we created an interactive model of the human head. The VRML-renderedinterface runs in a web browser plug-in (e.g., Cosmo Player) and navigating through three planes of high-resolution digital images. Applied to sectional anatomy instruction, the compact and modular features of this approach confers a level of web-portability difficult to achieve with the larger and less modular ***QuickTime*** technique. Although we have used the sectional anatomy of the head to demonstrate a possible application for our program, other anatomical regions would likely benefit from such an approach. The conventional web-scripting techniques employed here to both render the navigational interface and assemble the program also lends it to modificationand adaptation in disciplines where spatial reasoning is required when data is limited to two-dimensions.

CLEMENT* Hans, Norbert P.TESCH*, Wolfgang GRECHENIG*,Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy, Department of Trauma Surgery,Karl-Franzens-University of Graz,Austria(sponsored by A.H.Weiglein). Early experience on systemically integrated measurements in freehanded 3-dimensional ultrasonography.

Recently developed software by Siemens in combination with a 7,5mHz linear sound probe enables to perform 3-dimensional free-hand investigation of structures up to 18 cm. The experiments were conducted using a Siemens Elegra. Objects of different size, form and deformability, which had been previously measured exactly, were implanted into pork-shoulders in depths ranging from 1 to 5 cm. These objects were investigated sonographically and measurements were compared to each other. When measuring the size of objects, the quality of depiction should be up to 90% and an exactly timed feed is necessary. The feeding speed as well as the quality of depiction are analyzed by apparatus. With objects of up to 3cm and a length of approximately 5cm, the difference of the two measurements mentioned above amounted to between 5 and 25%. The biggest differences were encountered when measuring deformable objects, because the pressure of the sound probe caused deformation of the object underneath. With larger or longer objects, the accuracy of measurement depended on the relation between the surface of the soundprobe is driven over and the surface of the object to be measured. Errors in measurement of up to 40% occur if the object's distance to the sound probe increases during the measurement. 3-dimensional free-hand measurement enables to sonographically depict and measure anatomical and pathological objects of larger dimension without excessive expenditure of machines. Up to now, this measurement on the living human beeig was not possible with integrated systems.

COLLINS, James D., Ernestina H. SAXTON*, Samuel S. AHN*, Theodore Q. MILLER*, and Alfred CARNES*. Departments of Neurology and Radiological Sciences, UCLA School of Medicine, Los Angeles, CA. Repetitive and stretch injuries of the upper extremity cause thoracic outlet syndrome (TOS) in musicians and golfers: MRI/MRA

Repetitive and stretch injuries of upper extremities reduce tone in levator scapulae, trapezius, and serratus anterior muscles (laxity); scapulae asymmetrically droop, move forward, with results in round shoulders (humching). This increases tension on draining neck veins, supraclavicular spaces and neurovascular bundles within the scalene triangles. (Clin.Anat. 10:13,1997). Bilateral MRI/MRA displays structural abnormalities that compress the brachial plexus (Clin Anat. 8: 1-16, 1995). Histories, neurological examinations, chest radiographs and electrophysiological studies were obtained in 32 patients, musicians and golfers, who presented with arm pain and paresthesias impairing performance Imaging was conducted on the 1.5 Tesla GE Signa, 5.7 software, 4.0 mm thickness, saline waterbags beside the neck to enhance signal to noise ratio. T1 weighted and selected FSE sequences were acquired (coronal, transverse, transverse oblique, sagittal, 2D TOF MRA sequences and arm abduction external rotation sequence). All patients were at risk for TOS because of underlying structural abnormalities. Laxity developed from repetitive trauma. Abduction external rotation MRI sequence (arms overhead) displayed costoclavicular compression of the neurovascular bundles and draining veins of the neck and supraclavicular spaces; this triggered TOS symptoms. MRI/MRA anatomic sites of neurovascular and venous compression in professional musicians and golfers are presented.

COOKE, John M., and Jeanne D. KELLER. Departments of Cell Biology and Radiology, UMass Medical School, Worcester, MA. A case-based approach to teaching the clinical anatomy of the neck to first-year medical students.

We present a new module for teaching the clinical anatomy of the neck in a laboratory setting based on four cases of patients with an unknown mass in the neck. The lesions used as unknowns are (A) carotid body tumor, (B) thymic cyst, (C) thyroglossal cyst, and (D) metatstatic disease involving the jugulodigastric node. These cases were selected to emphasize: surface anatomy, cross-sectional anatomy and clinical imaging, and embryology. The module complements traditional dissection of the neck which we do in three 2-hour laboratory sessions. Two lectures dealing with basic anatomy and imaging pertinent to understanding the cases precede each of the first two lab sessions. Prior to the first lab, each student of a dissection team of four is assigned one of the cases (A-D). The teams are provided brief clinical histories (but no diagnosis) including both the presenting symptoms and a description of the size, shape and location of the unknown mass. As an exercise in surface anatomy designed for this module, the students are directed to draw the major surface landmarks of the neck on their cadavers with a grease pencil. They then try to accurately outline the borders of each of the four lesions. Prior to lab 2, students receive more detailed histories and the results of diagnostic studies including clinical images. Each student is also required to prepare three study questions pertinent to the assigned case prior to session 3. To complete the exercise, two faculty members facilitate an interactive discussion during lab 3 in which student "volunteers" read the case history, interpret both normal and abnormal features of projected clinical images, and report on assigned study questions. Faculty facilitators conclude discussion of each case with comments on the relevant clinical anatomy.

DIMOPOULOS Chris, Marios LOUKAS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, Poland. Mast cells detection in walls of coronary arteries.

For years now it has been known that the mast cells play a key role in a variety of pathological processes, including allergic reactions. However, the association of the mast cells with the circulatory system brings up an interesting theory about their appropriate histo-anatomical arrangement in and around the vessel wall and of course how is this histo-anatomical arrangement connected with any clinical implications. 80 specimens of normal human coronary arteries, were collected from postmortem autopsies and also 40 coronary arteries that showed atherosclerosis macroscopically and were stained with Eosin -Hematoxylin and with monoclonal antibodies against mast cells. The age of the specimens ranged with a mean of 21 years old. Mast cells were found only in intimal and adventitial layers but not in medial layers. In 62 of the specimens examined we were able to identify mast cells in arterial intima, while in all the specimens mast cells were evident in adventitia. However, the number of mast cells observed at the adventitial layer was much higher than the intimal layer at about. Still reasons for the presence of mast cells in intima of the coronary arteries remain unknown. Recently, studies on the role of mast cells in atherosclerosishave shown a correlation of mast cells distribution and angiogenesis. This suggests that mast cells' distribution before and during atherosclerosis could play a crucial role in the development and progression of the coronary heart disease.

DIMOPOULOS Chris, Marios LOUKAS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, Poland. Conal artery, morphology, topography and clinical implications.

The aim of this study was to describe the presence, the morphology and the topography of the conal artery in a clinically useful way. The study was carried on 180 hearts obtained from the routine autopsies performed in our department without any cardiac abnormalities and also 120 coronary angiograms. Digital image analysis software program Lucia applied for the measurements of the structures. Conal artery has been identified in all hearts examined and three main patterns were recognized: A, in which the conal artery arose independentlyof the right coronary artery (117-35.1%); B, in which the conal artery arose from a common coronary ostium (50-16.6%); C, in which only the right coronary artery took origin from the right aortic sinus (133-48.3%). The relative incidence of the three patterns together with the morphology and topography of the conal artery varied significantly with the weight of the heart and also with the degree of hypertrophied ventricular wall. Interestingly in hearts with hypertrophied myocardium conal artery appeared to be larger and to exhibit an unusual course. This may suggest that conal artery may further develop in compensation for the relatively reduced blood flow which is due to hyperthrophied myocardium.

EL-SHARABY, Ashraf A.*, Katsura UEDA* Satoshi WAKISAKA * and Kojiro KURISU*. Department of Oral Anatomy & Developmental Biology, Osaka University Graduate School of Dentistry, 1-8 Yamadaoka, Suita, Osaka, Japan. (Sponsored by B.R. MacPherson). The onset of bitter and sweet taste transduction as revealed by αgustducin immunohistochemistry in the developing lingual and palatal epithelium of rat.

We used the taste-cell-specific G protein, αgustducin to investigate the onset of taste transduction in the palatal and lingual epithelium from birth till the postnatal day (PN) 21. At PN1-5, solitary ovoid or bipolar αgustducin-immunoreactive cells were scattered among the epithelium of soft palate, nasoincisor, circumvallate and foliate papillae. Subsequently, these cells became wrapped in αgustducin-negative cells surrounded by an extracellular space forming bud-like structures in the circumvallate and foliate papillae. Different stages of typical taste buds were simultaneously recognized but the earliest expression of αgustducin was recorded only in the pored buds ***i.e.*** at PN1 in the soft palate and PN2-3 in the nasoincisor, circumvallate and foliate papillae. At PN7, both the solitary cells and bud-like structures were rarely recognized. Meanwhile, the total counts of immunoreactive cells within taste buds revealed a gradual increase toward the end of our investigation. We argued that taste transduction is essentially required from the time of birth and could be fulfilled by either solitary chemosensory cell scattered in the oral epithelium or mature receptor cells within the taste buds. Moreover, the onset of taste transduction accomplished by palatal taste buds developed earlier than that achieved by circumvallate and foliate taste buds.

FEIGL, Georg*, Christian A.J. SCHULZE-BAUER*, and G.A. Holzapfel* Institute of Anatomy, KFU-Graz and Institute for Structural Analysis, Division of Computational Biomechanics, University of Technology Graz, Austria. (Sponsored by A.H. Weiglein). Regional variance of fiber orientation in human lumbar anulus fibrosus.

The mechanical properties of anulus lamellas and the orientation of their fibers govern the function of the anulus fibrosus (AF). This study was aimed to investigate the regional variance of fiber orientation in human lumbar AF. For this preliminary study, we investigated 5 intervertebral discs (L1-L2) of fresh human cadavers including the adjacent vertebral bodies. Each segment was cut mediansagittaly using one half to investigate fiber orientation and the other half for corresponding

mechanical testing. Fiber angles with respect to the horizontal plane were determined photogrametrically from images taken at 6 circumferential positions (A-F) from ventral (0°) to dorsal (180°) and at three depth levels (I-III), determining also the fiber angles of the neighboring lamella at each level. Measured angles ranged from 18° to 70° increasing from the ventral (A) to the dorsal position (F). There were minor yet significant differences in absolute fiber angles between neighboring lamellas (2.5°+3.1°, P=0.002) and deep (III) and superficial (I) lamellas (2.7°+9.7°, P=0.015). The regional variance of the fiber angles was described by a linear model for the relation between the fiber angle a and the circumferential position Æ(|a|=26.8+0.133 Æ,r”00.58). These results provide essential novel data for appropriate mechanical modeling of the AF.

FIRBAS, Ulrike*, Wilhelm FIRBAS, and Manfred TSCHABITSCHER*. Department of Anatomy, University of Vienna, Vienna, Austria. Endoscopic anatomy of the connective tissue of the orbita. The endoscopic approach to the orbita has been in use for several years. We tried to identify different parts of the suspensory apparatus of the eyeball. In five human cadavers the condensed connective tissue of the orbita was studied with transconjunctival and transnasal access. We were able to identify the fascia bulbi, the check ligaments, the suspensory ligament of Lockwood, and the rectus muscle pulleys. The connective tissue apparatus can be important in orbital fractures and has to be considered in eye muscle surgery.

GARCIA, Luis A.*, and Mark O. JENSEN. University of North Dakota, School of Medicine, Department of Surgery. Cystic dilatation of peribiliary glands, a rare cause of obstructive jaundice. Peribiliary glands adjacent to extrahepatic and large intrahepatic ducts are normal histologic findings. These glands can undergo asymptomatic cystic dilatation in patients with portal hypertension. Obstructive jaundice has been rarely described. Our patient is the fourth ever reported case of obstructive jaundice caused by this rare benign condition. A 56 year old male was admitted with painless jaundice. Medical history included alcoholic liver cirrhosis, portal hypertension, inactive pulmonary tuberculosis and porto-caval shunt. Physical exam revealed jaundice, ascites and signs of liver insufficiency. Total bilirubin was 15.3, Alk P 329, GGT 148, WBC 7.8, PT 31, PTT 57, Negative AFP and hepatitis panel. Ultrasound and CT scan revealed marked intrahepatic duct dilatation, ERCP showed near occlusion of the common bile duct and common hepatic duct. Endoscopic and percutaneous stenting were unsuccessful. Surgical exploration revealed marked liver cirrhosis and small, fibrotic, and partially occluded biliary radicles. Ultrasound guided needle cannulation and transparenchymalliver exploration revealed small intrahepatic ducts not amenable to be used for biliary bypass. After substantial blood loss further attempts were aborted. Postoperatively patient developed multiple organ failure and died. Necropsy showed dense parenchymal liver fibrosis with active alcoholic hepatitis. Multiple dilated peribiliary gland cysts were found along the major intrahepatic ducts. The cysts measured up to 1 cm in diameter, were filled with mucoid material and were forming aggregates causing obstructive jaundice and marked cholestasis. Common hepatic duct and common bile duct were similarly affected. Periampulary and peripancreatic duct glands were also affected. No malignancy was documented.

GER, Ralph. Great Neck, NY. Compartment syndromes of the leg: pitfalls and prejudices. Decompression of the fascial compartments of the leg is a common procedure that is carried out prophylactically and therapeutically to respectively prevent or treat impending or established ischemia of the muscles of the leg as they become edematous in their relatively rigid osteo-fascial compartments. Current surgical technique is poorly described in most texts and those that offer

more guidance are not as helpful as they should be. Experience continues to show that the anatomy of the superficial nerves of the leg and the compartments and their contents are not fully appreciated. This leads to incisions that are poorly placed , whose length may be ill-advised, and which lead to complications. Finally, the closure of the wounds maybe unnecessarily complicated and cosmetically suboptimal. The relevant anatomy of the leg will be reviewed, clinical examples of the above contentions presented and suggestions made to improve the situation.

GEST, Thomas R., William E. BURKEL, Gerald CORTRIGHT, Jay CURKENDALL*, Geraldine DURKA-PELOK*, Neal ELKIN*, and Sun-Kee KIM*. Delivery of web-based dissection videos. During the past few years, we have made various changes to our gross anatomy course to increase opportunities for self-directed active learning. Last year, supported by a grant from the University of Michigan Center for Research on Learning and Teaching, we created digital movies of anatomical dissections for the first half of the gross anatomy course. Dissection procedures and still images of dissections were recorded with a Canon XL1 digital video camera and a Kodak DC290 digital camera. The video segments and still images were edited using Apple QuickTime Pro, iMovie, Media Cleaner Pro software, and several PowerMac computers. The movies were compressed for playback as streaming media using the Sorenson video codec. These movies were then delivered via our web courseware using a Mac OS X streaming video server. The videos are accessed by students as prelaboratory preparation and especially at the location where they are most needed, within the gross anatomy laboratories. A questionnaire was used to harvest student opinions of the effectiveness of the dissection videos as learning tools. Student response to the videos has been extremely positive, and we have received funding to complete the dissection videos for the second half of the course.

GILLILAND, Kurt O., Christopher D. FREEL, C. Wesley LANE*, and M. Joseph COSTELLO*. Department of Cell and Developmental Biology, University of North Carolina, Chapel Hill, NC.
Multilamellar bodies as potential scattering centers in human age-related nuclear cataracts. Transparency of the lens is necessary for the proper focusing of light on the retina. When a transparent lens develops light scattering centers and becomes opaque, it is said to be a cataract. Rare spherical objects covered by multiple membranes, termed multilamellarbodies (MLBs), may be one of the sources of light scattering. Five normal adult human lenses were obtained from donors, and five age-related nuclear cataracts were obtained immediately after extracapsular extraction. Each sample was sectioned fresh into 200 micron thick sections that were prepared for light or electron microscopy. Light micrograph montages of the equatorial plane were examined. Rare, but distinct, circular 1-3 micron diameter objects were observed consistently in the cataracts. The frequency of MLBs was 10X higher in cataracts than in the normal lens. The size, circular shape, and multiple layers of 5-nm membranes easily identified the MLBs, which displayed variable textures in their interiors. Because the MLBs are large compared to the wavelength of light, display interiors with variable staining textures, and have lipid-rich coverings, they appear to be ideal candidates for large scattering centers and may contribute significantly to the forward light scattering in nuclear cataracts. (Sponsored by NIH Grant EY08148)

GOODMURPHY[1]Craig W., Peter H. ABRAHAMS[1], Robert L. JORDAN*[1], Don E. WHEELER*[2], Anthony J. SCHMIDT*[2]. [1]St. George's University Medical School, Department of Anatomical Sciences, GRENADA, West Indies. [2]St. George's University, Department of Information Technology, Bay Shore NY.

Lotus Notes QuickPlace as a web tool for anatomy education in a multi-site medical school.

As multimedia and the web play an increasing role in anatomical education, the most time-consuming problem is website management and the work distribution required to both produce content and maintain it on the site. There is a dichotomy between teachers who often do not possess the computer knowledge to maintain servers and the IT personnel who do not possess any anatomical knowledge base to produce content. At SGU we have bridged this gap by utilizing pre-existing tools developed for the business community and adapted them for academic purposes. The Department of Anatomical Sciences is using a program called QuickPlace© which was developed by Lotus Notes© in order to allow members of a business team to collaborate on projects from distant sites. Our own school, SGU operates from many sites across continents. QuickPlace is organized into a series of rooms and nested rooms, each with their own security control. When members enter the site, it is tailored to show them only what they have been cleared to view, edit or add depending on their level of authorization. From a teachers perspective there are several key benefits to using QuickPlace for web site development: 1. Faculty can add content directly to QuickPlace sites using only an internet browser. 2. Ease of adding any page format supported by QuickPlace. Professors can import Word, Excel, or PowerPoint files as webpages, including jpeg, gif and animated gif graphics, and more complex HTML, Flash or Java script pages. 3. Ease of getting started and expanding. As the contents expand, more "Rooms" and "Inner Rooms" can be developed to accommodate the growth. 4. Guest faculty can post material directly or review content via an email that is generated automatically by the QuickPlace as for instance in the writing of this abstract! 5. Changes in content eg. new lectures, downloads, handouts, timetables etc. can also be rapidly communicated by QuickPlace email to all users. This presentation will use the St. George's University School of Medicine Department of Anatomical Sciences QuickPlace Site as a showcase for the simplicity of QuickPlace. We will demonstrate its use as an effective tool for any anatomy department interested in delivering an exciting mix of lectures, digital information, clinical integration and linked web sites for the purpose of clinical anatomy education.

GOULD[1], Douglas J., and Thomas J. DOLAN[2]*. [1]Educational Technology Development Group, Department of Anatomy and Neurobiology and [2]Medical Arts and Photography, University of Kentucky, Lexington, KY. The cranial cavity and meninges; a digitized lecture.

The objective of the present project was to create an easily programmable and reproducible interactive lecture tool covering the cranial cavity and meninges. Macromedia's ***Authorware*** was used to combine sequentially colored illustrations, digitized photographs of cadaveric material, Macromedia's ***Flash*** animations and highlighted text into a self-contained and easily distributable digitized lecture. ***Authorware***-created lectures can be made available to students by incorporating them into a website or by burning them on to an optical disk. Further, the majority of computers in use at home and in medical school computer laboratories are capable of running such programs. Perhaps the most appealing aspect of digitized lectures to students, is the ability to reproduce the lecture exactly as it was initially presented. In addition, a timed multiple choice and practice practical examination were included to further increase the interactivity and usefulness of the lecture. Preliminary evaluation of this format for lecture presentation and review has been extremely positive. Multimedia programming technology has now evolved to the point where practical

augmentation of typical anatomy lectures is an achievable goal for use both in and out of the classroom. Digitized video, custom animations, novel illustrations, self-testing features and ease of programmability are all features that can enhance and improve lectures for both students and faculty.

GRECHENIG*, Wolfgang, Hans CLEMENT*,Gerolf PEICHA*, Norbert P.TESCH*, and Friedrich ANDERHUBER*. Institute of Anatomy, Department of Trauma Surgery,Karl-Franzens-University of Graz, Austria. (Sponsored by A.H. Weiglein). 3-dimensional sonographic anatomy of the palmar aspect of the metacarpo-phalangeal joint.

The unexperienced sonographist often encounters problems investigating structures in the sectional view. Even more difficult is the interpretation of the view because of the lack of the experience in coordinatingthe data of the vertical and horizontal section. 3-dimensionalsonography gives a new general view, that is easy to understand. The sonographic anatomy on the palmar aspect of the metacarpo-phalangeal joints of the long fingers was investigated in the hands of 40 healthy volunteers using ultrasonic apparatus -capable of 3-dimensional delineation- with linear sound probes ranging from 7,5 to 13mHz. Standard ultrasonic gel was used as a means of contact, only in a few cases a gelatinous cushion of 1cm thickness was used for better depiction. At the same time, 5 cadavers hands, preserved according to Thiel's method were examined sonographically and the depicted structures were dissected. 2 hands were deepfrozen after sonographical examination and sections were prepared corresponding to the ultrasonic pictures. The ultrasonic depictions were optimized electronically (Adobe Photoshop). In connection with anatomic specimens, a 3-dimensional teaching model for the sonographic anatomy on the flexorside of the metacarpo-phalangeal joint of the long fingers could be stated. This model gives an exemplary overview and enables the unexperienced sonographist himself quickly due to the possibility of comparing the anatomical specimen with the 2-dimensional view in the ultrasonography.

GRINSPAN, Zachary M.*, Christopher CIMINO*, and Todd R. OLSON. Albert Einstein College of Medicine, NY. Cadaver based anatomy reports on the internet (ARI).

ARI uses web based database technology to create an online, cumulative, student authored journal of variations, vestigial remnants, pathology, surgeries, implants, and other cadaveric findings. The 2000 anatomy and embryology course required each dissecting table to identify an aspect of their cadaver and submit a researched report. ARI allows report creation through two password protected tools, one for administrative use by faculty and the other for students. The administrative component allows faculty to upload digital images of the structures, add relevant commentary, view and delete images, review submitted reports, and examine database statistics. The second component allows students to choose and comment on their images, enter and edit their report, and read the reports submitted by other students. During the current year, the project has yielded multiple benefits to the course. It has created efficient and non-disruptive universal access to interesting findings, encouraged students to conduct literature reviews, and fostered a keener interest in observing the unusual. In addition, ARI provided a focused opportunity for regular visits by pathologiststo discuss ***in situ*** findings and to examine how and why gross pathological changes affect normal anatomy. The web site uses mysql version 3.23.22-beta as the backend database, php version 4.0.4 as a server side scripting language, Apache 1.3.12 as the web server, and javascript as a client side scripting language. It resides on a Dell Pentium II computer running Red Hat Linux release 6.1, Kernel 2.2.12-20. For the future, ARI was designed to be exportable to other

institutions, potentially expanding the range and variety of reports contained in its library, and allowing students to collaborate with their colleagues across the country.

GUHA, Somes, and Stephen MILNER*. Department of Family Medicine, LSUHSC-Shreveport, Shreveport, LA. Modified volar advancement flap for composite digital end losses: The anatomical basis.
The volar advancement flap (VAF) is used to reconstruct digits following traumatic loss of the fingertips. It maximally restores the pulp, power, sensation and durability to the tip of the digit without further loss in length and movement. As both the neurovascularbundles (NVB) are included in the classical VAF, ischemic and sensory damage to the distal dorsal skin and nail is a concern in adults with poor microcirculation and renders it suitable only for use in the thumb which has two phalanges and also is supplied dorsally by additional branches from the radial artery. In our modification, the flap is based on only one digital NVB while the other is left behind to secure good blood supply and sensation in the dorsal surface of the digit. The anatomical basis of our modification of classical VAF is described, which allows this technique to be extended for use in all digits. A case series would be presented.

GUTTMANN, Geoffrey D. Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, SK, Canada. IMAGEMAPS: Making digital atlases dynamic and exciting!
With the growing number of electronic atlases, histology, neuroanatomy, embryology, and even gross anatomy has become increasingly accessible to the student via the web or CD-ROM. However, we are still seeing static material that can easily be viewed in the print version of the atlas and does not require the student to have a computer. How can this be changed? Imagemaps! Imagemapping is a unique method where one may rollover or click upon a structure and have that structure highlighted. Also, the structure may not only be highlighted but information may appear in another window or frame. There are various aspects to the types of clicks one may use as well as to the targets that the click may take one to. Imagemaps are commonly seen on commercial (e-tail) sites such as amazon.com, however, producing imagemaps for anatomical materials can become a very complex task. New or updated software from Adobe (Photoshop 6.0) and Macromedia (Fireworks), using Javascript, can make these tasks easier for the anatomist. Examples from the Electronic Atlas of Mouse Development will be used to illustrate imagemaps.

GUTTMANN, Geoffrey D., David M.L. COOPER*, Garnet V. PACKOTA*, and Dennis T. LANIGAN*. Department of Anatomy and Cell Biology, College of Medicine and Department of Biological, Diagnostic and Surgical Sciences, College of Dentistry, University of Saskatchewan, Saskatoon, SK, Canada. Application of 3D CT to craniometrics, volumetrics and densitometrics in cleft palate surgery: 1. Trials with pediatric skulls.
Spiral CT scanners have given radiologists a useful way of providing 3D images for presurgical planning and postsurgical monitoring. This is accomplished at a much lower radiation dose to the patient. The first part of this study was to determine the effectiveness of 3D CT in determining the craniometrics of pediatric skulls and also measuring cleft volume. First, we needed to determine how well our 3D computer reconstructions correlated to the actual skull. Thus, we used 8 pediatric skulls, ranging in age from 1 to 15 years old, to do a craniometric analysis both by digital caliper and computer reconstruction. Next we created artificial clefts in 3 cadaver heads. We determined

the size of the cleft by both computer reconstruction using images from the spiral CT scanner and casting. All reconstructions were done on a personal computer using commercial software. The results showed close correlation between the 3D CT and digital caliper measurements for the craniometrics of 8 pediatric skulls. Also, the computer reconstruction of the artificial clefts in conjunction with radiation measurements suggested that a particular spiral CT protocol (3 mm slice X 1.5 mm overlap) was best. The next step is to reduce radiation dose yet maintain image quality and then determine the success of the bone graft repair within the cleft. This work was supported by the Cleft Palate Foundation Junior Investigator Award.

HANSEN, John T., and Barbara DAVIS*. Department of Neurobiology and Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, NY. Human structure and function: an integrated course in anatomy, histology and physiology.

Rochester's new Double Helix curriculum captures the integrated strands of basic science and clinical medicine as they are woven throughout the four-year curriculum. Every course is interdisciplinary and presented in a hybrid problem-based learning (PBL) format (lectures, PBL sessions, labs). The Human Structure and Function (HSF) course has 320 contact hours over a 14 week period in the first-year curriculum and is divided into four blocks or units. The course integrates human anatomy, cell biology, embryology, histology, and physiology. A typical week in HSF includes about 10 hours of lecture, 5 hours of PBL, 8 hours of laboratory (anatomy, histology, or physiology), and a 2 hour integration session with our Introduction to Clinical Medicine (ICM, history and physical exam) course. Weekly integration between the HSF course and ICM occurs naturally and reinforces student learning across the basic/clinical science continuum. A two hour written and two hour laboratory practical exam are given after each of the four blocks, and the HSF exams are integrated with material from the ICM course. Students also are evaluated in a narrative format based on their PBL and laboratory participation. The advantages of an integrated structure-function course are obvious, and are embraced by undergraduateprograms that offer anatomy and physiology courses. However, integrated human structure and function courses are not seen commonly in medical school curricula, as the current academic culture does not encourage this kind of interdisciplinary course.

HASANOVIC, A. Department of Anatomy, University of Sarajevo, Bosnia and Herzegovina. The demonstration of variations of the human coronary arteries.

The aim of the investigations was to examine the existence and clinical significance of variations of the human coronary arteries. Coronary variations are frequently findings in patients with changes on coronary arteries as well as in patients with normal coronary circulation. However, certain variations are associated with myocardial ishemia or infarction, heart failure and sudden death. Our investigations were carried out on the human hearts at the Department of Anatomy and on patients at the Cardiology Department in Sarajevo. Using the method of dissection and coronary angiography method we established the existence of variations of the coronary arteries (variations of origins, distribution, territory) on the human hearts without macroscopic visible changes as well as on patients with ischemic changes (angina, myocardial infarction congenital cardiovascular malformations etc). In fact, we found the higher incidence of ischemic changes on patients with variations of coronary arteries.

HAST, Malcolm H.[1], and Daniel H. GARRISON*[2]. Department of Otolaryngology-Head and Neck Surgery[1] and Department of Classics[2], Northwestern University, Chicago and Evanston, IL. An annotated translation of Vesalius' De humani corporis fabrica (1543, 1555: from Book II, on the muscles of the head and neck.

The long-term objective of this project is to produce an annotated translation of both the 1543 and 1555 editions of Andreas Vesalius' De humani corporis fabrica, which formed the basis of modern medical science. Book II is entirely devoted to myology and contains the drawings of the famous "muscle men". In this poster, we show the head and neck region, very much enlarged, of a number of the "muscle men"; we also include several completely enhanced drawings of the entire figures. Since many of the identifying symbols (Roman and Greek letters) on the figures have been obscured by ink, heavy shadowing, or defects in the woodblocks, with even some parts of the drawings themselves obscured, we have enhanced the drawings by scanning the figures to digital .gif files and edited them in Adobe Photoshop, reconstructing characters pixel by pixel at 600 dots per inch. This poster also will give a translation of the figure legends, identify muscles using modern Latin anatomical nomenclature. (Sponsored by Grant No. 2RO1LM05675-06 from the National Library of Medicine of the National Institutes of Health and by Grant No. RL-22268-95 from the National Endowment for the Humanities).

JONES, Kenneth H. Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH. Building clay models as an anatomy learning tool for advanced dental students.

Learning anatomy by traditional dissection is effective for most students, but is of necessity a destructive process. Constructive methods such as model building, since it is a three-dimensional process, can also help students learn important anatomical relationships. We offer an advanced head and neck elective to upper level dental students where students build clay models of the floor of the mouth, soft palate, naso/oropharynx, and infratemporal fossa in lieu of dissection. Students are provided with written instructions,and the area is reviewed by the instructor using 35 mm slides and drawings. The instructor then advises the students as they construct the relevant anatomy by attaching the clay "muscles" to plastic skulls; wires and pipe cleaners represent major nerves and blood vessels. Learning was assessed in exams that required students to identify structures in diagrams of coronal sections before and after they built the models. Post-test scores increased significantly (+31%) compared to pre-test scores. Student satisfaction with model building as a learning tool was evaluated using a survey of 9 questions with a Lickert scale. Overall, students strongly agreed/agreed that they had learned the relevant anatomy and liked the model building method (means were 1.3 - 1.8 out of 5).

KAMATH, S.[1], T. MOSCONI*[1], E. REGA*[1], R. ROCKWELL*[2], K. SHIRIKJIAN*[2], U. SCHNEIDER*[2], and J. TAJUNA*[2]. [1]Department of Anatomy, Western University of Health Sciences, Pomona, CA; [2]College of Physical Therapy, Western University of Health Sciences, Pomona, CA. A case of bilateral asymmetrical deficiency in pectoralis major muscles.

We are presenting a rare congenital malformation of the pectoralis major M. observed in a 72 year old female cadaver in our gross anatomy dissection lab. Reports of pectoral muscle deformities are not uncommon in the literature and may be present in 1 in ~5000 to 1 in ~11000 (Rector, 1935, J. Pediat., 7:625), averaging about 1:10000. Outward appearance of the body revealed no obvious anomalies. The subject was obese with adipose deposits concentrated in the abdominal and thigh regions. Well developed breasts may have masked outward abnormalities, and pronounced hirsutism, notably over the chest and abdomen, was observed. No deformities of thoracic or upper

limb skeleton were noted, and Poland Syndrome was not indicated. The patient had been diagnosed with polio in 1954, and the cause of death (in 2000) was chronic obstructive pulmonary disease. Upon dissection, the following anomalies were observed: ***1)*** On the left side, the sternal portion of the sterno-costal head of pectoralis major was absent. The costal portion and the clavicular head were both well developed. The pectoralis minor was present and also well formed on the left, and the deltoid and subclavius Mm were not hypertrophied as is often seen accompanying deficient pectoralis. ***2)*** On the right side, the entire pectoralis major M was absent; no evidence of this muscle could be found on the clavicle, sternum, or ribs. Pectoralis minor was poorly represented by a fibrous, fatty muscle arising from ribs 2-5 and inserting onto the coracoid process. The right deltoid was also infiltrated with connective tissue and fat. Arising from the coracoid process was a coracobrachialis M with a similar fibro-adipose appearance. ***3)*** On both sides, the lateral pectoral nerves were absent, although medial pectoral nerves were present bilaterally. The nervous deficiency attests to a likely congenital malformation rather than a sequel to polio or Poland Syndrome, and probably represents a developmental failure of attachment or growth of the embryonic pectoral muscle mass.

KAVROS, Steven J. Mayo Medical School, Department of Orthopedic Surgery, Mayo Clinic and Mayo Foundation, Rochester, MN. Posterior tibial tendon dysfunction with relationship to the location of the tendon tear.

Dysfunction of the tibialis posterior tendon is a clinical entity causing unilateral acquired flatfoot deformity in adults. There has been much written and published pertaining to Achilles tendon rupture. Complete or partial tibialis posterior tendon ruptures occur infrequently in the young athlete. In the middle aged to elderly population, chronic tenosynovitis progressing to tendinosis and eventual partial tendon rupture is not uncommon. An MRI study is not usually necessary for an experienced foot and ankle specialist to make a clinical diagnosis. A retrospective MRI study of the tibialis posterior tendon, in patients with diagnosed posterior tibial tendon dysfunction, was done to identify the common location of the tendon pathology. Twelve subjects, eight female and four male, were used in the study. The ages ranged from 43 to 74 years. Partial tendon ruptures were commonly found 15 mm to 40 mm proximal to its insertion upon the tuberosity of the navicular. The most common location of the intrasubstancetear of the tibialis posterior is posterior and inferior to the medial malleolus. This clinical entity is a major cause leading to adult acquired unilateral flatfoot disorder.

KENDRICK*, Michael L.[1], Michael G. SARR[1]*, Arlen R. SEVERSON[3], and Wojciech PAWLINA[2], [1]Department of Surgery and [2]Department of Anatomy, Mayo Medical School, Rochester, MN. and [3]Department of Anatomy and Cell Biology ,University of Minnesota Duluth, School of Medicine, Duluth, MN. Anatomic considerations of the cervical tube pharyngostomy.

Cervical tube pharyngostomy (CTP) is a clinically useful, albeit rarely used procedure for patients requiring prolonged gastrointestinal decompression in whom other procedures such as percutaneous endoscopic gastrostomy or open gastrostomy tube placement are contraindicated. Our aim was to define the relevant anatomic landmarks, pertinent surrounding structures, and anatomically-based potential complications associated with this procedure. Using unembalmed, human cadaveric specimens, a CTP procedure was performed through the piriform recess, via the approach used clinically. With the newly placed tube in situ, a complete anatomic dissection was performed to identify all relevant anatomic structures and their relationship to the pharyngostomy tube. A skin incision was made parallel to the sternocleidomastoid muscle at the site of the

pharyngostomy tube. The course of the tube was dissected, and was identified to have penetrated the subcutaneous tissue, thyrohyoid muscle, thyrohyoid membrane, and lateral pharyngeal wall at the piriform recess. The internal and external laryngeal nerves, internal laryngeal artery, and superior thyroid artery were identified in close proximity to the tube, but were uninjured. We conclude that with knowledge of the surrounding anatomic structures and adherence to proper technique, the piriform recess provides a safe avenue for a percutaneous CTP.

KRAL*, Catharine A., A. Nicholas KURUP*, Joshua P. KOLLARS*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Department of Anatomy, Mayo Medical School, Rochester, MN.
Easing the transition: Decreasing the physical and emotional reactions to anatomy laboratory with senior medical students.
The first day of anatomy laboratory dissection can be a difficult and emotional time for many students. In an attempt to ease the transition and help students cope with their physical and emotional reactions, the faculty of the Anatomy Department at Mayo Medical School invited third-year students (MS3s) to assist the first-year students (MS1s) on the first day of anatomy lab dissection. The MS3s offered support and answered questions. To evaluate the MS1s' reactions to the first day, a questionnaire was distributed to MS1s and participating MS3s. A similar questionnaire was given to the second-year students (MS2s) as a control group. MS1s reported handling both the anxiety and the emotional/psychological impact better than they had expected when compared to MS2s. They also reported less anxiety (29% vs. 48%), disgust (12% vs. 20%), lightheadedness (6% vs. 24%), and headache (12% vs. 36%) than the MS2s. The results suggest that having a senior medical student assisting each anatomy dissection group can be an effective way to decrease the emotional and physical reactions that many students face on the first day of anatomy laboratory.

KREYER, Ruth*, Sepp E. POISEL, Peter OBRIST*, and Wolfgang DORINGER*. Institute of Anatomy and Histology and Department of Pathology, University of Innsbruck, and Department of Radiology, District Hospital, Feldkirch, Austria. Kinking or aneurysms in the cerebral arterial circle.
In a chance observation made during an anatomical dissection course one preparation showed multiple kinking areas in the posterior communicating artery (pca) and in the anterior cerebral artery, bilaterally. Further kinking could be observed in the left pca, the right middle cerebral artery and the left ophthalmic artery, the left vertebral artery and the basilar artery. Out of 158 ***in situ*** preparations in another cadaver we found kinking of the pca, bilaterally, and in a third preparation a kinking of the left pca could be perceived. 74 elongations, out of which 29 kinkings, were observed in 285 investigated isolated brains. In 480 fresh post mortems only one case of pca kinking and another case of loop-shaped pca elongation could be observed. The histological screening of the kinking areas showed a splittering of the internal elastic membrane and a myxoid cystic loosening up of the collagen in the tunica media. In immunohistochemistry alterations in type 1, 3 and 4 collagen could be observed. Panangiographicimaging studies on 69 patients showed elongations of the pca in 11 cases (7 f and 4 m), but no kinking could be perceived, and in 4 patients an aneurysm was definitely conceived. Our findings show in comparison to an "normal" vessel, that in kinking areas there is a clear increase of type 1 collagen in the intima, a reduction of type 3 collagen in the intima and in tunica media, and a clear increase in type 4 collagen in the adventitia. These changes could, in our opinion be the cause of the particular softness of the kinking area with its myxoid cystic loosening and of its free from arteriosclerosis. It appears logical that adhesions could cause kinking by tension or by pressure. Furthermore kinks can occur, leading to perfusion disturbances in the area supplied. We also can conceive kinking complications in form of ruptured

vessels. Irritations of nerves are also conceivable, particularly of the cranial nerves V, VII-X, XII and medulla oblongata. Finally we wonder whether kinking or coiling do not merely represent different stages in elongation or whether possibly they are an early stage of an aneurysm which showed histologically variations similar as the one we found in kinking areas.

KYALYAN, Gohar P. Department of Human Anatomy, Yerevan State Medical University, Armenia.
The ultrastructure of human pineal body in the last stages of prenatal ontogenesis.
Pineal body (PB) from 5 seven month age fetal cadavers were examined as part of the complex research project. Electronic microscopic investigation confirmed the presence in PB of four type of cells: "light" pinealocytes (LP), "dark" pinealocytes (DP), glial cells (GC), low differentiated propinealocytes (PP). LP formed nearly 40% of the PB parenchyma. There was no strong composition of cells in PB parenchyma. In most cases the cells were situated far from each other. There were glial processes and microvessels between them. Only sometimes the five-ten cells arranged in follicular rosettes were revealed. Different types of cells surrounded the central follicular cavity, which is following to the pericapillary space. LP appear as plump bipolar spindle-shaped cells with two processes. LP are characterized by a large euchromatic nucleus with one or two excentric nucleolus and electronically light cytoplasm. Lp have a bad developed Golgi and rough endoplasmic reticulum (RER). Around the nucleus and in the processes few middle size mitochondria are revealed. Cytoplasm of LP is very rich in different types of vesicles: electronically light, electronicallydark and light vesicles with dark center. In most cases different types of vesicles formed the multivesicular complex, which is covered by thin common membrane. DP appear as large oval cells. Processes of the DP were revealed as very rare. The large nucleus of the DP is situated in the middle of the cell and is surrounded by a thin stripe of electronically dark cytoplasm. DP haven't well-developed organelles, but have numerous free ribosomes. PP are revealed as small cells with electronically dark cytoplasm and nucleus. In most cases PP formed compact groups in PB parenchyma. Processes of the PP are not revealed. Cytoplasmicand nuclear material in PP are in condensate condition. PP and GC formed 15% of PB parenchyma. Thus, our investigation reveals several interesting peculiarities of PB ultrastructure , which will be presented in detail.

LOUKAS, Marios, Chris DIMOPOULOS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, Poland. Sinutubular ridge and the beginning of atherosclerosis in human aorta.
Atherosclerosis has been observed in sinutubular ridge in early life, however the reasons for such focal lesions have not been established. The purpose of this study therefore was to examine macroscopically and histologically the sinutubular junction, the place of the sinutubular ridge development, in order to examine the peculiarities of this location. Sinutubular junction is an imaginary line connecting the sinus portion of the aorta with the tubular. This line is the place that the sinutubular ridge can be most often found. We examined 180 adult hearts and 30 neonatal hearts derived from the autopsies performed in our department without any cardiac malformations. We were able to identify the sinutubular ridge in all hearts. However a significant great association was present between the thickness of the ridge and the age. In the younger hearts sinutubular ridge we were able to identify it only histologically while in 10 years old heart it was clearly visible macroscopically. Interestinglywe were able to identify that the sinutubular ridge it was the first place of atherosclerotic plaque formation together with the fatty streaks that were also present in unrelated manner. In older subjects sinutubular ridge were presented with local calcifications and hemorrhages. In neonatal hearts sinutubular ridge appeared to have intimal and medial thickening

with fragmented or absent internal elastic lamina. This suggests that the thickening represents a physiologic adaptation to changes in flow and wall tension, however such changes represent locations in which atherosclerotic lesions are prone to develop.

LOUKAS, Marios, Chris DIMOPOULOS, Ewa WALCZAK*, and Teresa WAGNER*. Department of Pathology, Institute of Rheumatology, Warsaw, Poland. The clinical anatomy of the membranous septum.

The aim of this study was to describe, morphology and the topography of the membranous septum in a clinically useful way. The study was carried on 200 hearts, 120 obtained from the routine autopsies performed in our department without any cardiac abnormalities and also 80 congenital malformed hearts with cardiac abnormalities involving the interventricular septum and the membranous septum. Digital image analysis software program Lucia applied for the measurements of the structures. Membranous septum area has been identified in all hearts examined. The shapes of the membranous septum varied considerably, and could be described as semilunar, oval, triangular, circular, irregular etc. The mean area of the Membranous septum varied from 5.84mm to 22mm. However, the superior border and the border next to the left bundle branch (LBB) is of great clinical importance during correction of defects associated with the membranous septum. Interestingly the superior border of the membranous septum was in direct continuity with the aortic cusps in 40% of the heart examined. The border next to LBB is located only 2 mm away and in 10% of the hearts connective tissue fibers of LBB was in contact with membranous septum. Morphometric assessment of the relationships between the Membranous septum with the aortic valve, LBB, surface area and shape could be very helpful in surgical intervention in neonates.

MA, Terence P. Department of Anatomy, University of Mississippi Medical Center, Jackson, MS. Use of interactive web-based practice test system in dental gross anatomy.

We have reported on the development of a practice test package on the dental gross anatomy website at our institution. This type of interactive component is thought to encourage student use of web-based materials. To date only material from below the neck has been included on the website. In the first year of the web site, 1998-1999, there was no interactive component. The site received 12,621 total hits during the course. In 1999-2000, there were 12,429 executions of the practice test question package out of a total of 49,672 hits (faculty use and logged errors removed from the count) at the site. In 2000-2001, there were 23,678 executions of the practice test question package out of 93,390 hits. In both years, access to the website was predominately from off-campus computers (>77% of all hits) and students used the practice test system mostly from home (67.4% in 1999-2000; 63.0% in 2000-2001). Every student used the website and practice test package to some degree in 2000-2001. It was not possible to determine from one year's data whether the practice test question package helped students perform better on exams but there was clear increase in use by students of the available resources.

MacPHERSON[1], B.R., Thomas DOLAN[2], and Kathryn WONG-RUTLEDGE[2]. [1]Educational Technology Development Group, Department of Anatomy and Neurobiology and [2]Medical Arts and Photography, University of Kentucky, Lexington, KY. A tutorial for explaining the anatomical basis of referred pain.

Referred pain is a difficult concept for health professional students to understand. We assembled

a compact disc dealing with the organizational anatomy of the autonomic nervous system to outline the anatomical arrangement of somatic and visceral efferents. The role of visceral afferent fibers in referred pain is the final module for this tutorial. Basic storyboards were constructed from lecture notes. Base artwork for still and animated images was sketched by hand and imported into Adobe Photoshopä where a professional appearance was applied. Images to be used in the animations were imported into Macromedia Flashä where moving elements were created and animated over the base artwork. Still images and animations were composited in Macromedia Directorä where text was added, as well as interactivity. Three basic concepts for understanding referred pain were outlined: proximal injury-distal , embryological and visceral afferent pathways. A common example for each type of referred pain was included. The final product will contain a set of databased learning objectives for each module as well as a quiz module for self assessment. Beta testing of the first two ANS modules in the CD indicated students found the program to be a significant enhancement to the lecture presentations,without which they would not have gained the same level of understanding on the topic. They liked the ability to progress through the material at their own pace and review areas that they found unclear. They requested integration of a self assessment module, currently under development.
Supported by an Instructional Technology Grant from the UK Medical Center and the James and Barbara Holsinger Endowed Professorship.

MAHAKKANUKRAUH, Pasuk B., and Vichit SOMSARP*. Department of Anatomy, Faculty of Medicine, Chaingmai University, Chiangmai, Thailand. Dual innervation of the brachialis muscle. A study of the brachialis muscle was made to ascertain its dual innervation on 76 Thai cadavera of which 45 were male and 31 female with an age range between 15 - 92 years. The results revealed100% innervation from the musculocutaneous nerve and 81.6 % from the radial nerve. Of these 81.6% with dual nerve supply two patterns of branching of the radial nerve existed; one with descending course (58%) and the other with ascending or recurrent course (42%). The radial nerve appeared to target the inferolateral part of the brachialis more often than the middle part, at a ratio of 103 to 21 or about five to one. The cause of the dual innervation may be due to fusion of the two parts of the embryonal muscular primordia : the ventral (flexor) premuscular mass and the dorsal (extensor) premuscular mass, or a misunderstanding according to the permissive pathway of a specific muscle anlagen by a specific axon. Clinical relevance : with an 81.6% incidence of dual innervation an anterior approach to the humerus, through a brachialis muscle bisection would render denervation to half of the muscle in 18.4% while through a splitting between the bellies of the brachialis and brachioradialis would cause 81.6% denervation of half of the brachialis. However, avoidance of the latter damage could be accomplishedwith realization of the fact and with caution. (Sponsored by Faculty of Medicine, Chiangmai University)

MALAKHOVA*, Olga E., Dennis E. BROOKS*, Richard L. CANNON*, Maria E. KALLBERG*, Elen E. KUEKUERICHKINA*, Andras M. KOMAROMY*, Frank, J. OLLIVIER*, William W. DAWSON*, Mark B. SHERWOOD*, and George N.LAMBROU* Departments of Anatomy and Cell Biology, Neuroscience, Ophthalmology, Small Animal Clinical Science. University of Florida, Gainesville, FL. and CIBA Vision, Basal Switzerland. (Sponsored by Kyle E. Rarey). Neuroanatomical changes in the visual cortex following chronic endothelin-1 administration.
A redistribution of neurochemicals has been identified in the visual cortex of monkeys with laser-induced glaucoma as a model for understanding aspects of human vision. Recent physiological data has shown that inactivation of the V2 area reduced the responses of feedback connections

to V1. We examined the effect to the visual cortex of endothelin-1 (ET) delivered unilaterally for 1.5 years by osmotic minipump to the perineural region of the optic nerve. Some monkeys received Sham solution. Immunohistochemistrywas used to identify the distribution and density of calbindin (CB) positive neurons in V1 and V2 visual cortex affected by ET administration.CB positive neurons were found in the V1 and dorsal V2 of both ET and sham groups, with the greatest density in layers II-III. Counts of CB positive neurons in V1 and V2 resulted in a significant decrease of CB staining on the contralateral side of the ET treated eye. The CB positive neurons in V1 and V2 showed a homogeneity in organization, with similar „bare-like‰ areas. We speculate that the „bare-like‰ areas in V1 and V2 may represent regions of feedback connections from V1. The reduction of CB activity in V1/ V2 may have been affected by ET administration. (Sponsored by CIBA Vision, Basal, Switzerland).

MALEY*, Bruce E. (Sponsored by D.J. Gould). Educational Technology Development Group, Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY. Creating instructional software packages that are course specific.

Typically, students in anatomy courses are required to learn cross sectional anatomy, radiologic anatomy and osteology. While they are important for understandinganatomy, little time is available for their formal instruction. Increasingly, instructors utilize expensive commercially available packages that they either make available at some central site or require the student to purchase. However, most commercial package's content often does not correspond to course content making it difficult for the student to know specifically what should be learned. We have developed software packages, using Macromedia' ***Authorware***™, for cross sectional anatomy, radiology and osteology to fit the needs of individual courses, but are flexible to allow easy modification for other courses. Images were recorded with a digital camera, modified in an imaging program and imported into ***Authorware***™. Individual structures were outlined, corresponding labels and a navigational system were applied using the program's drag and drop tools. A self testing component was added to the program to allow students immediate feedback to their level of knowledge. The finished software packages could be modified quickly to fit the needs of any course. At the end of the course students were asked to evaluate the programs and the feedback has been positive.

MAZZURCO*, Jason D., and Robert M. DEPHILIP. Department of Anatomy & Medical Education, The Ohio State University, Columbus, OH. Interactive tutorial designed to help develop a three-dimensional perception of mitral valve anatomy and to aid in the evaluation of transesophageal echocardiography.

Transesophageal echocardiography (TEE) has become the "gold standard" for pre-operative and peri-operative evaluation of mitral valve anatomy and requires a clear, three-dimensional understanding of the mitral valve. The perception of mitral valve anatomy in three dimensions is often difficult to learn by relying on static, two-dimensionalimages. We have designed a technology-enhanced tutorial to aid clinicians in developing a three-dimensional perception of the mitral valve and of images obtained using TEE. The tutorial is internet-based and dynamic, and consists of descriptions of mitral valve anatomy, Quick Time Virtual Reality heart images, cadaver heart images, and TEE video clips. The tutorial emphasizes six standard views of mitral valve anatomy that correspond to a systematic examination used by anesthesiologiststo evaluate the mitral valve. This tutorial should enhance one's ability to develop a three-dimensional perception of the heart in the chest and of the mitral valve in the heart, and should shorten the time required to learn how

to interpret TEE of the mitral valve.

MEJINO, José L.V.*, and Cornelius ROSSE. Structural Informatics Group, Department of Biological Structure, University of Washington, Seattle, WA. Anatomical relationships in the Foundational Model of anatomy.

The variety of relationships that describe the structural arrangement of martial objects and substances within the human body are conceptually summarized by the Anatomical Structural Abstraction (ASA) of the Foundational Model (FM). The ASA consists of interacting networks: Pn, the part-of, Bn, the boundary, and SAn, the spatial association network. ***ASA = (Pn, Bn, SAn)*** captures spatial knowledge about any anatomical structure. In this abstraction, each network corresponds to a class of relationships. There are different kinds of parts (e.g., the right ventricle is a conceptually different part of the heart than the myocardium), which are interrelated in ways that constitute a morphological whole. Since part-of relationships can only be sanctioned for entities of the same spatial dimension, the sternocostal surface or inferior margin cannot be represented as parts of the heart. However, zero to 2D entities can logically be related to the 3D entity, heart, through the Bn: e.g., the sternocostal surface of the heart is bounded by margins, which in turn are bounded by points, whereas the cardiac surfaces form the boundary of the heart itself. SAn encompasses different classes of relationships: anatomical location (which can be expressed in terms of containment, adjacency and coordinates), orientation, and connectivity (which includes continuity and attachment). These fundamental relationships provide the logical basis for interrelating anatomical entities of different spatial dimensions in a comprehensive and consistent manner within the FM. The relationships are implemented in the frame-based knowledge modeling system called Protégé. Each concept (e.g., heart, sternocostal surface) in the Anatomy Ontology (AO) component of the FM is represented in Protégé as a frame. A relationship, such as 'has-part', 'branch-of', 'attaches-to' are regarded as attributes of appropriate classes of concepts. Although all anatomical structures have parts, only certain classes can have the attribute 'branch-of' or 'attaches-to'. Protégé creates templates for high level classes of the AO in which the different kinds of attributes sanctioned for that class appear as "slots". Template slots are inherited by the frames of the descendants of an AO class. The slots have to be filled in by values, (e.g. value for 'has branch' slot of 'ascending aorta' frame is 'right coronary artery, left coronary artery'). This mechanism ensures the comprehensiverepresentation of anatomical relationships.(Supported by Contact No. LM03528 and Grant No. LM06822 from the National Library of Medicine.)

MOUFFLET*, Ariel S., Jennifer MOORE*, Christopher CIMINO*, and Todd R. OLSON. Albert Einstein College of Medicine, NY. A student online dissector and course guide.

Anatomy is an exciting and yet daunting first year challenge. It is to be expected that new students will seek advice and direction from previous students. What is often underestimated is the impact these students have on directing the learning experience. The guide was produced by two current 2nd year students [AM,JM]. Their goal was to create an interactive resource through which students could share their insights into learning anatomy with future students. Working with the Directors of the Course and Computer Based Education, the project was divided in two parts: (1) writing of core content, selection of images, and editing of contributions from other students [AM] and (2) the creation of a web interface and navigation aids [JM]. The guide is unique in four ways. First, it presents a student's perspective of the course. It includes detailed dissection instructions along with dissection tips and original study aids. Second, it is accessed directly from the course's website and serves as a parallel learning resource linked to faculty generated web content. Third,

it contains additional visual aids and commentary to help the student before, during, and after each lab. A series of Gold Standard Multimedia* images illustrate point-by-point dissection steps, and key structures are emphasized using line drawings. Finally, each online exercise concludes with a summary organized to facilitate review. Our future vision is to annually enlist students to further refine and enhance its usefulness by incorporating their experiences and insights. This student generated learning resource, done in cooperation with the course's Director and integrated into the course's website, provides new anatomy students with a unique and reliable means to gain maximum benefit from the experiences of many students who successfully completed the course.

NIEDER, Gary L., and Frank NAGY. Department of Anatomy, Wright State University School of Medicine, Dayton, OH. Access analysis of a gross anatomy course web site.

The use of online materials in support of medical school courses has become common and ranges from posting basic syllabus materials such as schedules to lecture presentations with graphics, audio and video. Since we produced an extensive web site for our Human Structure course, including many hours of graphics+audio stream presentation, we were interested in how these materials were used by our students. Also, since our students are required to have computers, and have access to a computer lab on campus, we were interested in where and when students used online resources. We collected web server log files during the entire course and performed a comprehensive analysis of this data to quantify the use of different online materials, the times and dates of use and whether the students were accessing from the computer lab, elsewhere on campus or from off campus. The total number of 'hits' on the web site was 556,902, including 161,450 html pages and 129,133 audio only QuickTime movie files. The total volume of data was 21.69 GB, including 15.33 GB of audio data. Overall, 72.2% of page accesses came from on-campus, 67.6% specifically from machines in the computer lab. Of the 27.8% of accesses off campus, the greatest proportion was for textual information pages rather than the more massive audio-lectures. The data, along with student feedback, suggests that low bandwidth limits the students use of online lectures off campus. Lecture materials were of two types. Certain presentations were assigned for viewing before class and were never presented 'live'. Of these, 80.5% of hits actually occurred before or on the day of class. Tracking of individual visits showed that the average visitor viewed 12.7 pages at a sitting (the average lecture was 27.5 pages) and stayed at the site 33 minutes. Other online presentations were replications of lectures which were given 'live'. Of these, 65% of hits occurred on or before the day of class. These materials were viewed for an average of 27 minutes and 16.0 pages at a sitting (lectures averaged 39.7 pages). Looking at both server statistics and student self-reporting, it appears that some students view on line presentations more than once, while others are not using them at all. Viewing lectures more than once, at different times relative to tests and other course activities, and in a piecemeal fashion suggest that on demand access provides useful options for assimilating the vast amounts of information in the course.

NORTON, Neil S., Margaret A. JERGENSON, Laura C. BARRITT*, and Thomas H. QUINN. Departments of Oral Biology and Biomedical Sciences, Schools of Dentistry and Medicine, Creighton University,Omaha, NE. Unilateral variation of the branching pattern of the external carotid artery.

The external carotid artery is described as being the major vascular supply to head and neck structures external to the cranial cavity. The vessel begins at the bifurcation of the common carotid artery in the carotid triangle and passes superiorly towards the mandible in a plane more

superficial than the internal carotid artery. It is during passage through the carotid triangle that the external carotid is "normally" described as giving rise to 5 of its arterial branches: the ascending pharyngeal, superior thyroid, lingual, facial, and occipital. The external carotid then passes deep to the posterior belly of the digastric and stylohyoid to eventually enter the parotid bed where it is surrounded by the parotid gland. It is during this passage that the posterior auricular branch is normally given off. The external carotid artery terminates by dividing into the superficial temporal and maxillary branches. We report an anomalous unilateral variation in the branching pattern of the right external carotid artery in a 95-year old woman. In this particular case, the superior thyroid, and lingual branches were observed as most often described. However, no other branches were viewed in this area. Upon careful dissection of the parotid bed for demonstration of the divisions and branches of the facial nerve, the remaining branches of the external carotid were uncovered. The external carotid had coiled into a loop within the parotid gland. The facial artery was observed leaving the parotid gland to supply the face. The occipital artery and posterior auricular were given off in close proximity to one another. The external carotid then terminated by bifurcating into superficial temporal and maxillary branches. This unique looping and branching pattern would cause further difficulty in parotidectomy.

PEDERSEN*, Ruth L., Karen M. MILLS*, Dean R. FISHER, Terry REGNIER*, Duane K. RORIE*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Department of Anatomy, Mayo Clinic, Rochester, MN. The procedural skills laboratory: building a bridge between anatomy dissection and procedures used in clinical and surgical practice.

Recent trends in anatomy education provide greater emphases on conceptual understanding of the discipline leading to better knowledge of procedural skills and problem solving ability. To ensure balance between conceptual learning and procedural skills, Mayo Clinic developed a Procedural Skills Laboratory (PSL) designed to facilitate training in clinical/surgical skills. The PSL is intended for staff, residents, and medical students as they learn and perfect clinical procedures on cadaveric specimens. The PSL space was designed so that several small groups or a single group (up to 60)could use it. Areas for micro-vascular surgical training, temporal bone laboratory, and a dedicated distance learning classroom with audiovisual links to the laboratory are included. The gross anatomy teaching laboratory, cadaver procurement and preparation facilities, and a preparation room to clean and store surgical instruments are contiguous. Procedures demonstrated by the staff, and then practiced by the learners, include joint arthroscopy, spinal taps, suture and staple placement, flap raising, central line placement, airway management, emergency medicine and trauma procedures. Demand for its use continues to grow. The goal is to achieve a balanced program that will promote the development of both procedural skills and the conceptual understanding of gross anatomy.

PEICHA* Gerolf, Norbert P.TESCH*, Gunther WINDISCH*, Wolfgang GRECHENIG*, and Hans CLEMENT*. Department of Trauma Surgery, Institute of Anatomy, Karl-Franzens-University of Graz, Austria. (Sponsored by A.H. Weiglein). Experimental investigation of intracompartmental pressure in the compartments of the foot.

The main reasons for compartment syndromes of the foot are fractures and fracture dislocations of the Chopart and Lisfranc joint as well as comminuted calcaneal fractures and crush injuries with severe soft tissue damage.In contrast to compartment syndromes of the lower leg, the critical valie for intracompartmental pressure of the foot is already 20-25 mm Hg. In those cases, emergency fasciotomy has to be performed. Aim of the study was to investigate if enhancement of pressure within one plantar compartmentleads to increased pressure within the neighboured compartments

as well. The study was carried out in 20 cadaver feet preserved according to Thiel's method using the 295-1 pressure monitor (STRYKER). The single compartments were filled with fluid up to a basic pressure of 4 mm Hg. Subsequently, the intracompartmental pressure of one compartment was enhanced to values above the critical border of 20-25 mm Hg and the pressure of the other compartments were measured at the same time using an identical pressure monitor.The results were documented.We could observe that enhancement of pressure within one compartment influences all the other compartments, as well. The intracompartmental pressure increases most of all each in the very neighboured compartment. The amount of fluid necessary for critical enhancement of pressure is the smallest within the lateral and the central deep compartment. We conclude from the results that in case increased pressure within one singular compartment of the foot all compartments have to be decompressed performing emergency fasciotomy and traumatologists have to pay special attention to injuries of the lateral column of the foot.

PETTERBORG, Larry J., Randall BRYANT*, and Sean MILLER*. School of Physical Therapy, Texas Woman's University, Dallas, TX. Relationship of spatial reasoning test scores and performance in gross anatomy.

In addition to learning and properly using anatomical terminology, students in anatomy courses where cadaver dissection is available may experience improvements in cognitive abilities such as spatial reasoning. Utilizing the 20-item version of the Purdue Visualization of Rotations Test (ROT) we have been able to demonstrate significant increases in spatial ability in students that participate in dissection courses. We are now investigating the idea that a student's performance in an anatomy course might be related to their spatial reasoning ability. In our initial study of this question, first year physical therapy students (n = 80) took the ROT prior to their human gross anatomy course. Each student took four practical (identification of cadaver structures) and written exams during the course. Pearson product-moment correlation coefficients were derived from these data. The results of this analysis revealed no significant correlations between ROT scores and practical exam scores. However, there was a significant relationship for spatial ability and written exam scores for women students. These results suggest that women students might benefit the most from a gross anatomy course that emphasizes the 3-D relationships of bodily structures. In an era of decreasing reliance on established teaching methods in human gross anatomy education, it is necessary to examine the relationship between exposure to cadaver dissection and changes in cognitive and other abilities in students.

PIETRASIK*, Arkadiusz, Michal ZAWADZKI*, Michal MARCHEL*, Kamil PIETRASIK, and Bogdan CISZEK*. Department of Anatomy, Center of Biostructure Research, The Medical University of Warsaw, Poland. Endoscopic visualization of Vieussen’s valve.

Vieussen’s valve is located in the outlet of the coronary sinus, marking the end of the great coronary vein. Literature shows that it is present in 65 – 80% of humans. Knowledge of its anatomy plays an important role in catheterization of coronary sinus. Anatomy of the valve has been examined with the help of traditional methods so far. In our study we attempted to visualize Vieussen’s valve without destroying the coronary sinus. Study was performed on 50 unfixed specimens of human hearts. A standard arthroscope (4 mm in diameter / optics 0^{o}) was inserted into the coronary sinus from right atrium. The valve was filled by the reverse flow of fluid. Appropriate images were video recorded and studied in computer digital image analyzing system. Obtained pictures allowed for a real, not disfigured assessment of the morphology of the valve as well as a detailed examination of all venal ostia of the coronary sinus and their valves. Five morphological types of Vieussen’s

valve were distinguished. Endoscopy of the coronary sinus is a good and reliable method of Viuessen's valve visualization.

PORTA, David J.[1-3], and Tyler A. KRESS*[3]. [1] Department of Biology, Bellarmine University, Louisville, KY. [2] Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. [3] Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN. Is distal friction (or entrapment) necessary to cause bending fractures of the leg at relatively low speeds?

Occasionally health care providers are asked to render opinions regarding the mechanism of injury that results in fractures. A common belief is that relatively low speed impacts rarely result in fractures without some form of entrapment of the limb. Four matched pairs of geriatric embalmed cadaver lower limbs were utilized for a controlled study. Each was dynamically impacted at the anterior mid-shaft by a 4.75 cm diameter instrumented steel pipe connected to the front of a 50 kg impact cart which was propelled at an average velocity of 7.9 m/s (17.7 mph). The right specimens were suspended by a rod passed through the femur. The only distal constraint was the ***inertia*** of the shoe and foot. The left specimens were subjected to an axial load of 20 kgs. and the shoe was placed on a concrete pad. Thus the distal constraint was a ***frictional*** set-up. Results: All limbs fractured. There were no statistically significant differences between the matched pairs in terms of impact cart velocity, peak impact force, or average tibial cortex thickness. Conclusion: Inertial constraints at the distal portion of a limb can be sufficient to allow for 3-point loading that results in fractures even at relatively low speeds.

PORTER*, Aaron, Louise A. Mawn*, and Arthur F. Dalley II. Department of Ophthalmology and Visual Science and Department of Cell Biology, Vanderbilt Medical Center, TN. Digital dissection course of orbital anatomy.

A specific course on orbital anatomy was developed to enhance resident education in ophthalmology. This course was digitally formatted to include cadaver dissection photos placed in an interactive Microsoft ***PowerPoint*** format. Artist renderings of the cadaver dissection details are also included to outline the anatomy as demonstrated by cadaver dissection. This course could be used to enhance education of clinical and surgical anatomy of the orbit.

RAOOF, Ameed. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, MI. Introducing integrated clinical teaching techniques to gross anatomy curriculum.

Integrated clinical teaching techniques were introduced to enhance students' comprehension of the relevance of anatomical knowledge. The techniques included review sessions of the applied aspects of each region of the human body. This is done at the end of the lecture and dissection part of that region. Other techniques included: the distribution and analysis of related clinical vignettes during the review sesions, and the introduction of clinical-case type exam questions to the traditional identify-the-structure type practical exam. Clinical questions made up to 10% of the exam. Students' opinion of the usefulness of these technques were assessed at the end of the semester through a questionnaire. part of the quesionnnaire was left for general comments. Results showed that 82% of the students who responded to the questionnaire agreed that the review sessions helped them in understanding anatomical facts and their clinical relevance. Also, 87% thought that the vignettes were clear and comprehensive while 83% agreed that the clinical

practical exam questions were useful in correlating anatomical facts to clinical application.

RAOOF, Ameed, Thomas R. GEST, William E. BURKEL, and Tamara STEIN*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, MI. Peer presentation/evaluation technique during gross anatomy labs: New measures for enhancing its effectiveness.

It has been almost a decade since the student dissection/presentation method was introduced to the gross anatomy course. Student's opinions regarding peer presentations and evaluation technique were assessed following the introductionof new measures that were believed to ensure better applicability and effectiveness. The gross anatomy course is taught to 170 medical students annually at the University of Michigan Medical School, with six students at each dissection table divided into two teams. At the beginning of the laboratory session, a student from team 1 demonstrates the last session's dissection and another student from team 2 explains its clinical correlation. This academic year (2000), new measures were introduced, such as observation of students by faculty during presentations, allocating grades and computerizing forms for follow up. Students considered the presentation/evaluation techniques useful in helping them understand anatomical concepts (65%) and clinical concepts (30%) compared to last year (47% and 25% respectively). The majority of students (69% and 62%) considered the technique useful in helping them prepare for sessions and in improving their presentation skills. Last year's rates were 53% and 52% respectively. The latest improvement in the presentation evaluation, though simple, is validated by the student's ratings, and reflects to a certain extent the effectiveness of the new measures and the need to work on them further to ensure maximum effectiveness.

REEVES, Rustin E., David J. BARKER*, John A. ASCHENBRENNER*, Harold J. SHEEDLO*, and Rouel S. ROQUE*. Department of Pathology and Anatomy, University of North Texas Health Science Center, Fort Worth, TX. Digital images for computerized anatomy laboratory and make-up exams in an integrated system-based curriculum.

Over the past year, we have begun to use computerized testing for gross anatomy, neuroanatomy and histology practical and make-up exams in our system-based curriculum. The need for computerized practical exams arose because of (1) occasional student absences from the scheduled gross lab practical exams and (2) a need for remedial exams for students who failed a particular system. In order to construct a computerized exam similar in content to the original practical exam, digital images of the exact test material were taken minutes prior to the normally scheduled practical exam. The digital images for these exams were taken with a Nikon CoolPix 990 camera, then processed using Adobe image editing software. Computerized exams were generated using Microsoft PowerPoint presentations or LXR-Test computerized test software. With minimal modification to these images, a comparable digitized exam was administered to students who missed the scheduled laboratory practical. Images taken at close distances lacked specific landmarks necessary for proper student orientation of some structures. In many cases, this problem was alleviated with a few simple prompts on the actual image or test question, to show correct anatomical position. For our anatomy faculty, the use of computerized exams has alleviated the need to reconstruct lab make-up exams using cadavers. Future projects may utilize QuickTime VR Authoring software to construct a simulated 3-D student view that can be moved with the mouse. Computerized exams have recently been given in the Renal System for the first year curriculum. Overall student response was very positive to this new type of testing and additional computerized exams are being planned for next year.

RIORDAN*, Colin L., Lillian B. NANNEY, Joseph UPTON* and Sean F. WOLFORT*. Department of Plastic and Reconstructive Surgery, Vanderbilt University School of Medicine, TN, and Department of Plastic and Reconstructive Surgery, Beth Israel Deaconess Medical Center, Boston, MA. The vascularized sural nerve - a reliable nerve graft.

The sural nerve is nourished by the singular superficial sural artery proximally but distally receives multiple contributions from musculocutaneous and fasciocutaneous perforators of the posterior tibial and peroneal (fibular) arteries. Although reports of the vascularized sural nerve show the prevalence of the superficial sural artery as between 30 and 70%, our clinical experience differed. We report a large anatomical study (n = 56), together with three clinical cases, to assess the incidence and potential suitability of this vascularized nerve graft. Dissections were performed on 6 fresh cadavers injected with Microfil dye and 22 preserved cadavers. The superficial sural artery was present in 91% of the dissections. The mean diameter of this extrinsic artery was 1.5mm. The mean percentage of neural tissue within the sural nerve is 62% proximally, compared to 34% distally where the posterior tibial and peroneal arteries supply it. This anatomical difference provides a solid rationale for the preferential use of the proximal portion of the nerve as opposed to its distal segment. When a vascularized nerve graft is indicated, the proximally based sural nerve appears to offer clear advantages compared to other vascularized nerve grafts.

ROSSE, Cornelius, and José L.V. MEJINO*. Structural Informatics Group, Department of Biological Structure, University of Washington, Seattle, WA. The Foundational Model of anatomy.

Anatomical knowledge, in a strict sense, concerns the structural organization of the body. A logical, machine-understandable representation of such structural knowledge is a requirement for supporting reasoning about the anatomy of the human body by next-generationcomputer programs in education and clinical medicine. Neither ***Terminologia Anatomica*** nor other controlled medical terminologies, which contain extensive anatomical term lists, have a sufficiently rigorous semantic structure required for such machine-based reasoning. We are developing the Foundational Model of anatomy (FM) as a component of the Digital Anatomist Information System to provide such an enabling resource. We conceptualize structural knowledge as an inheritance hierarchy (ontology) in which groups of material objects that constitute the body are organized into classes according to the structural characteristics they share with one another and by which they may be distinguished from one another. Spaces, surfaces, lines and points associated with these objects are also integrated in the class structure of this Anatomical Ontology (AO), which is the backbone of the FM. The variety of relationships that describe the structural arrangement of these entities (part of, boundary, location, adjacency, attachment, continuity) constitute the Anatomical Structural Abstraction (ASA); relationships pertaining to the morphological transformation of anatomical structures during development, growth and aging form the Anatomical Transformation Abstraction (ATA); and the principles, rules and definitions according to which these relationships are modeled constitute the metaknowledge (Mk) component of FM. ***FM = (AO, ASA, ATA, Mk)*** therefore summarizes all the information that represents structural knowledge of any part, or the whole, of the body. This structure-based organization of anatomical knowledge accommodates both the systemic and regional views of anatomy in a logically sound and scalable framework. The FM is implemented in a frame-based knowledge representation system called Protégé; it incorporates more than 50,000 terms for macroscopic anatomy; and is integrated in the National Library of Medicine's Unified Medical Language System. The FM is intended as a resource to be used by application developers in education and clinical medicine. Indeed, its validation as a generalizable resource can only be accomplished by application developers in different fields and for different purposes. (Supported by Contact No. LM03528 and Grant No. LM06822 from the National Library

of Medicine.)

SAXTON*, Ernestina H., James D. COLLINS, Samuel S. AHN*, Theodore Q. MILLER* and Alfred CARNES. Departments of Neurology and Radiological Sciences, UCLA School of Medicine, Los Angeles, CA. Occupational injuries enhance compression abnormalities of the brachial plexus [thoracic outlet syndrome (TOS)] as displayed by MRI and MRA.

Repetitive trauma disrupts fascial planes and results in inflammation, pain, limited function, weakness and atrophy. Shoulder girdle laxity is reflected by drooping and anterior-lateral rotated scapulae, backward displacement of the manubrium sterni (round shoulders) and costoclavicular compressed neurovascular bundles and draining veins of the brachial plexus. Structural abnormalities predisposing to TOS in work related injuries include laxity, round shoulders, straight back, muscular thorax, cervical rib, and cervicothoracic kyphoscoliosis. Bilateral MRI/MRA demonstrates compromising structural abnormalities of the brachial plexus (Clin Anat. 8:1-16, 1995). Imaging was conducted on the 1.5 Tesla GE Signa, 5.7 software, 4.0 mm thickness, saline waterbags beside the neck to enhance signal to noise ratio; T1 weighted and selected FSE sequences were acquired (coronal, transverse, transverse oblique, sagittal, 2D TOF MRA and arm abduction external rotation sequence). Abduction external rotation (arms overhead) posterior-inferiorly rotated clavicles and subclavius muscles and anterior-laterally rotated the coracoid processes, with rotation of the drooping shoulder. This increased tension accentuated compression within the scalene triangles and supraclavicular spaces, compressed the internal jugular and subclavian veins as they formed the brachiocephalic and innominate veins, and triggered arm, face and leg pain, numbness and tingling, and headache. Physical therapist, farm worker, computer graphic designer, bus driver, and a nurse are presented.

SHEW, Ronald L., and Mark F. SEIFERT. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN. An analysis of gross anatomy exam questions (single-answer vs. multiple-multiple choice) and student performance.

The format of our gross anatomy written examinations includes: (1) single-answer (SA) questions, which require students to select the best response from several choices, and (2) multiple-multiple choice (MMC) questions, which require students to first answer four questions and then to select the response that supports their answers. The former style constitutes ~55/85 exam questions and the latter ~30/85 questions. Students have complained about these multiple-multiple choice format questions. They argue that they can know 75% of a question and get it wrong and that poor performance on this portion of the exam keeps some from obtaining higher grades. We have set out to evaluate these criticisms. Statistical analyses revealed that the mean number of SA questions missed by all students on 6 exams over the past 2 years was 5.32 ± 4.37 (SD) questions/exam. The mean number of MMC questions missed were 10.7 ± 4.30 questions/exam. We then subdivided the students by grade [honors (H), high pass (HP), pass (P), and fail (NP)], year, and exam. These data were ranked by the MMC/SA ratio from highest to lowest. This resulted in a correlation coefficient of 0.947. These data demonstrated that (1) the number of SA questions missed paralleled the number of MMC questions missed, (2) the number of SA questions missed correlated with the number of MMC questions missed, and (3) students receiving lower grades missed SA questions at a higher frequency than MMC questions and at a lower MMC/SA ratio, compared to students receiving higher grades. The inclusion of MMC questions in modest numbers demands that students know their subject matter thoroughly. Further, their inclusion allows us to discriminate between students of varying ability. This prevents grade inflation and

validates our current grading policy.

SONEIRA, Carlos F., and Jonathan S. CARLOS*. Department of Clinical Science, University of Wisconsin-La Crosse, La Crosse, WI, and Department of Anatomy, Southern California University of the Health Sciences, Whittier, CA. Replacement of muscle fibers by adipose tissue in the soleus and gastrocnemius muscles.

Limb muscles from older individuals are smaller and have significantly more fat and connective tissue than limb muscles of younger individuals. The purpose of this study is to report the findings in two cases that showed significant replacement of muscle fibers by adipose tissue in the soleus and medial head of gastrocnemius muscles. The lower limbs of 33 embalmed human cadavers were studied and bilateral fatty infiltration of the triceps surae was observed in two of them (one male and one female, 89 and 88 years old, respectively). The affected muscles were carefully dissected and tissue samples were processed for histological examination with hematoxylin and eosin, Masson's trichrome and immunohistochemistry for neurofilament protein. The external contour and volume of the affected muscles was normal on gross examination. One case showed fatty infiltration of the medial part of the soleus muscle, while the other case showed fatty infiltration of the whole soleus and the medial head of gastrocnemius. Microscopic examination revealed very few atrophic muscle fibers and large amounts of adipose and fibrous tissues replacing normal muscle tissue. The results of the immunohistochemistry were non-conclusive. The observed changes are consistent with denervation atrophy and may represent extreme cases of the "normal" muscle atrophy that occurs with aging. The process seems to begin on the medial aspect of the soleus muscle and extends to include the whole soleus and the medial head of gastrocnemius.

SPINNER, Robert J., John L. D. ATKINSON*, David G. KLINE*, and Robert L. TIEL*. Department of Neurologic Surgery, Mayo Clinic, Rochester, MN. Peroneal intraneural ganglia. The importance of the articular branch: a unifying theory.

Intraneural ganglion cysts have received disproportionate attention over the past century, largely due to the controversy regarding their pathogenesis, e.g., whether these ganglia are derived from an articular or pararticular origin, or from within the nerve. We present a unifying theory which explains certain intriguing clinical observations made by others; namely, their universal occurrence near joints and extension proximal to joints; the high percentage of antecedent trauma and frequent knee or superior tibiofibular joint abnormality; the predominance of deep peroneal nerve dysfunction (preferentially over superficial peroneal nerve involvement); the finding of a pedicle to the superior tibiofibular joint in approximately 40% of reported cases; and the high recurrence rate following surgery. Since the peroneal nerve is the most common site for intraneural ganglia, we have chosen it as the example for our theory. We performed a retrospective review of 12 consecutive patients and then a prospective study of an additional 8 patients with peroneal nerve intraneural ganglia. In all 20 patients, a communication to the joint space was identified via an articular branch to the superior tibiofibular joint. All patients had predominantly deep peroneal nerve loss clinically, electrically and radiographically, but several patients had more complete peroneal nerve dysfunction. In all cases, retrospective review of the MRI demonstrated a connection to the joint, which was not always noted on initial interpretation by the radiologist. MRI also demonstrated the longitudinal extent of the cyst within the nerve, the frequent association of abnormal signal in the superior tibiofibular joint, and using a 3T magnet, an enlarged, cystic articular branch. Intraoperative observation confirmed a communication to the joint through the articular branch. The trifurcation of the peroneal nerve into deep, superficial and articular branches was a constant

finding. The articular branch was markedly enlarged, and, on cross-section, was hollow and fluid-filled. In select cases, contrast dye was injected into the articular branch and demonstrated a communication to the joint capsule, but also delineated the cyst margins within the common peroneal nerve. In all cases, the transected articular branch was oversewn, and the cyst capsule excised. Significant pain relief was experienced in these patients, but overall, there was only mild improvement in neurologic function. At a minimum of 1 year follow-up, there were no recurrences, in many cases confirmed by MRI as well. We believe that intraneural ganglia are derived from an articular origin and recurrences may occur due to continued production and dissection of cyst fluid.

SRIVASTAVA, Sakti, William L. HEINRICHS*, Jean HEEGAARD*,Robert CHENG*, and Parvati DEV*. Stanford University School of Medicine, Division of Human Anatomy, Stanford University Medical Media and Information Technology group (SUMMIT), and Department of Mechanical Engineering, Stanford, CA. Teaching hand anatomy with the Anatomical Workbench.

Most gross anatomy courses today offer only a day or two for teaching hand anatomy in the first year of medical school. To supplement and complement traditional teaching methods, we have developed several lesson modules using digital technologies. In addition to local institutional use, these modules are designed for deployment on 'net' browsers, as part of the Next Generation Internet (NGI) Initiative. We anticipate wide dissemination of the content, hoping to foster collaboration between user groups at distant sites. The media-rich content focuses on both structure and function of the hand, and is presented on the Anatomical Workbench composed of a stereo-capable computer, a hand-held, haptic (force-feedback) device, and the NGI. High-resolution, digital, stereo-photographs allow users to view and conduct virtual hand dissections from different vantage points and magnifications. The lessons allow users to interact with accurate tissue and biomechanical properties of computer generated models and include complex topics such as intrinsic muscles and their functions. Adding haptic properties to these models enables users to feel the forces required to produce normal flexion and extension movements and compare some abnormalities. Dynamic interactions facilitated by the workbench will enable anatomists to illustrate and teach anatomy using methods heretofore impossible. (Sponsored by Contract No. NO1-LM-0-3506 from the National Library of Medicine)

TESCH*, Norbert P., Wolfgang GRECHENIG*, Hans CLEMENT*, Johannes MAYR*, and Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy,Department of Trauma Surgery,Department of Pediatric Surgery,University of Graz, Austria. (Sponsored by A.H. Weiglein). Sonoanatomy of the distal radius during growth.

The distal end of the radius is often a place of acute and chronical discomfort. The aim of this examination was therefore to depict the sonoanatomy of the distal radius during growth and its typical changes. 20 healthy children aged 2 month to 18 Years were examined in a statistical as well as a dynamical way and left and right arm were compared. In comparison to that 10 healthy adults aged 20 to 60 were examined as well. For the examination a different sound probes were used (a 7,5mHz one by Hitachi and sound probes of high frequency by Esaote,ATL and Siemens). In every case the distal radius showed a definite, sonomorphologically characteristic alteration during growth. The changes in the epiphyseal cartilage as well in the epiphyseal growth plate could be delineated. The periosteal changes during growth and a hypochondrogenicstrip between the bright periosteal reflex and the cortical reflex could be depicted as well. By means of color-encoded duplex sonography the vessels which grow into the cartilage in the early life could be delineated as well. The conclusion must be that sonography can give important information in various cases, for example for clarification of acute traumata, for follow-up controls after fractures

and osteosyntheses, if the suspicion of osteomyelitis arises and if there are chronic discomforts. In children the development of the epiphysis and the depiction of the center of ossification, the epiphyseal growth plate, the periosteum and the cartilage of the joint must be taken into account.

TESCH*, Norbert P., Wolfgang GRECHENIG*, Hans CLEMENT*, Johannes MAYR*, Gerolf PEICHA*, and Gunther WINDISCH*. Institute of Anatomy, Department of Trauma Surgery, Department of Pediatric Surgery, University of Graz, Austria. (Sponsored by A.H. Weiglein).
Sonographic anatomy of the pectoral region.
Pathologic processes like muscular atrophy, hematoma, inflammatory diseases or scars often afflict the pectoral region. Aim of this study was to investigate if exact visualization of the soft tissues of this region and eventual pathologic changes is possible by means of ultrasonographic examination. Using 20 cadavers preserved according to Thiel's method, the best probe position for depiction of the pectoralis major and minor were evaluated. Furthermore, static and dynamic sonographic examination was performed in 20 healthy volunteer (age from 5 to 60 years)usingboth a 7,5MHz linear probe (Hitachi) and high frequency probes (ATL, Esaote, Siemens). Dynamic examination inclouded motions of the shoulder girdle and rotation of the upper axtremity in Comparison to the contralateral limb. Subsequently, ultrasonography was conducted in male patients with confirmed hematoma, muscular scarification and atrophy. Fascias were depicted as bright reflections, muscles showed typical sonomorphology with longitudinal echos in the longitudinal section and reticular structure in the transverse plane. The single muscles were clearly distinguished from each other. The long biceps tendon was clearly depicted underneath the tendinous insertion of the pectoralis major. The pathologic changes mentioned above became visible, as well. We could show that ultrasonography is an exact and reproduceable technique for the evaluation of anatomic and pathologic details in the pectoral region.

THOMAS, Pamela P., and Charles R. THOMAS*. Department of Anatomy, University of Health Sciences-College of Osteopathic Medicine, Kansas City, MO and Department. of Anatomy and Cell Biology, University of Kansas Medical Center, Kansas City, KS. A simple approach for dissection of the anterior forearm.
Given today’s sweeping changes in curriculum, the study of anatomy has become compressed and time is often of the essence. This is especially troubling in the laboratory. In the laboratory setting, if dissection procedures can be simplified, dissecting time shortened and learning enhanced, everyone gains. We have simplified several dissection approaches in our laboratories, and feel that at least one is worthy of sharing. In the dissection of the flexor forearm, various dissection guides describe multiple steps for identifying superficial and deep structures. We take a much simpler approach that is easily mastered by students, can be accomplished in a matter of minutes and allows complete observation of all relevant structures and relationships. Usually only two cuts are made to reflect muscles, and if carefully done, this will allow easier identification of difficult structures like the superior and inferior ulnar recurrent arteries, interosseous recurrent artery and Martin-Gruber anastomoses. This dissection method also allows the structures in the anterior forearm to remain relatively intact, thus facilitating review for the students.

WAPNICK, Simon. Director Postgraduate Clinical Anatomy Courses, New York Medical College, NY. Anatomy instruction for physicians. Which road?
Since the publication of De Corpis Fabricus Hominis by Vesalius, the father of modern anatomy, in 1534, physicians in all parts of the world have been exposed (as part of the medical student's curriculum) to a lengthy anatomy course revolving around cadaver dissection. There are several different factors that are rapidly changing this half millennium of tradition: curtailing tuition time allocated to anatomy courses at most medical schools, cutting back in outlay costs and the advent of electronic media. These factors as well as the perception that a complete cadaver dissection of the whole body is not essential, has resulted in numerous clinical specialists observing that young physicians enter and complete their residency training ill prepared with fundamental knowledge of the essentials of human anatomy. The subsection, Postgraduate Clinical Anatomy Courses (PCAC) of the Department of Cell Biology and Anatomy at New York Medical College, was initially founded and directed by the late Dr. Gene Wenk in 1995. It has had the encouragement, guidance and support of the Chairman of Cell Biology and Anatomy. The PCAC was established to offer anatomy and embryology instruction for residents in training as well as that of physicians who wished (as part of their retraining) to learn anatomy with the aid of cadaver dissection.
Clinical departments contract for each course and support all financial costs including staff participation. The PCAC at NYMC offers continuing courses (anatomy and/or embryology) for surgeons in General Surgery (3 separate programs), Head and Neck Surgery, Neurosurgery, Maxillary Facial, Urology, and Gynecology and non-surgical specialties such as Radiology, Neurology, Pediatrics and Neonatology. In addition, residents and attending specialists have been encouraged to use cadavers for clinical anatomical research as well as a review of any complicated proposed surgery. Numerous clinical anatomists have indicated in correspondence that attrition in anatomy instruction found in this country, has likewise occurred in most medical schools outside the USA. There has been enthusiastic support to establish an International Association of Postgraduate Clinical Anatomists of those who wish to address this problem. It is the purpose of this presentation to discuss this issue with members of the AACA and determine if any interest exists to form a SIG (Special Interest Group) within the AACA to work on this topic.

WEIGLEIN, Andreas H., Lumnije KCIKU*, and Christoph PERTL*. Institute of Anatomy, Department of Dental Surgery and Radiology, Karl-Franzens-University Graz, Austria. Planning of oral endo-osseous implant surgery based on inferior alveolar nerve anatomy.
Dental implants sometimes cause pain due to pressure on the inferior alveolar nerve. If there are more implants it is impossible to select and subsequently remove or change the implant that causes the pain. In order to enable the accurate selection of the cause of pain, we dissected 10 mandibular canals of cadavers embalmed with the Graz embalming technique and proved the findings by both histological and plastinated serial slices. The mandibular canal contains a bundle of nerves that comprises two larger nerves, that are separately wrapped in perineural sheaths, one of which is the inferior alveolar nerve supplying branches to the dental alveoli, the other being the mental nerve, that emerges from the canal though the mental foramen to supply skin and mucosa of the lower lip, cheeks, and chin. The two nerves are spirally twisted around each other. The mental nerve lies medially to the inferior alveolar nerve in the posterior molar region and passes it inferiorly in the anterior molar region to finally emerge from the canal laterally in the premolar region. Based on these anatomical findings the implant causing the pain can be selected accurately and the source of pain can be removed to release the patient.