26th Meeting of the
American Association of Clinical Anatomists

jointly sponsored by the

American Association of Clinical Anatomists

and the

July 14 – 18, 2009

InterContinental Hotel, Cleveland, Ohio

The American Association of Clinical Anatomists officially began on October 17, 1983 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

The Official Journal of the
American Association of Clinical Anatomists,
the British Association of Clinical Anatomists,
the Australian and New Zealand Association of Clinical
Anatomists, and the Anatomical Society of Southern Africa

Editorial Board - 2009

Associate Editors

Annual Banquet
Thursday, July 16, 2009

Natural History Museum

6:00 pm – Reception
7:00 pm – Awards Presentation
8:00 pm – Dinner

Previous Honored Members of the AACA

*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
*Ray J. Scothorne, 1995
Robert A. Chase, 1996
Tatsuo Sato, 1997
John E. Skandalakis, 1998
Donald R. Cahill, 1999
*Sandy C. Marks, Jr., 2000
David G. Whitlock, 2001
Robert D. Acland, 2002
Arthur F. Dalley, II, 2003
John V. Basmajian, 2004
Ian Whitmore, 2005
Peter H. Abrahams, 2006
Gary G. Wind, 2007
Vid Persaud, 2008

* deceased

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Honored Member, 2009

The American Association of Clinical Anatomists

Recognizes and Awards
Honored Membership to

Richard S. Snell, M.D., Ph.D., F.R.C.S.

Clinical Anatomist • Educator • Scientist • Author

For his visionary and historically significant role in promoting the importance of clinically-relevant anatomy, his long and distinguished career as an educator, his pioneering work on pigment cells and factors that control the distribution of melanin in human skin, and particularly in recognition of his prolific authorship of clinical anatomy textbooks over the past three and a half decades.

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The 2009 Presidential Speaker
Wednesday, July 15, 1:15 – 2:15 pm

Carlos A.G. Machado

Presented at the 26th Meeting of the AACA,
Cleveland, Ohio
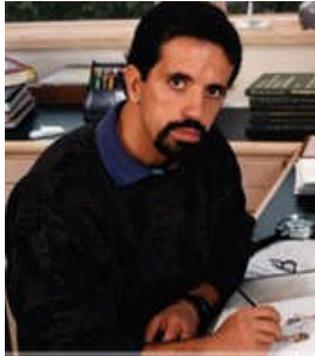
Carlos A.G. Machado trained and practiced medicine as a cardiologist in Brazil, before his medical illustration talents took his career in a different direction. Through sheer luck, his skill and artistry in medical illustration came to the attention of Ciba Geigy/Novartis when they were looking for someone to continue the illustration program founded by Dr. Frank H. Netter. Dr. Machado has contributed to the Netter Collection of Medical Illustrations for fourteen years, working for Ciba-Geigy/Novartis, then Icon, and now Elsevier as a full-time artist. Adding over 1,000 new illustrations to the collection, Dr. Machado has also updated many of the Netter images to reflect current medical practice.

Dr. Netter's unique style, technique, talent, knowledge, and remarkable body of work that comprises more than 6,000 illustrated plates, with over 20,000 individual images, are still unsurpassed by the most prestigious contemporary medical illustrators. One of the key factors that made his style so distinguished is the association of the appealing language and

concepts of commercial and advertising illustration with the transmission of scientific knowledge.

The life work of these two physician artists has changed the way that physicians learn from medical school through professional practice. Dr. Machado will analyze the factors that influenced Dr. Netter's style and contributed to his success. He will give an insider's view to the similarities and differences between Dr. Netter's and Dr. Machado's professional training, styles, concepts, and particular techniques.

Educational Affairs Presentation
Thursday, July 16, 10:45 – 11:45 am

William F. Dunn, M.D.

*"Integrating Clinical Anatomy into the Reformation of Advanced Training:
The Simulation Movement – What's Ahead?"*

1. Review the rationale and argumentation for a strong presence of simulation integrated into the fabric of healthcare training and delivery systems
2. Demonstrate applied clinical anatomy in training of clinicians within an experiential learning context
3. Demonstrate examples of simulation use and impact within a multidisciplinary simulation center
4. Provide visions of possible future directions for simulation-based processes in healthcare

AACA Council Presentation

Friday, July 17, 11:00 – 12:00 pm

Noel T. Boaz, Ph.D., M.D.

Evolutionary Anatomy: The Structural Basis for Evolutionary Medicine

The human organism is an evolutionary palimpsest that incorporates structural remnants of respective bilaterian, chordate, vertebrate, tetrapod, mammalian, and primate adaptational complexes. Understanding human anatomy then involves an integrative paradigm that draws from comparative anatomy, evolutionary and developmental ("evo-devo") studies, genomics ("morphomics"), and paleontology. A detailed appreciation of physiological and biochemical functions of body parts within environmental context, both now and in the past, is essential to this approach. These disparate lines of evidence are bound together by the common thread of evolution by natural selection. Clinical application of an Evolutionary Anatomy holds great promise for a more informed, rigorous, and testable Evolutionary Medicine – the solving and prevention of clinical problems from a perspective of evolutionary biology. This presentation provides an introduction to a newly developing discipline and how it can foster new directions in clinical anatomical research and in medical education.

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

Ballroom C

Exhibit hours: 7:30 am – 4:30 pm on Wednesday and Thursday
7:30 am - noon on Friday

American Association of Anatomists

Bone Clones, Inc.

Carolina Biological Supply, Co.

eHuman

Elsevier

Holt Anatomical, Inc.

Matthews International

Mopec

Thieme Medical Publishers

Touch of Life Technologies

Wiley

Wolters Kluwer Health - LWW

Accompanying Persons' Programs

A Step Back in Time… to Amish Country

Wednesday, July 15
9:00 am   InterContinental Hotel pick up
4:00 - 4:30 pm   Return to Hotel

With millions of visitors a year, Ohio's Amish country is one of Cleveland's most requested visitor tours. Lured by the slower pace, guests are reminded of what life was like 50-100 years ago, before technology took over our lives and made everyone accessible 24/7.

The tour day begins with a 9:00 am pick up at your hotel and heads out to Geauga County - 40 minutes east of downtown - where the bus will stop to pick up a local Amish expert to conduct the tour. Most of the stops on this tour (below) include a sample item to taste or take home!

* Furniture & quilt shop – have coffee & cookies with Amish owner and learn about his trade (everyone will receive a homemade Amish quilt sample)

* Amish cheese co-op – everyone will receive a bag of cheese samples). Lunch – at the private home of an Amish family for a typical multi-course "wedding feast" (everyone receives a fresh baked loaf of bread)

* General store – visit Ohio's oldest general store opened in 1840 to see dry goods & foods (everyone receives a jar of home made Amish jam)

* Working Amish farm – understand the farming methods used by the Amish, visit the barn to see the tools used (everyone will receive a seasonal "treat")

Cost per person is: $130/person (includes transportation, lunch, EA Guide & an Amish expert guide and samples or treats at each stop).

Cleveland City Tour

Thursday, July 16, 2009

9:00 am	Pick up at InterContinental
2:00 – 3:00 pm	Drop back at hotel (depending On whether group wants shopping or museum time – see below)

A 2½ hour city tour highlighting the history, architecture, downtown developments, museum district, and lakefront of Cleveland. Includes a 90 minute stop for lunch.

9:15 – 11:45 am

* Cuyahoga River & Lake Erie – transportation hubs in the Midwest

* North Coast Harbor - Rock & Roll Hall of Fame & Museum, Great Lakes Science Center & Cleveland Browns Stadium

* City's Civic District - City Hall, Federal Reserve Bank, Cleveland Public Library, Historic Warehouse District - downtown Cleveland's liveliest neighborhood w/ loft apartments, restaurants & nightlife

* Gateway District - Quicken Loans Arena (Cav's & LeBron!), Progressive Field (Indians). Guests and pedestrian friendly E. 4th Street entertainment district

* Playhouse Square – step off bus for a 20 minute tour inside this 1920's former movie house that now anchors America's 2nd largest performing arts district

* Public Square - with the Terminal Tower train station complex looming above. Then the bus journeys east 5 miles to University Circle, the cultural hub of Cleveland, with more cultural, educational, healthcare & social service agencies in one square mile than any other district in the world.

12:00 Noon   Lunch - Guests will tour the 100 year old mansion turned club before sitting down to lunch in the casual Grill overlooking the 100 dock harbor. This home, renovated in 1990 and turned into Cleveland's finest lakefront club, overlooks Lake

Erie and was originally home to one of Cleveland's first industrialists. Choose from a pre-set menu.

1:30 – 3:00 pm

* Martin Luther King, Jr. Drive through Cleveland's Cultural Gardens

* University Circle – Cleveland's Cultural Hub (all museums, botanical garden, etc.)

* Little Italy – restaurants, art galleries & shops. Lakeview Cemetery, Cleveland's outdoor museum, including Tomb of U.S. President James Garfield, and other famous "residents," including Elliott Ness & John D. Rockefeller

3:00 pm Return guests to InterContinental Hotel

Cost: $80/person (incl. bus, lunch, Step-On-Guide & theater tour)

26th Meeting of the American Association of Clinical Anatomists

Pre-Conference Activities

Tuesday, July 14th, 2008

8:00 - 9:30 am **Journal Committee Meeting** - (members of Journal Committee) - **Room 207**

9:30 am - 5:00 pm **AACA Council Meeting** – (AACA Officers and Councilors) - **Room 207**

3:00 - 6:00 pm **Registration – Coat Room**

Career Development Committee Reception

5:00 – 6:30 pm **Career Development Committee Reception ─ Six Continents**

Welcome Reception

6:30 – 8:30 pm **Welcome Reception Ballroom BC**

Sponsored by Elsevier

For all meeting attendees
and accompanying persons

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Wednesday, July 15th, 2009

7:00 - 8:00 am	**Editorial Board Breakfast Meeting for Editors/Associate Editors of *Clinical Anatomy* – Room 207**
7:30 - 4:00 pm	**Registration – Coat Room** **Commercial Exhibits – Ballroom C**
7:00 – 8:30 am	**Continental Breakfast – Ballroom C**
9:00 am	**Accompanying Persons' Program Departure - A Step Back in Time** *Departure site, Registration Desk*

Session Schedule

8:00 – 8:30 am	**Opening Ceremonies /Remarks**: - **BOA A**

Richard L. Drake, Ph.D.
Director of Anatomy
Professor of Surgery
Cleveland Clinic Lerner College of Medicine
of Case Western Reserve University

James K. Stoller, M.D., M.S.
Jean Wall Bennett Professor of Medicine
Chairman, Education Institute
Cleveland Clinic

Alan L. Hull, M.D., Ph.D.
Associate Dean for Curricular Affairs
Jones Day Endowed Chair in Medical Education
Cleveland Clinic Lerner College of Medicine
of Case Western Reserve University

Poster Sessions

Poster Session 1
    HEAD/NECK, EXTREMITIES, THORAX, ABDOMEN
        – **Ballroom C**

Poster Session 2
    EDUCATION, BACK/PELVIS AND ANATOMICAL SERVICES
        – **Ballroom C**

All posters will be on display throughout Wednesday and Thursday from 7:30 am to 4:30 pm.

Poster presenters assigned to **Poster Session 1 must** be present at their posters **during the Wednesday morning and afternoon breaks.**The list of the posters (authors and titles) for this session is found on pages 30-35

Poster presenters assigned to **Poster Session 2 must** be present at their posters **during Thursday morning and afternoon breaks.** The list of the posters (authors and titles) for this session is found on pages 35-41

Symbols used in the program:

+ Eligible for the Ralph Ger Student Platform Presentation Award
¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award

Oral Presentations

8:30 am **Platform Session 1**: Extremities.
        Moderator – Robert Spinner, **BOA A**

8:30   Quantitative morphometric analysis of the triquetrum-hamate joint's articular surfaces. **FOGG, Quentin**, Neil ASHWOOD, and Chao WANG. University of Glasgow, Glasgow, United Kingdom.

8:45 + Three-dimensional innervation of popliteus muscle. **THAI, AI**, Piroska SZABO, and Anne AGUR. University of Toronto, Toronto, ON M5R 1K9, Canada.

9:00   Palmar arch of the hand. **KHAN, Ahmed**, Estomih

MTUI, Douglas MINTZ, and Audrey CRUMMEY. Department of Clinical Anatomy, Weill Cornell Medical College, New York 10065, USA.

9:15 + Computation of physiological cross sectional area of skeletal muscles using finite element modeling. **RAVICHANDIRAN, Kajeandra**, Mayoorendra RAVICHANDIRAN, Michele OLIVER, Karan SINGH, Nancy McKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S 1A8, Canada.

9:30 Regional anatomic structures of the elbow that may potentially compress the ulnar nerve. **APAYDIN, Nihal**, Ayse KARATAS, Marios LOUKAS, R. Shane TUBBS, and Aysun UZ. Ankara University School of Medicine, Ankara 06100, Turkey.

9:45+ Intramuscular innervation of extensor carpi radialis longus and brevis using 3D computer modeling. **RAVICHANDIRAN, Nisanthini**, Mayoorendra RAVICHANDIRAN, Kajeandra RAVICHANDIRAN, Nancy MCKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S 1A8, Canada.

10:00+ Palmaris profundus: MRI evidence to support the term musculus comitans nervi median. **HEBERT-BLOUIN, Marie-Noelle**, Nelly AMADOR, Kimberly AMRAMI, Elena PIROLA, and Robert SPINNER. Mayo Clinic, Rochester, MN 55905, USA.

10:15 – 11:15 am   **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **– Ballroom C**

TechFair

11:15 – 11:45 am **TechFair Session 1**
Moderator – Brian MacPherson, **BOA A**

11:15 From Lister's tubercle to Rotter's nodes - A new experiment in cinical anatomy podcasting. GOGALNICEANU, Petrut, **Peter ABRAHAMS**, Andrew FLETCHER, Elizabeth MCEVOY, and Jamie ROEBUCK. St. George's Hospital, London W1U 6LD, United Kingdom.

11:25   The Perineum. A student-centered learning tutorial.
        MACPHERSON, Brian, Thomas DOLAN, Derek
        EGGERS, Matt HAZZARD, and Kathryn WONG.
        University of Kentucky, Lexington, KY 40503, USA.

11:35   RARITY: a new e-learning tool integrating radiology and
        anatomy for medical students. **SMITH, Gregory**, Peter
        ABRAHAMS, Stephen BRYDGES, Birgit
        FRUHSTORFER, Paul GAZZANI, Tim RATTAY, Anil
        VOHRAH, and Richard WELLINGS. St. Mary's College
        of California, Moraga, CA, USA.

11:45 am – 1:15 pm   **Lunch**. This is also a time for hands-on
interaction with the TechFair presentations and to browse the
posters and commercial exhibits **– Ballroom C**

11:45 – 1:15 pm   Past-Presidents' Lunch – **Falcon Room**

1:15 – 2:15 pm   Presidential Address - **BOA A**

Presidential Address

Dr. Carlos Machado

Following the Trail of Frank Netter: Master Medical Illustrator.
Moderator – Larry M. Ross, AACA President

2:15 - 2:45 pm   **Refreshment Break** – You are encouraged to
browse the posters and commercial exhibits **– Ballroom C**

Oral Presentations

2:45 pm **Platform Session 2**: Education I.
        Moderator – Tom Gest, **BOA A**

2:45   The "Anatomy Department" today: How to adapt and
        prevail in the 21st century. **JONES, Kenneth H**. The
        Ohio State University, Columbus, OH 43210, USA

3:00   Student responses to clinical procedure teaching in
        the anatomy lab. **WILSON, Donald**, and Pedro NAVA.

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Loma Linda University, School of Medicine, Angwin, CA 94508, USA.

3:15   Designing a "histology without borders" longitudinal program in a new and integrated curriculum. STEFAN, Ancuta M., Eileen MOSER, and **Cristian STEFAN**. Touro University College of Medicine, Hackensack, NJ 07601-7023, USA.

3:30+   Development of an educational 3D contractile model of forty-one forearm and hand muscles. **RAVICHANDIRAN, Mayoorendra**, Michele OLIVER, Karan SINGH, Winnie TSANG, Nancy McKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S1A8, Canada.

3:45   Outlining of the detailed structures in sectioned images from Visible Korean. **CHUNG, Min Suk**. Department of Anatomy, Ajou University School of Medicine, Suwon 443-749, Republic of Korea.

4:00   How dental students are taught anatomy and neuroanatomy: Survey results from North America faculty. **LAMBERT, H. Wayne**, Stavros ATSAS, Douglas GOULD, and Bob HUTCHINS. Department of Neurobiology and Anatomy, West Virginia University School of Medicine, Morgantown, WV 26508, USA.

4:30 – 7:00 pm Anatomical Services Symposium - **BOA A**

Anatomical Services Symposium

Best Practices

The members of the Anatomical Services Committee and guests will present sections of the AACA Donation Program Best Practices document and moderate an open-floor discussion of each section. AACA members and others with an interest in Donation Program Best Practices are invited to participate in an interactive discussion.

Informed Consent - Jon Jackson
Institutional Oversight - Brandi Schmitt
Transfer/Allocation/Use - Leon Martino
Transportation - Darrell Petersen
Tracking - Dean Fisher
Disposition - Ronn Wade

Thursday, July 16th, 2009

7:30 - 8:30 am   **Career Development Committee Breakfast - Room 207**

7:30 - 8:30 am   **Anatomical Services Committee Breakfast - Room 204**

7:30 – 8:30 am   **Financial Affairs Committee Breakfast – Room 206**

7:30 – 8:30 am   **Continental Breakfast – Ballroom C**

7:30 - 4:00 pm   **Registration – Coat Room**
Commercial Exhibits – Ballroom C

9:00 am   Accompanying Persons' Program –
Cleveland City Tour
Departure site, Registration Desk

Oral Presentations

8:30 am **Scientific Platform Session 2:** Head and Neck/Thorax. Moderator – Alan Richards, **BOA A**

8:30   The neurovascular relationships of the oculomotor nerve. **ESMER, Ali Firat**, Ayhan COMERT, S. Tuna KARAHAN, Tulin SEN, and Eray TUCCAR. Ankara University Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey.

8:45   Integrating historical lines of D.B. McGrigor, teaching clinical osteology and imaging of the face. **BENNINGER, Brion**, Oregon Health and Science University, Portland, OR 97239, USA.

9:00   Arterial vascularization of the anterior perforated substance. ACAR, Halil Ibrahim, **Ali Firat ESMER**, S. Tuna KARAHAN, Tulin SEN, and Eray TUCCAR. Ankara University, Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey.

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9:15   The clinical anatomy of the moderator band. **LOUKAS, Marios**, and R.Shane TUBBS. St. George's University, St. George's, Grenada.

9:30   DVD demonstration of topographic anatomy of axillary lymph nodes for breast cancer surgery. **SATO, Tatsuo**, Hirokazu SAKAMOTO, Yoko TSUBOI. Tokyo Medical and Dental University, Tokyo 101-0062, Japan.

10:00   A novel method for cerebrospinal fluid diversion utilizing the sternum: A cadaveric and animal study. **TUBBS, R. Shane**, and Marios LOUKAS. Children's Hospital, Birmingham, AL 35233, USA.

10:00 – 10:45 am   **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **– Ballroom C**

10:45 – 11:45 am Educational Affairs Presentation - **BOA A**

Educational Affairs Presentation

William F. Dunn, M.D.

"Integrating Clinical Anatomy into the Reformation of Advanced Training: The Simulation Movement: What's Ahead?"

Moderator - Cristian Stefan

TechFair

11:50 am – 12:30 pm   **TechFair Session 2**
Moderator – Greg Smith - **BOA A**

11:50   Generating 3D computerized models from plastinated anatomical specimens. **LOZANOFF, Scott**, Michael FARRELL, Kris KAWAMOTO, Steven LABRASH, Beth LOZANOFF, and Selcuk TUNALI. University of Hawaii School of Medicine, Honolulu, HI 96813, USA.

12:00   Integrated anatomy class learning. **ZHANG, James**.
University of Kentucky, Lexington, KY 40506, USA.

12:10   A novel simulation of cadaver-based learning in a
virtual anatomy experience using Second Life (SL).
RICHARDSON, April, Jennifer BRUECKNER, Sandra
CHALLMAN, Thomas CUNNINGHAM, Frank DAVIS,
Matt HAZZARD, David RITCHIE, and Jacqueline YOON.
University of Kentucky, Lexington, KY 40536, USA.

12:20   Anatomy of the carotid and vertebral artery as
demonstrated by ultrasound. **MORRISON, Stuart,**
Jennifer McBRIDE, and Larry RABER. Cleveland Clinic
Foundation, Cleveland, OH 44195, USA.

12:30 pm – 2:00 pm **Lunch**. This is also a time for hands-on
interaction with the TechFair presentations and to browse the
posters and commercial exhibits **– Ballroom C**

2:00 – 3:30 pm Educational Affairs Symposium - **BOA A**

Educational Affairs Symposium

"Inter-Professional Anatomy Teaching"
Ameed Raoof

"How to Find the Facial Nerve
During Parotid Surgery"
Alan T. Richards

"Engaging Millenial Learners through
Team Based Learning"
Jennifer Brueckner

Moderator – Mark Seifert

3:30 - 4:15 pm   **Refreshment Break** – You are encouraged to
browse the posters and commercial exhibits **–
Ballroom C**

Business Meeting

4:15 – 5:30 pm **AACA Annual Business Meeting**
(Open to all current members and membership
applicants) – **BOA A**

Banquet and Reception

5:15 – 6:00 pm Buses will be departing to the Natural History
Museum

6:00 – 7:00 pm **Banquet Reception** (cash bar) – Natural
History Museum

7:00 – 7:45 pm **Annual Awards** and presentation of the
Honored Member Award

8:00 – 9:30 pm **Dinner**

Friday, July 17th, 2009

7:30 -8:30 am   **Educational Affairs Committee Breakfast** –
                  Room 201

7:30 -8:30 am   **2010 Meeting Planning Committee Breakfast**
                  – **Room 207**

7:30 – 8:30 am **Continental Breakfast – Ballroom C**

7:30 am – 12:00 pm **Registration**, **Coat Room**
                      Commercial Exhibits, **Ballroom C**

Oral Presentations

8:30 - 10:30 am **Scientific Platform Session 4**: Education II
                  Moderator – Brion Benninger, **BOA A**

8:30   Progress report on the e-Human Project. **BROWN,
        Paul**, and Robert CHASE. Stanford University School of
        Medicine, Stanford, CA 94305, USA.

8:45   The effects of changes in teaching strategy and
        curriculum on student performance in gross anatomy.
        GEST, Thomas. University of Michigan Medical School,
        Ann Arbor, MI 48109, USA.

9:00   Validation of anatomy podcasts in undergraduate
        education. GOGALNICEANU, Petrut, **Peter
        ABRAHAMS**, Andrew FLETCHER, Elizabeth MCEVOY,
        and Jamie ROEBUCK. St. George's Hospital, London
        W1U 6LD, United Kingdom.

9:15   Balancing reduced time in gross anatomy with
        incorporation of clinical correlation content. **TODD,
        Gordon**, Chandrakanth ARE, and Hugh STODDARD.
        University of Nebraska Medical Center, Omaha, NE
        68198, USA.

9:30   Surgical clinical correlates in anatomy: Implementation
        of a first year medical school program. **HAUBERT,
        Lisa M**., Kenneth H. JONES, and Susan D. MOFFATT-
        BRUCE. The Ohio State University Medical Center,
        Columbus, OH 43210, USA.

9:45　Professional visions of the dead: An ethnography of gross anatomy students' adjustment to dissection. **FOUNTAIN, T. Kenny**. Case Western Reserve University, Cleveland, OH 44106, USA.

10:00　Self-efficacy's influence on the academic achievement of medical students in gross anatomy. **BURGOON[1], Jennifer M**., and Noelle A. GRANGER[2]. [1]The Ohio State University, Division of Anatomy, Columbus, OH 43210, [2]The University of North Carolina, Department of Cell and Developmental Biology, Chapel Hill, NC 27599, USA.

10:15　Mastering structural and developmental anatomy through Kirigami. **BRUECKNER, Jennifer**, Cady BLACKEY, and Lisa PURDY. University of Kentucky College of Medicine, Lexington, KY 40506, USA.

10:30　**Announcement and Presentation of Student Award Winners**

10:30 – 11:00 am **Break**

11:00 – 12:00 noon AACA Council Presentation - **BOA A**

AACA Council Presentation

"Evolutionary Anatomy: The Structural Basis for Evolutionary Medicine"

Noel Boaz, Ph.D., M.D.

Moderator – Mark Seifert

12:00 pm - 12:15 pm **Closing Remarks**

12:30 – 2:00 pm **New AACA Council Meeting, Room 201**

Saturday, July 18th, 2009

** A separate registration fee is required for this event **

26th Annual Meeting Postgraduate Course

Post Graduate Course

Simulation in Medical Education
Saturday, July 18, 2009

Course Coordinators
Kathleen Rosen, M.D.
Richard Drake, Ph.D.
Jennifer McBride, Ph.D.

Morning Session at Lerner Research Institute (across from hotel), Room NA5-08

	Panel A: Multidisciplinary Simulation
8:00 am	Welcome and Days Activities **Richard Drake, Ph.D.:** Director of Anatomy, Professor of Surgery, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
8:05	Introduction to Medical Simulation **John Szarek, Ph.D.:** Professor of Pharmacology and Director of Clinical Pharmacology at Commonwealth Medical College

8:15	Software and Web Based Simulation of Anatomy and Function **Kathleen Rosen, M.D.:** Professor Anesthesiology Case Western Reserve University School of Medicine, Faculty Director of the Mt Sinai Skills and Simulation Center
8:35	Simple Task Trainers for Physical Diagnosis and Procedures **Thomas Noeller, M.D.:** Assistant Professor of Emergency Medicine, MetroHealth Medical Center and Associate Faculty Director of the Mt. Sinai Skills and Simulation Center
8:55	Ultrasound Simulation **Robert Jones, D.O.:** MetroHealth Medical Center
9:15	Cardiovascular Simulation **Sanjay Gandhi, M.D.:** Director Endovascular Cardiology, MetroHealth Medical Center
9:35	Questions
9:45	Break

Panel B: Surgical Simulation

10:00	Laparoscopic Surgical Simulation **Jeffrey Ponsky, M.D.:** Professor and Chair, Department of Surgery, Case Western University School of Medicine, University Hospitals
10:30	Cororectal Anatomy and Simulation **Conor Delaney, M.D.:** Professor and Vice Chair, Department of Surgery, Case Western University School of Medicine, University Hospitals
10:50	Simulation in Urology **Lee Ponsky, M.D.:** Assistant Professor, Department of Urology, Case Western University School of Medicine, University Hospitals

11:10	Female Reproductive Anatomy and Childbirth Simulation **John-Eric Jelovsek, M.D.:** Director of Surgical Education and Residency Site Director in OB/GYN; Assistant Professor, Cleveland Clinic Lerner College of Case Western Reserve University School of Medicine
11:30	Subspecialty Simulation: Ophthalmology, ENT and Orthopedics **Marco Maurtua, M.D.:** Department of Anesthesiology, Cleveland Clinic
11:50	Questions
12:00	Lunch
12:45	Transport to Mt. Sinai Skills and Simulation Center

Afternoon Session at Mt. Sinai Skills and Simulation Center

8 Stations – 20 minutes at each station

Ultrasound Simulation and Central Venous Access Station
Respiratory System: Airway, Chest Tube and Cricothyrotomy Station
Standardized Patient, Ventriloscope and Sounds Manikin Station
Cardiovascular Simulation Station
Female Reproductive Station
Manikin Station
Assorted Task Trainers Station
Gastrointestinal Laparoscopy Station

5:00	Transport back to InterContinental Hotel

Poster Listing

Symbols:
+ Eligible for the Ralph Ger Student Platform Presentation Award
¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award

Poster Session 1

Head/Neck, Extremities, Thorax, Abdomen

001   Cottle's test and sign, associated history and clinical anatomy of the nasal valve. **BENNINGER, Brion**. Oregon Health and Science University, Portland, OR 97239, USA.

002   Cleidocranial dysplasia, integrating embryology and anatomy to provide an accurate clinical diagnosis. **BENNINGER, Brion**. Oregon Health and Science University, Portland, OR 97239, USA.

003   Measurements of pedicles and articular pillars as guidelines for cervical spine fixation. **DOSSOUS, Paul-Michel**, Estomih MTUI, and Santosh SANGARI. Weill Cornell Medical College, Cornell University, New York, NY 10021, USA.

004   An evaluation of dental induced air emphysema by CBCT: a review of the fascial spaces. **NORTON, Neil S.,** Terry F. LANPHIER, Paul C. EDWARDS, Laura C. BARRITT, Margaret A. JERGENSON, and Tarnjit S. SAINI. Creighton University, Omaha, NE 68178, USA.

005   Branching pattern of the external branch of the superior laryngeal nerve. **YALCIN, Bulent**, R. Shane TUBBS, Ayhan COMERT, and Hasan OZAN. Gulhane Military Medical Academy, Department of Anatomy, 06018, Ankara, Turkey.

006   Examining the path of the facial nerve in the temporal bone using CBCT. **McMAHON, Luke A**., Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA.

007 Outlined images and 3D models based on sectioned images of cadaver head. **PARK, Jin Seo**. Dongguk University School of Medicine, Gyeongju, Republic of Korea.

008 Spatial relationships between scalene and anterior vertebral muscles and their innervations. **SAKAMOTO, Yujiro**. Tokyo Medical and Dental University, Tokyo 113-8549, Japan.

009 The branching patterns of the nerve to mylohyoid and nerve to posterior belly of digastric. MILLET, Brock, **Craig GOODMURPHY**, and Timothy BUNTON, Eastern Viriginia Medical School, Department of Pathology and Anatomy, Norfolk, VA 23501, USA.

010 Anatomy and clinical significance of the trigeminocerebellar artery. SEN, Tulin, **Ali Firat ESMER**, and Eray TUCCAR. Ankara University, Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey.

011 Ultrasound demonstration of intracranial vascular anatomy. **MORRISON, Stuart**, Jennifer McBRIDE, and Larry RABER. Cleveland Clinic Foundation, Cleveland, OH 44195, USA.

012 The root of dental anatomy: A case for naming Eustachius as the father of dental anatomy. **BENNETT, Greg**, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA.

013¶ Creating an interactive 3D virtual specimen of the human skull from CT datasets. **DETTON, Alan**, and Douglas GOULD. The Ohio State University, Columbus, OH 43204, USA.

014¶ Adapting a head and neck lymph node classification that integrates anatomy and clinical terminology. **BARRETT, Richard**, and Brion BENNINGER. Oregon Health and Science University, Department of Integrated Biosciences, Portland, OR 97239, USA.

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015¶   Using CBCT to study the incidence of concha bullosa in the nasal cavity. **SMITH, Kyle D**., Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA.

016¶   Examining the length and geometric patterns of the palatine canal using CBCT. **HOWARD-SWIRZINSKI**, **Karen A**., Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA.

Extremities:

017   Intraneural ganglion cyst: A 200-year-old mystery solved. **SPINNER, Robert**, Bernd SCHEITHAUER, Jean-Francois VINCENT, and Alexandra WOLANSKYJ. Mayo Clinic, Rochester, MN 55905, USA.

018¶   Can measurements of the axillary, femoral and popliteal arteries be used as predictors of hypertension? **TAVANGARI, Ricky**, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA.

019   The Strickland stone: the role of a clinical anatomist with anthropology, geology and physics. **BENNINGER, Brion**. Oregon Health and Science University, Portland, OR 97239, USA.

020   Anatomy of the triangular fibrocartilage complex and the progression of ulnar instability syndromes. **FOGG, Quentin**, and Brion BENNINGER. University of Glasgow, Glasgow, United Kingdom.

021   Attachments and innervation of the thenar musculature revisited. **NASH, Lance**, Lauren PORTNOW, Quentin FOGG, and Vaughn JACKSON. American University of the Caribbean, Sint Maarten, Netherlands Antilles.

022   Digital measurement of the palmaris longus tendon in a Dutch population: A cadaveric study. **NASH, Lance**, Lauren PORTNOW, Michael DI LORETO, Jonathan

GUPTA, and Ryan KARASEK. American University of the Caribbean, Sint Maarten, Netherlands Antilles.

023 Branches of the axillary nerve and it's contribution to motor innervation of the shoulder. **KARASEK, Ryan**, Quentin FOGG, Jonathan GUPTA, and Lance NASH. American University of the Caribbean, Sint Maarten, Netherlands Antilles.

024 A simple method for practicing musculoskeletal injection using cadavers and a novel injection medium. **DOWNIE, Sherry**, Todd OLSON, and Maya THERATTIL. Albert Einstein College of Medicine, Bronx, NY 10461, USA.

025 Interactions between ligamentous and muscular attachments to the coracoid process. **DI LORETO, Michael**, Quentin FOGG, and Lance NASH. American University of the Caribbean, Sint Maarten, Netherlands Antilles.

026 Lateral wear of the humeral capitulum related to tennis elbow? **SHEEDLO, Harold J.**[1], Rustin REEVES[1], Cara FISHER[1], Robert ROUTH[1], Victor KOSMOPOULOS[2], Brian WEBB[2], and Robert BUNATA[2]. Department of Cell Biology and Genetics[1], Department of Orthopedic Surgery[2], University of North Texas Health Science Center, Fort Worth, TX.

027 Muscle atrophy patterns of supraspinatus in relation to architecturally distinct regions. **KIM, Soo**, Robert BLEAKNEY, Erin BOYNTON, Danley LUNN, and Tim RINDLISABACHER. University of Saskatchewan, Saskatoon, SK S7N 0W3, Canada.

028 The enigmatic syndrome of meralgia parasthetica. **NIKFARJAM, Jeremy**, Ralph GER, A. VAN SCHOOR. Albert Einstein College of Medicine, Great Neck, NY 11023, USA.

029 Thoracic outlet syndrome and the axillary artery-Part I: The frequency of the arterial anomaly. **OLINGER, Anthony**, and Brion BENNINGER. Western States Chiropractic College, Portland, OR 97230, USA.

Thorax:

030¶ General morphology and patterns of the external intercostal muscle and its link to rib fractures. **WENGER, Lindsay**, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA.

031 Left superior vena cava. **FRANCISCO, Margarida**. Faculdade de Medicina de Lisboa, 2775 Carcavelos-Lisboa, Portugal.

032 Anomalous "lusoria" subclavian artery. **FRANCISCO, Margarid.** Faculdade de Medicina de Lisboa, 2775 Carcavelos-Lisboa, Portugal.

033 Fracture and embolization of a subclavian port catheter. **BEST, Irwin**, and Mike BOSLEY. Emory University Hospital, Atlanta, GA 30322, USA.

034 The effect of selective bone component damage on bovine rib strength and fracture pattern. **PORTA, David**, and Anna HARVEY. Bellarmine University, Louisville, KY 40205, USA.

035 Missed cervical ribs on plain radiographs alter management of thoracic outlet syndrome (TOS) patient. **COLLINS, James**, Samuel AHN, Alfred CARNES, Hugh GELABERT, and Ernestina SAXTON. David Geffen School of Medicine at UCLA, Los Angeles, CA 90024, USA.

036 Aortic root anatomy assessed with high-resolution computed tomography. SCHOENHAGEN, Paul, **Richard DRAKE**, and Stuart MORRISON. Cleveland Clinic Foundation, Cleveland, OH 44195, USA.

037 Lingular vein of the left lung and its drainage patterns. **YAZAR, Fatih**, Cenk KILIC, Hasan OZAN, and Erkan YILDIZ. Department of Anatomy, Faculty of Medicine, Gulhane Military Medical Academy, Ankara 06018, Turkey.

Abdomen:

038   Anatomical and histological pathology of neoplastic liver nodules. **KEITH-STANLEY, Gideon**. Ross University of Medicine, Oklahoma City, OK 73132, USA.

039   A case of a middle mesenteric artery. **SAGA, Tsuyoshi,** Keiicihro NAKAMURA, Makoto TETSUKA, and Koh-ichi YAMAKI. Kurume University School of Medicine, Kurume 830-0011, Japan.

040   Intraparenchymatous spatial distribution of a single renal artery. Study on corrosion casts. **MATUSZ, Petru**, Agneta Maria PUSZTAI, and Delia Elena ZAHOI. University of Medicine and Pharmacy, Timisoara 300041, Romania.

041   A study of morphometry and ductal variations of extrahepatic biliary apparatus in cadavers from Mumbai. **MISHALL, Priti**, and Lakshmi RAJGOPAL. Albert Einstein College of Medicine, Bronx, NY 10461, USA.

Poster Session 2

Education, Back/Pelvis, Anatomical Services

042   Revamping an undergraduate anatomy course: Impact of medical students as TAs and lab sessions. **RAOOF, Ameed**, Lowell FISHER, Sabine HILDEBRANDT, Anuja JAIN, Dennis LEE, Jennifer MCDONALD, Monica MICHELOTTI, and John STRIBLEY. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

043   Prediction of performance on anatomy and histology examinations as a measure of student self assessment. LACHMAN, Nirusha, Kevin CHRISTENSEN, and **Wojciech PAWLINA**. Mayo Clinic, Rochester, MN 55905, USA.

044   Banning laptop computers in anatomy lectures and discussions. **ZOLLER, Lawrence**. University of

Nevada Las Vegas, School of Dental Medicine, Las Vegas, NV 89106, USA.

045   The effect of dissection and peer teaching on student performance in medical gross anatomy. **SAWAYA, Zachary**, and Thomas GEST. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

046   How to teach anatomy to students pursuing a career in medical and health sciences. **MOHIALDIN, Vian**, and Bruce WAINMAN. McMaster University, Hamilton, ON, Canada.

047   Evaluation of student retention of basic science material in a PBL-based physical therapy curriculum. **FERGUSON, Donald G.**, and Mary Alice DUESTERHAUS MINOR. Clarkson University, Potsdam, NY 13699, USA.

048   A graduate anatomy hybrid course; Is it a better mousetrap? **HUTCHINS, Bob**, and Emet SCHNEIDERMAN. Texas A&M University, Health Science Center, Baylor Dental School, Dallas, TX 75246, USA.

049   Active learning practices in gross anatomy lab at LECOM. **KULESZA, Randy**, Mathew BATEMAN, Bertlan DUDAS, Jonathan KALMEY, Theodore MAKOSKE, and Mark TERRELL. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA.

050   Adaption of anatomical teaching to the COMPASS curriculum and dispersed campuses. **BELBECK, Larry**. McMaster University, Hamilton, ON, Canada.

051   Anatomic pitfalls in clinical practice. **GER, Ralph**, and Kathy DOOLEY. Albert Einstein College of Medicine, Great Neck, NY 11020, USA.

052   Authentic assessments in gross anatomy at LECOM. **BATEMAN, Mathew**, Bertlan DUDAS, Jonathan KALMEY, Randy KULESZA, Theodore MAKOSKE, and Mark TERRELL. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA.

053   Case-based learning strategies in LECOM's medical gross anatomy lectures. **KALMEY, Jonathan**, Mathew BATEMAN, Bertlan DUDAS, Randy KULESZA, Theodore MAKOSKE, and Mark TERRELL. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA.

054   Efficacy of on-line mastery quizzes in dental anatomy. **LEE, Lisa**, and Douglas GOULD. The Ohio State University, Columbus, OH 43210, USA.

055   Longitudinal study of online lecture use and performance in a gross anatomy and embryology course. **NIEDER, Gary**, and Nicole BORGES. Wright State University Boonshoft School of Medicine, Dayton, OH 45435, USA.

056   Musculoskeletal exam review course using both cadavers and live volunteers. **DOWNIE, Sherry**, Todd OLSON, and Maya THERATTIL. Albert Einstein College of Medicine, Bronx, NY 10461, USA.

057   Peer teachers introducing anatomy to first year medical students. **KIENE, Jason**, Barbara FREEMAN, Ray LASEK, and Susanne WISH-BARATZ. Case Western Reserve University, School of Medicine, Cleveland, OH 44106, USA.

058   Plasticast: a podcast of plastinated specimens to illlustrate facial anesthesia techniques. SATTI, Uzma, Peter ABRAHAMS, Stephen BRYDGES, Emma ESQUILANT, Ann-Marie FEELEY, and **Gregory SMITH**. University of Warwick, Coventry CV4 7AL, United Kingdom.

059   Reinvigorating scientific preparation of physicians: Scientific Foundations for Future Physicians. **DALLEY, Arthur**, and Dee SILVERTHORN. Vanderbilt University School of Medicine, Nashville, TN 37232, USA.

060   Semantic groups in the anatomical lexicon of Modern English. **TAM, Matthew**, and Tom TURMEZEI. The Radiology Academy, Norwich NR4 7UB, United Kingdom.

061   Teaching neurologic localization skills using a
        team-based learning module. **PEARSON, John**. Wright
        State University Boonshoft School of Medicine, Dayton,
        OH 45435, USA.

062   The efficacy of team-based learning in histology.
        BROKAW, James, and Keith CONDON. Indiana
        University School of Medicine, Indianapolis, IN 46202,
        USA.

063   The University of Michigan gross anatomy web site: A
        decade of experience. **GEST, Thomas**. University of
        Michigan Medical School, Ann Arbor, MI 48109, USA.

064   Is fascia an organ? **BENNINGER, Brion**. Oregon
        Health and Science University, Portland, OR 97239,
        USA.

065   Student surveys to help enhance virtual microscopy
        histology course. **TODD, Gordon**, and Shantaram
        JOSHI. University of Nebraska Medical Center,
        Omaha, NE 68198, USA.

066   Gross anatomy lab teaching environment to maximize
        learning. **TODD, Gordon**. University of Nebraska
        Medical Center, Omaha, NE 68198, USA.

067   Using the FISH business model to motivate the
        millennial generation in the anatomy classroom.
        BRUECKNER, Jennifer, Steve EVANS, Ilva IRIARTE,
        and Donna WEBER. University of Kentucky College of
        Medicine, Lexington, KY 40506, USA.

068   Do teachers and learners have equivalent mastery of
        subject matter when students peer teach? **BEALE,
        Elmus**, Asa BLACK, Dietrich BUSSELBERG, Herb
        JANSSEN, David OSBORNE, David STEELE, Patrick
        TARWATER, and Susanne VAN WEELDEN. Paul L.
        Foster School of Medicine, El Paso, TX 79905, USA.

069   Characteristics of effective and scholarly anatomy
        teaching: An imperative for the 21st century.
        TERRELL, Mark, Mathew BATEMAN, Jon KALMEY,

and Randy KULESZA. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA.

070   AnataChat: Benefits and pitfalls of using a chatroom to complement a medical gross anatomy course. **WARD, Peter**, and Jandy HANNA. West Virginia School of Osteopathic Medicine, Lewisburg, WV 24901, USA.

071   Medical students as gross anatomy instructors - The Anatomy Graduate Teaching Assistant Program. **WARD, Peter**, Robert FISK, and Jandy HANNA. West Virginia School of Osteopathic Medicine, Lewisburg, WV 24901, USA.

072¶   Medical students show limited use of computer-aided instruction in studying gross anatomy. **CHATTERJEE, Allison**, and James WALKER. Basic Medical Sciences Department, Purdue University, West Lafayette, IN 47907, USA.

073¶   Side-by-side simultaneous use of 3D cross sectional cadaver, normal and pathological CT/MRI imaging. **ROSS, Allen**, and Brion BENNINGER. Oregon Health and Science University, Portland, OR 97239, USA.

074¶   The use of plastinated brain cross-sections improves understanding of three-dimensional neuroanatomy. **GREENE, Sarah,** Frank DALY, Maureen ESTEVEZ, and Todd HOAGLAND. Boston University School of Medicine, Boston, MA 02118, USA.

Back/Pelvis:
075¶   Creating a 3D virtual pelvis from a computed tomography DICOM dataset. **KENZ, Eric**, and Kenneth H. JONES. Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

076   Anterior neurovascular relationships to the lumbar intervertebral discs and their morphometry. COMERT, Ayhan, Mehmet ARSLAN, Halil Ibrahim ACAR, Mevci OZDEMIR, Alaittin ELHAN, Ibrahim TEKDEMIR, **R. Shane TUBBS**, Ayhan ATTAR, and Hasan Caglar UGUR. Ankara University Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey.

077   An unusual Iliac fossa venous plexus. **BEST, Irwin**.
       Emory University Hospital, Atlanta, GA 30322, USA.

078   Artery of Adamkiewicz variations and clinical
       implications for interventional pain management.
       DOWNIE, Sherry, John HOUTEN, Marek KUROWSKI,
       Todd OLSON, Binod SHAH, and Mark THOMAS.
       Albert Einstein College of Medicine, Bronx, NY 10461,
       USA.

079   Automating requests for anatomical specimens.
       MUELLER, Dean, Mary BERNIER, Shiow-Hwa GAU,
       Thomas GEST, and Jianfeng WANG. University of
       Michigan Medical School, Ann Arbor, MI 48109, USA.

080   Comparison of embalming techniques and solutions
       used at the University of California. **WACKER,
       Charlotte**, Natalie LIQUORI, and Elizabeth MEGELIN.
       University of California, Davis, Body Donation Program,
       Sacramento, CA 95817, USA.

081   Competing for whole body donations in a free market
       system: one medical school's approach. **McARTHUR,
       Angela**, and David LEE. University of Minnesota,
       Minneapolis, MN 55455, USA.

082   Gift body program biographical data at Kansas City
       University of Medicine and Biosciences. **THOMAS,
       Pamela**, Gretchen DUNFORD, and Sara PYLE.
       Kansas City University of Medicine and Biosciences,
       Kansas City, MO 64106, USA.

083   Serological testing to reduce risk in the University of
       California's whole body donation programs. **SCHMITT,
       Brandi**, Mark BROOKS, Andrew CORSON, Dean
       FISHER, Herb HAWLEY, and Charlotte WACKER.
       University of California, Oakland, CA 94607, USA.

Abstracts

ACAR, Halil Ibrahim, Ali Firat ESMER, S. Tuna KARAHAN, Tulin
SEN, and Eray TUCCAR. Ankara University, Faculty of
Medicine, Department of Anatomy, Ankara 06100, Turkey.

Arterial vascularization of the anterior perforated substance.

Object: Arteries of the anterior perforated substance (APS) are important because of their role in blood supply of the important structures such as the internal capsule, putamen and caudate nucleus. The purpose of this study was to investigate the arteries of the APS. Methods: The arteries of the APS were investigated in 60 cerebral hemispheres from 30 formalin fixed adult cadaveric brains. The dissections were performed using microsurgical instruments and a surgical microscope. The numbers and the origins of the arteries of the APS were investigated. Results: The branches of the middle cerebral artery (MCA) which penetrated the APS are known as the lateral lenticulostriate arteries (LLAs). The average number of LLAs arose from the M1 segment of the MCA was found seven (min:4, max:11) in all specimens. The branches of the anterior choroidal artery which reached the APS were seen in all specimens. We found 1-3 branches which arose from A2 segment of anterior cerebral artery (ACA) to APS in all hemispheres. And also, 1-3 branches originated from A1 segment of ACA were seen in 48 hemispheres. In addition, two accessory MCAs (accMCA) originated from the A2 segment of the ACA were recorded as a variation and their perforating branches to APS were observed. Conclusion: Some complications like motor deficits can occur due to injuries of these arteries. Therefore the neurosurgeons must be aware during operations such as aneurysm or insular tumor surgeries.

APAYDIN, Nihal, Ayse KARATAS, Marios LOUKAS, R. Shane TUBBS, and Aysun UZ. Ankara University School of Medicine, Ankara 06100, Turkey. Regional anatomic structures of the elbow that may potentially compress the ulnar nerve.

Ulnar nerve compression at the elbow is the second most common compression neuropathy of the upper limb. Traumatic injuries to the ulnar nerve at the elbow are a frequent problem as it is vulnerable to stretching and compression with motion of the upper limb. Although the anatomical course of the ulnar nerve at the hand and wrist has been studied previously, potential compression sites at the elbow have not been well defined. The aim of the present study was to explore the course of the ulnar nerve at the elbow and forearm and to determine possible anatomical structures that may cause compression of this structure. Such pathological entities include fibrous bands, fascial thickenings or neurovascular anomalies and these were examined in 12 cadaveric upper limbs. The length of any fibrous

bands and if present, their distance to the medial epicondyle was recorded. On five sides a fibrous band originating from the medial intermuscular septum was observed to cross over the ulnar nerve. The average length of the fibrous band was 5.7 cm and it attached to the medial epicondyle. The mean length of the ulnar nerve as it coursed in the cubital tunnel was 3.8 cm. In 4 of the cases, the ulnar nerve was covered by muscle fibers originating from the flexor digitorum superficialis and extending to the flexor carpi ulnaris. On five sides, we observed fibrous thickenings and on 8 sides, vascular structures were found crossing over the ulnar nerve. Knowledge of possible compression sites of the ulnar nerve is important to the surgeon so that complications are avoided and postoperative recurrence is decreased.

BARRETT, Richard, and Brion BENNINGER. Oregon Health and Science University, Department of Integrated Biosciences, Portland, OR 97239, USA. <u>Adapting a head and neck lymph node classification that integrates anatomy and clinical terminology.</u>
The current classification of head and neck lymph nodes lacks a standardized system that integrates both basic anatomy and clinical relevance. Currently, anatomy texts, atlases, and journals used to educate future health care professionals use a classification system that differs with the commonly used clinical nomenclature. As a result, student trainees entering the professional world are confused by lymph node terminology. The purpose of this study was to suggest a lymph node classification system that accurately reflected anatomy and clinical applications. A literature search was conducted on anatomical and clinical texts, atlases, journals and websites. Results revealed two reoccurring classification themes from anatomical texts and atlases: 1) superficial and deep chains, 2) grouped by local anatomical structures. Since 1989 the clinical specialties use a Roman numeral "level"™ system. The differences between anatomical and clinical classification systems, has led to academic frustration. Following an analysis, we developed a functional classification system, which integrated anatomical and clinical terminology from the current classification systems. Our suggested system revises the clinically accepted "level system" approved in 1989 and replaces the terminology with an anatomically-derived naming system. We feel that this system satisfies the need for a means of classification that unifies anatomy and clinical applications.

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BATEMAN, Mathew, Bertlan DUDAS, Jonathan KALMEY, Randy KULESZA, Theodore MAKOSKE, and Mark TERRELL. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA. Authentic assessments in gross anatomy at LECOM.

Authentic assessment is rooted in the ability of the learner not only to be audited in their knowledge and understanding, but should be used to educate and improve the student's performance and product. In designing assessments that seek to improve a student's performance, the student must integrate and effectively use knowledge to perform tasks that mimic work in the "real" world. Through the use of such assessments in gross anatomy lectures and laboratories, the faculty is able to deliver assessments that are meaningful to students and provide formative feedback for improving future performances. The implementation of assessment strategies such as collaborative assessments, round-robin oral laboratory quizzes, and an oral component of the lab practical give the students an opportunity to practice what is expected of them in ways that reflects the true collaborative nature of the healthcare setting. Assessment strategies such as oral examinations and clinically relevant second order questions in the laboratory, enhances the student understanding of concepts by requiring them to integrate material from the laboratory and lecture setting. Also, through the use of oral examinations students develop the ability to articulate difficult concepts to their peers, which enhances their ability to communicate in a healthcare setting. In providing authentic assessment strategies throughout the anatomy curriculum, students are better able to assess their own performance while improving understanding.

BEALE, Elmus, Asa BLACK, Dietrich BUSSELBERG, Herb JANSSEN, David OSBORNE, David STEELE, Patrick TARWATER, and Susanne VAN WEELDEN. Paul L. Foster School of Medicine, El Paso, TX 79905, USA. Do teachers and learners have equivalent mastery of subject matter when students peer teach?

The basic science curriculum at the Paul L. Foster School of Medicine is organized by systems and presented in the context of 120 clinical presentations (why people present to the doctor). In the gross anatomy lab we seek to teach anatomy as well as other essential physician skills including professionalism, teamwork, critical thinking, hypothesis building, and life-long-learning. A Students-Teaching-Students (STS) model

will be used to foster these skills. In this model, students select partners who will alternate their attendance in lab. In addition, half the class will dissect the lower limb while the other half will dissect the upper limb. In each case, the students who do a given dissection (referred to as the "teachers") will teach their partners who did not attend the lab and did not do the dissection (the "learners"). Thus each student alternates his/her role as teacher/learner. Versions of the STS model described here are commonly used in teaching gross anatomy. However there do not appear to be any quantitative assessments of its efficacy. We will test the hypothesis that teachers and learners attain equivalent mastery of anatomy subject matter under the STS paradigm. We will evaluate this method in a study beginning with the freshman class matriculating in 2009. Individual student scores on each exam question will be recorded with respect to their status as teacher or learner on the item being tested in that question. This longitudinal, repeated crossover study design thus uses each student as his/her own control because students alternate in their roles as teachers or learners. As an additional control, the performances of the same students will be monitored in physiology lab where the STS model is not used.

BELBECK, Larry. McMaster University, Hamilton, ON, Canada. <u>Adaption of anatomical teaching to the COMPASS curriculum and dispersed campuses.</u>
The McMaster Medical program has transitioned from a self directed problem based program to a Concept-based, Multidisciplinary, Problem-based, Accessible electronically COMPASS curriculum. Two additional campuses have been developed with the COMPASS curriculum. Anatomy resources have evolved to increase Medical Imaging, Pathoanatomy and Pathophysiology at the introductory level and to increase the capability of surgical skills for senior students and residents. In order to disseminate information to dispersed sites, we converted our laboratory from a modular design that covered traditional anatomy to a flexible open concept teaching area supported by libraries of specimens. Small surgical suites are being constructed adjacent to the main anatomy lab that will allow resident teaching, continuing education and undergraduate Pathoanatomy and student project dissections. The delivery of information has changed from a preceptor for small groups to a presentation centre capable of presenting anatomical specimens to a broader audience. In addition, the presentation can be captured electronically and disseminated at later dates.

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BENNETT, Greg, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA. The root of dental anatomy: A case for naming Eustachius as the father of dental anatomy.

It is believed the title, "Father of Dental Anatomy," has yet to be bestowed upon any anatomist. When one considers the names of those whose effect on dentistry has reached far beyond their lifetimes, we often think of Fauchard, Wells, Morton and Black. Another name that deserves to be mentioned among the pantheon of these greats is Bartholomaeus Eustachius. The purpose of this study is to investigate the impact on dental anatomy by Eustachius. Comprehensive literature review was conducted on historical texts, journals and websites. Results revealed no individual has been identified as the "Father of Dental Anatomy". However, two names were found that deserve consideration. Da Vinci was the first to write about dental anatomy. Unfortunately, his writings on the subject were lost for centuries. Eustachius was the first to publish a treatise on dental anatomy, Libellus de Dentibus, in 1563. The Medical Heritage Society, mid 1970's, named Da Vinci the first oral anatomist. His works are older than those of Eustachius; however, since they were lost, they had little effect on dental anatomy. The contributions of Eustachius are legion, and through them he gave us our first thorough look at dental anatomy. His many discoveries include his elucidation of the periodontal membrane, the explanation of the difference between enamel and dentin, the first description of the dental pulp and its role in sensation within the teeth. Though Da Vinci has been named the first oral anatomist, Bartholomaeus Eustachius should be named the "Father of Dental Anatomy."

BENNINGER, Brion. Oregon Health and Science University, Portland, OR 97239, USA. Cleidocranial dysplasia, integrating embryology and anatomy to provide an accurate clinical diagnosis.

Cleidocranial dysplasia (CCD) is a well-defined skeletal disorder with characteristic signs and symptoms and is an autosomal dominant disease. It is distinguished by clavicular hypoplasia, aplasia, dental anomalies, delayed ossification of cranial sutures and fontanelles. Although the clavicle resides in the thorax and the mandible in the head region, these two affected structures are linked. Both ossify intramembranously and begin ossification during the 5th and 6th weeks of fetal life respectively. A case of

an active 17 year old female presented to her dentist at age 12 with teeth becoming "crooked." Panoramic images of the mandible demonstrate retention of deciduous dentition with delayed eruption of permanent teeth. An astute dentist examines her shoulder contour and asks if she can touch her shoulders together anteriorly. The patient performs the procedure effortlessly. A chest X-Ray revealed absent clavicles and shortened ribs. A thorough patient history includes a positive family finding (great aunt) and delayed anterior fontanelle closure. This patient was not advised to refrain from any activity and went on to perform gymnastics. There is a wide range of severity of skeletal deformities with CCD. Caregivers for young children/infants with absent clavicles and altered rib morphology must be alert to respiratory distress due to a narrow thorax. As the children age, they must be aware of dangers of combative activity (sports and jobs with aggressive physical contact) because the subclavian vessels are at risk. This case report highlights the importance of integrating embryology and anatomy to be an efficient and safe clinician.

BENNINGER, Brion. Oregon Health and Science University, Portland, OR 97239, USA. Cottle's test and sign, associated history and clinical anatomy of the nasal valve.
Maurice H. Cottle (1898-1981) has been referred to as the father of modern rhinology. He pioneered several techniques associated with the "nasal valve." The nasal valve is located within the nose and is not formally recognized by the terminologia anatomica, nor is it found in conventional anatomy texts. During quiet breathing, Cottle's test is performed by placing fingers on the cheek and drawing it laterally from the midline, thus opening a region of the nasal valve. A literature search was conducted using journals, texts and websites to investigate Cottle's test, sign and the anatomy of the nasal valve. Results revealed Heinberg and Kern in 1973 discovered an examination procedure that made breathing easier on the side the test was performed. They named it Cottle's test. Mink, in 1903, first described the nasal valve. Cottle's test and sign, used universally by rhinologists, represents integrity of the nasal valve. The nasal valve is further divided into internal and external valves. When clinicians use the term nasal valve, this usually refers to the internal valve. The internal valve is also known as the limen vestibuli or the os internum. Testing has proven that this is the narrowest point of the nasal cavity marking the division between the external naries and the external turbinates. The

external and internal valves are assessed clinically as separate entities. Each valve works as a collective unit and has clinical relevance regarding the pathology of the nose. In conclusion, Cottle's test was discovered by Heinberg and Kern and has stood the test of time. The nasal valve has two distinct anatomical regions, which perhaps warrant formal recognition in anatomy texts due to its clinical relevance.

BENNINGER, Brion. Oregon Health and Science University, Portland, OR 97239, USA. <u>Integrating historical lines of D.B. McGrigor, teaching clinical osteology and imaging of the face.</u> Teaching the superficial face during a head and neck or general anatomy course normally consists of dissecting the layers of the facial skin away from the underlying muscles of facial expression. Atlases that highlight the bones with animated colors and human or plastic skulls teach osteology. Imaging of the facial skeleton generally consists of a simple AP roentograph. Upon qualification, healthcare professionals are expected to navigate the facial anatomy which initially appears a simple task until they realize the multiple areas of the face that become injured from various energy mechanisms. The purpose of this study was to integrate an approach to learn the clinical anatomy of the facial skeleton while using a technique that would enable a healthcare provider to diagnose the majority of trauma injuries with their anatomical knowledge. We investigated the historical "lines" described by Brigadier General D.B. McGrigor regarding the radiology of war injuries and wounds of the face and jaw. A questionnaire was used to ask if fourth-year medical and dental students were confident with the anatomy of the facial skeleton. Results revealed the lines of McGrigor can be used both for identifying the clinically relevant anatomy and devising a safe technique to read images of the facial skeleton. He devised a system by drawing lines from left to right across the facial skeleton. Each line is associated with clinically relevant anatomy and allows the clinician to confidently diagnose trauma to the facial skeleton. In conclusion, learning McGrigor's lines allows one to successfully navigate the anatomy in search of pathology of the facial skeleton.

BENNINGER, Brion. Oregon Health and Science University, Portland, OR 97239, USA. <u>Is fascia an organ?</u> Classically, fascia is recognized as connective tissue, translating from Latin as a "band or bandage" or "a wisp of cloud." Fascia is often divided into superficial (SF) and deep (DF) categories. SF,

aka the adipose, hypodermis or panniculus, is a loose, aereolar fascia with abundant adipocytes. DF is predominantly characterized by dense more linearly organized collagenous fibers. Fascia is typically discussed as a "static" structure. Further investigation reveals a highly variable tissue with numerous functions and clinical importance. An organ is a relatively independent part of the body that carries out one or more special functions. This study's purpose is to investigate whether fascia should be labeled an organ of the body. A literature search of anatomical and clinical texts, journals and websites was carried out to assess the definition, structure, classification and function of fascia and organs. Thirty-two cadavers were dissected to identify fascia and its basic types. Results revealed an assortment of definitions for fascia. Besides adipose cells, the SF was replete with its own nerves, vessels, lymphatics and elastic dynamic connective tissue. DF demonstrates free and encapsulated nerve terminations (Ruffini and Pacini corpuscles). Body shape, compartment integrity, contraction, and proprioception were some functions. Also, our results revealed that fascia is a dynamic tissue which has 3 basic categories: 1) superficial, 2) intermediate and 3) deep. Regardless the source of organ definition, fascia satisfied its requirements. In conclusion, this study suggests that fascia be listed as an organ and further work be conducted regarding its classification.

BENNINGER, Brion. Oregon Health and Science University, Portland, OR 97239, USA. The Strickland stone: the role of a clinical anatomist with anthropology, geology and physics.
The Strickland Stone is a basalt boulder discovered in Portland, Oregon in 1929. The stone has two distinct impressions on opposite sides of its surface. The two areas have been identified by geologists as a connecting vesicle pipe caused by gas trapped in the stone during formation. The larger impression appears to be a shod human footprint. The projected age of the rock from initial inspection was outside the time frame of human existence. The purpose of this study was to provide empirical evidence to a geologic anomaly by using anatomical research, physics and anthropological theories to present the probability of human existence in North America over 1 million years ago. We measured the footprint and compared it to anatomical samples, identified pressure points to determine weight distribution and performed CT scans. Samples were taken for geochemical and geometrical dating. We used the Leidenfrost Effect (physics) for

the vesicles and current anthropology for human identification. The footprint equates to a men's shoe size 7, with a projected height of 5'. CT scans reveal identifiable bone pressure deformations within the short surface vesicles caused by the Leidenfrost Effect. The pipe vesicle theory was eliminated. Geometrical dating established an age of 1.18 -1.14 million years, the era of Homo erectus. Further anatomical modeling and pressure mapping will support our position and challenge conventional anthropological theories.

BEST, Irwin, Emory University Hospital, Atlanta, GA 30322, USA. An unusual Iliac fossa venous plexus.
Suprapubic varicosities are quite rare. In younger patients, a congenital or acquired developmental anomaly should be suspected when such an unusual collateral pathway develops. A thorough initial clinical evaluation is helpful in planning diagnostic and therapeutic interventions as illustrated. Method: A 21-year-old presented with a two-month complaint of pain in both iliac fossae and suprapubic tenderness particularly after vigorous lower extremity exercise. Duplex ultrasound was negative for deep venous thrombosis. Past medical history revealed prematurity at 26 weeks, prolonged postnatal ICU course, cardiac arrest, and several intracranial shunts for hydrocephalus. Physical examination revealed a large subcutaneous venous plexus over the pubis and tenderness from the medial right upper thigh, suprapubic area, and left medial thigh. Results: Magnetic Venous Imaging defined the location and status of the feeding and outflow vessels. Venography defined the most practical approaches for treatment. Conclusion: The skin and superficial fascia of the penis/clitoris and pubic region drain into the superficial external pudendal vein and deep external pudendal veins are unimportant in clinical practice. These tributaries connect to the femoral vein or the greater saphenous veins. The right external iliac vein was hypoplastic. The right iliofemoral venous system was treated with venoplasty and stents before removing these essential tributaries from the circulation. Longstanding subclinical hypoplasia of the right iliofemoral system was aggravated by vigorous physical training.

BEST, Irwin, and Mike BOSLEY. Emory University Hospital, Atlanta, GA 30322, USA. Fracture and embolization of a subclavian port catheter.
Central venous catheters have become ubiquitous in current medical therapy. Annually, approximately five million central lines

are inserted in the USA. Catheter fracture and separation have been most often associated with a left subclavian venous access. When catheter malfunction is suspected, further evaluation is needed to verify continuity. Method: A 56-year-old woman presented for a subclavian port evaluation before resuming outpatient chemotherapy for a recurrent pelvic malignancy. This well established and previously functioning port could not be aspirated in the outpatient clinic. Fluoroscopic evaluation revealed a missing left subclavian port catheter. The port reservoir was noted in the infraclavicular area. The catheter was found in the region of the right pulmonary artery. From a right femoral approach, the catheter was retrieved from the pulmonary artery with a gooseneck snare. No thrombus was noted in the pulmonary artery. Discussion: Catheters placed into the subclavian vein between the first rib and the clavicle are more likely to become disrupted than at other locations. In theory, the subcutaneous route to the internal jugular veins might not be subject to these stresses. However, acute angulation and failure might also result. Conclusion: Blood withdrawal from the port before use remains the simplest test for patency, continuity, and function of indwelling ports and catheters. When aspiration fails, prompt evaluation is needed to prevent further complications.

BROKAW James, and Keith CONDON. Indiana University School of Medicine, Indianapolis, IN 46202, USA. The efficacy of team-based learning in histology.
Team-Based Learning (TBL) is an instructional strategy in which traditional lectures are replaced with in-class activities that promote group discussion and active learning. Students are expected to master the basic facts and concepts of the subject matter prior to coming to class. We sought to determine whether the knowledge obtained using TBL is comparable to that obtained using traditional lectures, and whether students have a preference for either instructional method. From 2006-2008, the students in a graduate histology course were taught the structure and function of the basic tissues using TBL. Other topics in the course were taught using lectures, so the students experienced both instructional methods. Using the same 59 multiple-choice questions, we tested the students' knowledge about the basic tissues, and compared the results to those obtained in 2005, when the basic tissue material was taught using lectures. In 2006-2008, the mean ± SD exam performance after TBL (87.5 ± 7.5, n = 32; 83.9 ± 11.1, n = 36; 78.9 ± 13.2, n = 24) was similar

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to that observed in 2005 after lectures (82.7 ± 12.0, n = 39). When asked to respond to the statement, "I prefer TBL sessions rather than traditional lectures", 40.4% of the students agreed or strongly agreed, 23.4% disagreed or strongly disagreed, and 36.0% had no opinion (89 of 92 students responding). These results suggest that TBL and lectures produce comparable learning outcomes, at least as measured on a multiple-choice exam, and that students have a mild preference for the TBL format.

BROWN, Paul, and Robert CHASE. Stanford University School of Medicine, Stanford, CA 94305, USA. Progress report on the e-Human Project.
This presentation updates the computer based e-Human Project for the online study of human gross anatomy. It displays images from the Stereo Atlas of Human Anatomy by David L. Bassett. These images, selected by Bassett for a Student Atlas of Human Anatomy (never published), are presented with interactive labels, annotations and voice descriptions of each structure. There is a fully incorporated Quiz mode. In addition to Bassett images there are many motion sequences making use of new imaging technologies. For example, one may selectively explode the skull into its many bones from any perspective. These bones may be morphed from bone to X-ray in any position during viewing. The user may build a skull one bone at a time. The course of the cranial nerves is displayed in relationship to the skull. Visual tours of the body are also possible. The project is ideal for self study by students learning at their own pace. They may continue to review anatomy after structures have been sacrificed in the laboratory. The program remains a permanent resource of information after the student completes the anatomy course. It also is a resource for anyone interested in human anatomy. The program will be server based but will also be available on the Mac IPhone.

BRUECKNER, Jennifer, Cady BLACKEY, and Lisa PURDY. University of Kentucky College of Medicine, Lexington, KY 40506, USA. Mastering structural and developmental anatomy through Kirigami.
Mastering the three dimensional relationships of structural and developmental anatomy is one of the most challenging tasks facing any first year health professional student. While the gross anatomy laboratory is an effective means by which to appreciate the spatial relationships of many anatomical regions, it does not

provide meaningful assistance with regions such as the middle ear and the pterygopalatine fossa. The resources for presenting the three dimensional relationships of the embryo are even more scarce, necessitating the development of an educationally sound, cost effective system of embryology models. Kirigami techniques provide this type of system. Kirigami is an art form which is a combination of origami, or paper folding, and paper cutting. We introduced kirigami models into a first year gross anatomy and embryology course for a variety of structural and developmental anatomical systems and evaluated their efficacy. One hundred percent of students used the adult kirigami models, rating them an average of 4 on a 5 point scale. Thirty six percent of the class used the embryology kirigami models, rating them an average of 3 on a 5 point scale. The difference in student use and satisfaction of kirigami in gross versus developmental anatomy was the level of model use and reference during the lecture period on the topic of interest. In addition to incorporating the embryology models into lectures, we are also developing pathological correlate models to encourage use of this meaningful learning tool.

BRUECKNER, Jennifer, Steve EVANS, Ilva IRIARTE, and Donna WEBER. University of Kentucky College of Medicine, Lexington, KY 40506, USA. Using the FISH business model to motivate the Millennial generation in the anatomy classroom.
As the Millennial generation enters our classrooms and laboratories, it brings a novel set of expectations and challenges for the anatomy educator. The Millennials have been described as sociable, optimistic, talented, well-educated, collaborative, open-minded, influential, and achievement-oriented. In order to motivate Millennial learners, educators should provide structure and supervision, a fun, flexible learning environment where their perspectives are valued and respected. One approach to integrating these principles into the anatomy classroom is the FISH business model, born out of the Pike Place Fish Market in Seattle, Washington. The fishmongers at Pike market work long, grueling hours but maintain an upbeat positive work environment that inspires workers and customers alike. This model, known as the FISH! Philosophy, is defined by four main ideas that can be easily applied to nearly any work or educational situation: be there, play, make their day, and choose your attitude. This poster will use Blooms taxonomy to address the FISH model in anatomy education. The four FISH principles will be outlined, as they apply to anatomy education. FISH classroom initiatives will

be identified, compared and illustrated, with personal instructional strategies that model the Fish Philosophy. Finally, the FISH teaching methods will be evaluated and the benefits and disadvantages will be discriminated.

BURGOON[1], Jennifer M., and Noelle A. GRANGER[2]. [1]The Ohio State University, Division of Anatomy, Columbus, OH 43210, [2]The University of North Carolina, Department of Cell and Developmental Biology, Chapel Hill, NC 27599, USA. <u>Self-efficacy's influence on the academic achievement of medical students in gross anatomy.</u>

The purpose of this study was to investigate the influence of self-efficacy for the anatomy curriculum on the academic performance of students enrolled in a medical gross anatomy course. Anatomical self-efficacy is defined as an individual's judgment of his or her ability to successfully complete tasks such as dissecting, learning anatomical concepts, and applying anatomical knowledge to clinical situations. To obtain students' anatomical self-efficacy ratings, four surveys containing the same anatomical self-efficacy instrument were completed by first-year medical students (n = 157) after each examination during a gross anatomy course. Additional data collected included demographic information, MCAT scores, and anatomy exam scores, both written and laboratory practical. To investigate a possible relation between anatomical self-efficacy and academic performance on each exam, hierarchical linear regression analyses were conducted. The potential predictive nature of self-efficacy for academic performance was investigated twice for each exam, once for the written examination component and once for the laboratory practical component. For these analyses, academic ability, defined as the sum of the physical sciences and biological sciences MCAT scores, was controlled. The results of the hierarchical linear regressions indicated that all four laboratory practicals scores were predicted by the corresponding self-efficacy ratings, while two of the four written exams scores were predicted by the corresponding self-efficacy ratings ($p < 0.05$). [This project was supported by the Fund for the Development of Post-Secondary Education, US Department of Education.]

CHATTERJEE, Allison, and James WALKER. Basic Medical Sciences Department, Purdue University, West Lafayette, IN 47907, USA. <u>Medical students show limited use of computer aided instruction in studying gross anatomy</u>.

Previous studies (Ward and Walker, 2008) have indicated that students studying gross anatomy achieved the highest level of success by using a variety of learning resources and studying methods. In the current study we assessed the use of computer aided instruction (CAI) by gross anatomy students at the Indiana University School of Medicine (IUSM). We distributed a survey to the regional centers of the IUSM. The overall response rate was 51%. On average, 43% of students reported daily use of PowerPoint presentations, Internet browsing, and email. PowerPoint presentation software and school based learning management systems such as Blackboard Vista and Angel were ranked "very useful" by over 60% of students. Across the various regional centers, there were variations in the perceived usefulness of the resources, which likely reflect the unique approach to teaching and learning at each campus. Almost sixty percent of students reported that they never used any type of CD/DVD ROMs to study gross anatomy. Furthermore, a majority of students were either unaware of, or did not use any of the commercial computer applications that are currently available. A notable exception was seen at the IUSM Lafayette campus where almost half of the students reported using the Visible Human Dissector several times a week. Our studies reveal that first year medical students at the IUSM make limited use of CAI to study gross anatomy. These results may be important in future decisions regarding the development of alternative learning resources.

CHUNG, Min Suk. Department of Anatomy, Ajou University School of Medicine, Suwon 443-749, Republic of Korea.
Outlining of the detailed structures in sectioned images from Visible Korean.

Sectioned images of cadavers enable the creation of realistic three-dimensional (3D) models. In order to build a 3D model of a structure, the structure has to be outlined in sectioned images. As this outlining is time consuming, users want to be provided with outlined images, and the more detailed structures are outlined, the more widely can the outlined images be utilized. In the Visible Korean, sectioned images (intervals 0.2 mm) of a male cadaver's whole body were prepared. In the available 1,702 sectioned images (intervals 1 mm), 850 structures were outlined interactively on Photoshop over a period of seven years. The outlined images were changed into black-filled images of each structure; the black-filled images were decided to distribute because their small file sizes made this convenient. We

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investigated whether black-filled images have potential to be applied in different ways. Outlines of these images were interpolated to produce new images at 0.2 mm intervals, and outlines were filled with different colors to acquire color-filled images of whole structures. Volume and surface reconstructions of these black-filled images were used to build satisfactory volume and surface models. The black-filled images accompanied by corresponding sectioned images could provide a source of 3D models for medical simulation systems.

COLLINS, James, Samuel AHN, Alfred CARNES, Hugh GELABERT, and Ernestina SAXTON. David Geffen School of Medicine at UCLA, Los Angeles, CA 90024, USA. <u>Missed cervical ribs on plain radiographs alter management of thoracic outlet syndrome (TOS) patients.</u>
Cervical ribs develop at the C7 vertebra and have an epiphyseal plate, in contrast to elongation of the C7 transverse process. Osseous and musculotendinous abnormalities alter fascial planes in the region of the thoracic inlet. In patients with thoracic outlet syndrome (TOS) the cervical rib enhances costoclavicular compression of the bicuspid valves within the subclavian and axillary veins; the lymphatics; the brachial plexus, and subclavian artery (the neurovascular bundle) in the region of the cervicothoracic spine. Patients present with neurological symptoms such pain; numbness and tingling; weakness of the intrinsic hand muscles, and headache. Cervical ribs are often missed on plain radiographs of the chest and the cervical spine. Bilateral MRI/MRA/MRV displays abnormalities that alter fascial planes and result in costoclavicular compression of bicuspid valves within lymphatics and draining veins of the neck and supraclavicular fossae and the subclavian and axillary arteries with binding nerve roots (JNMA 1999; 91:333-41). Monitored multiplanar images with abduction external rotation and 2D Time of Flight MRA/MRV without contrast were acquired on a 1.5 Tesla GE Signa LX unit, 44 cm field of view, 521 x 256 matrix and saline water bags to enhance signal to noise ratio. We routinely obtain PA and lateral chest and AP cervicothoracic spine radiographs prior to imaging. We present three patients whose cervical ribs were missed on plain radiographs and who underwent surgical procedures for other presumed diagnoses other than TOS and a patient with progressive TOS symptoms after TOS surgery without removal of the cervical rib. Plain radiographs should be obtained on all patients presenting with TOS.

COMERT, Ayhan, Mehmet ARSLAN, Halil Ibrahim ACAR, Mevci OZDEMIR, Alaittin ELHAN, Ibrahim TEKDEMIR, R. Shane TUBBS, Ayhan ATTAR, and Hasan Caglar UGUR. Ankara University Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey. <u>Anterior neurovascular relationships to the lumbar intervertebral discs and their morphometry.</u>

Although infrequent, injury to anteriorly located neurovascular structures during posterior approaches to lumbar intervertebral discs can occur. Therefore, a detailed anatomic knowledge of such anterior relationships may decrease surgical complications. Ten fixed male cadavers underwent posterior exposure of the lumbar thecal sac, nerve roots, pedicles and intervertebral discs. To identify retroperitoneal structures at risk during posterior lumbar discectomy, a transabdominal retroperitoneal approach was performed and observations made. The distances between the posterior and anterior edges of the lumbar intervertebral discs were measured and the relationships between the disc space, pedicle and nerve root evaluated. For left and right sides, the distance from the inferior pedicle to the disc gradually increased from L1-2 to L4-5 (range 2.7 to 3.8 mm and 2.6 to 4.5 mm) and slightly decreased at L5-S1. For left and right sides, the mean distance from the superior pedicle to the disc was more or less the same for all disc spaces (range 9.3 to 11.6 mm and 8.2 to 10.5 mm). The right and left mean disc to root distance for L1-2 to L5-S1 levels ranged from 3.0 to 22.1 mm and 3.6 to 20.6 mm, respectively. The root origin gradually increased from L1 to L5. The right and left nerve root to disc angle gradually decreased from L3 to S1. Disc heights gradually increased from L1-2 to L5-S1 (range 11.3 to 17.4 mm). The mean distance between the anterior and posterior border of the intervertebral discs ranged from 39 to 46 mm for all levels. Based on our study and in order to avoid anteriorly located neurovascular structures, instrumentation should not be inserted into the lumbar disc spaces more than 3 cm from their posterior edge.

DALLEY, Arthur, and Dee SILVERTHORN. Vanderbilt University School of Medicine, Nashville, TN 37232, USA. <u>Reinvigorating scientific preparation of physicians: Scientific Foundations for Future Physicians.</u>

In 2007, the AAMC and Howard Hughes Medical Institute partnered to consider the natural science competencies that graduating physicians need, focusing both on the expanded knowledge base and opportunities for greater synergy and

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efficiency in premedical and medical education. A Scientific Foundations for Future Physicians (SFFP) Committee of 24 biomedical scientists and educators from undergraduate and medical faculty, met 5 times over the last 2 years. Twelve overarching principles spanning all scientific disciplines resulted from their deliberations. The committee recommended 8 general competencies in the biomedical sciences, with associated exemplary learning objectives and illustrative examples, that all medical students should demonstrate before receiving the M.D. degree, and identified 5 broad scientific competencies that learners should master before entering medical school. It was determined that premedical and medical learning should focus on defined competencies rather than on specific courses taken or disciplines studied. The SFFP report debuts as the AAMC is revising the MCAT, the National Board of Medical Examiners revises the USMLE, NSF discusses the undergraduate biology experience in its Vision and Change meetings, and the College Board revises the AP Biology curriculum. The report is presented as a blueprint that can be used by educators to design premedical and medical school educational programs that give learners a scientific foundation for the future practice of medicine. It is intended to initiate a broad dialogue within the undergraduate and medical education communities to reinvigorate the scientific preparation of physicians.

DETTON, Alan, and Douglas GOULD. The Ohio State University, Columbus, OH 43204, USA. Creating an interactive 3D virtual specimen of the human skull from CT datasets.
The objective of this project was to develop an interactive computer program designed to facilitate the study of anatomical relationships of the human skull through the use of a virtual environment. CT images of the head of a human subject were saved as a DICOM dataset. "Volsuite" was employed for surface rendering of the skull data, which were then converted to an obj. file. The obj. file was then brought into Autodesk Maya 2008 to correct imperfections in the 3D model. The object was then segmented and color mapped for labeling with Adobe Photoshop CS3 to provide versatility in the final product."Virtools 4.0" was used to create the interactive virtual 3D skull seen in the final presentation. The virtual environment offers the user the ability to learn anatomical structures through hotspots and roll-over labeling. Some of the selectable features include isolation of right and left halves of the skull, removal of the calvaria, colored presentation of anatomical structures, and transparency modes,

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all of which are capable of user controlled omni-directional rotation, panning, and zoom. A moveable cross sectional plane also presents the user with a comparative image of the initial data represented in a 2D slice at the associated level.

DI LORETO, Michael, Quentin FOGG, and Lance NASH. American University of the Caribbean, Sint Maarten, Netherlands Antilles. Interactions between ligamentous and muscular attachments to the coracoid process.

The coracoid process of the scapula is an important functional and surgical landmark of the shoulder. Functionally the coracoid process provides a proximal attachment site for three muscles and an attachment site for ligaments that provide passive support (directly or indirectly) to the glenohumeral and acromioclavicular joints. Surgically it is an important palpable landmark and is routinely sectioned (coracoidostomy) to provide an enlarged field of access to the anterior aspect of the shoulder. This study aims to clarify the arrangement of this variety of tissues attached to the coracoid process. Cadaveric shoulders (n = 30) were dissected to reveal and define the individual attachments. The muscles attached to the process as distinct individual structures (n = 8; 27%), with the coracobrachialis and biceps brachii muscles combined (n = 16; 53%), and with all three combined (n = 6; 20%). In a majority of cases (n = 20; 67%) the anterior-superior part of the muscle attachments was not attached into the bone, but rather continuous with the coracoacromial ligament. The coracoclavicular ligaments were clearly distinct from the other coracoid attachments. These data define the relationships between muscle and ligament attachments to the coracoid process. The combination of muscles prior to attachment in a high percentage of cases suggests little disruption to their function following restoration of the sectioned coracoid process. The identification of clear connections between these attachments and the coracoacromial ligament may provide a mechanism for postoperative shoulder pain, and is worth further consideration and investigation.

DOSSOUS, Paul-Michel, Estomih MTUI, and Santosh SANGARI. Weill Cornell Medical College, Cornell University, New York, NY 10021, USA. Measurements of pedicles and articular pillars as guidelines for cervical spine fixation.

The study was conducted on eighty-three dried C3 through C6 vertebrae from an American population of cadavers, obtained from the Department of Anatomy and Body Visualization, Weill

Cornell Medical College, to provide statistical data as a parameter for screw fixation in the pedicles and articular pillars of C3-C6 vertebrae. Using a digital stainless steel vernier caliper with 0.01mm accuracy, the measurements were taken for the pedicles and articular pillars. The right pedicles had a mean vertical dimension of 6.226 mm (range: 4.05 mm - 9.33 mm; Standard deviation = 0.915) and a mean transverse dimension of 4.883 mm (range: 3.13 mm - 7.38 mm; Standard deviation =0.835) The left pedicles had a mean vertical dimension of 6.132 mm (range: 3.86 mm - 8.52 mm; Standard deviation 0.885) and a mean transverse dimension of 4.758 mm(range: 1.69 mm - 7.32 mm; Standard deviation = 0.987). The mean transverse dimension of the right articular pillar was 10.625 mm (range: 7.51 mm - 15.36 mm; Standard deviation =1.54) and the mean anterior/posterior dimension was 8.659 mm (range: 4.42 mm - 12.69 mm; Standard deviation =1.53). The left articular pillar had a mean transverse dimension of 10.326 mm (range: 5.99 mm - 13.22 mm; Standard deviation =1.35) and an anterior/posterior dimension of the 8.520 mm(range: 3.88 mm - 11.70 mm; Standard deviation =1.58). There was no statistical difference between thickness of right and left pedicles and the articular pillars. The especially low values of pedicle measurements (1.69 mm) and articular pillars (3.88 mm) should be kept in mind for selecting the screws for cervical spine fixation.

DOWNIE, Sherry, Todd OLSON, and Maya THERATTIL. Albert Einstein College of Medicine, Bronx, NY 10461, USA. A simple method for practicing musculoskeletal injection using cadavers and a novel injection Mmedium.
A variety of methods, ranging from simulator manikins to cadaver courses with fluoroscopic guidance, have been developed to provide physicians the opportunity to practice and improve their therapeutic injection skills. Each method has advantages and disadvantages. Our goal was to create a simple, efficient and inexpensive method to enhance the skills and confidence of Physical Medicine and Rehabilitation residents in performing a variety of therapeutic injections. Using undissected cadavers and a novel injection medium, residents practiced injections of joints, bursae and tendons, as well as peripheral nerve blocks and neurotoxin injection techniques. A physiatrist and an anatomist facilitated the session and senior residents mentored junior residents. Standard surface anatomy landmarks were used to identify the sites for injection. Injections were performed with a disposable syringe and 18 gauge needle using colored gel (red,

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green or blue) with a consistency that minimized diffusion from the site of injection. Three residents, each using a different colored gel, injected into the same joint or region. Subsequently the joint/region was opened and the accuracy of each injection was evaluated by the position of the gel. The gel was inexpensive and easy to use, and provided residents with immediate feedback about their injection accuracy. Residents commented that many of the cadavers had osteoarthritis and other pathologies and thus provided a better representation of the anatomic challenges of the patient population than synthetic models. Resident evaluations indicated that this method improved their skills and enhanced their confidence about performing a variety of therapeutic injections.

DOWNIE, Sherry, John HOUTEN, Marek KUROWSKI, Todd OLSON, Binod SHAH, and Mark THOMAS. Albert Einstein College of Medicine, Bronx, NY 10461, USA. Artery of Adamkiewicz variations and clinical implications for interventional pain management.
BACKGROUND: The artery of Adamkiewicz (AoA), or great radicular artery (GRA), typically originates from one of the left thoracolumbar segmental arteries. The GRA supplies the distal spinal cord and is of vital importance. GRA damage by injection with steroids has been associated with watershed infarctions resulting in anterior spinal artery syndrome. METHODS: The GRA and anterior radiculomedullary arteries were dissected, using an anterior thoracoabdominal approach, on 29 ethnically diverse cadavers. The bodies of the thoracic and lumbar vertebrae were removed by transecting the pedicles with an autopsy saw. The vascular supply of the anterior spinal cord was exposed, and the location and distribution of the arteries recorded. Spinal nerve level corresponding to the GRA, GRA side of origin, GRA length, and the presence of additional anterior radiculomedullary arteries anastomosing with the anterior spinal artery were documented. Gender and ethnicity were also assessed relative to variability. RESULTS: All GRAs originated from T9 to L3 spinal levels. Right-sided GRAs occurred in 6 cadavers (20.7%) and had a suggestive gender and ethnic distribution. GRA length increased cranial to caudal, and anastomosing anterior radiculomedullary arteries occurred in 41.4% of cases. DISCUSSION: There is greater anatomical variation in GRA (AoA) and associated anterior radicular arteries than previously recognized. Failure to appreciate this variation greatly increases the risk of vascular injury and anterior spinal

artery syndrome and complications. Therefore, combining recommended preventive strategies is of vital importance to minimize risk in performing a lumbar transforaminal epidural injection at any level and on either side.

DOWNIE, Sherry, Todd OLSON, and Maya THERATTIL. Albert Einstein College of Medicine, Bronx, NY 10461, USA. <u>Musculoskeletal exam review course using both cadavers and live volunteers.</u>
The lack of anatomic knowledge, basic exam skills, and confidence of junior residents to perform and teach the musculoskeletal exam (MSKE) is widely published. A needs assessment of our physiatry residents indicated similar deficiencies. We developed a course where teams of senior and junior residents simultaneously reviewed anatomy on previously dissected cadavers and practiced musculoskeletal examination skills on living volunteers. The course, consisting of four two-hour sessions, was facilitated by a physiatrist and an anatomist with expertise in kinesiology. In the first three sessions, residents completed flag-type quizzes on previously dissected cadavers and reviewed the principles of normal and pathologic musculoskeletal anatomy. In the fourth session, multiple stations were set-up, each consisting of a cadaver, a living volunteer, and instructions for conducting specific provocative tests. Residents practiced palpation and provocative tests on the volunteers then repeated the tests on the cadavers to clarify the anatomical rationale. Pre- and post-course confidence questionnaires and post-course teaching evaluations were administered. Confidence levels in doing and teaching the MSKE increased for all residents after completing the course. PGY2s showed the greatest increase in performing the MSKE (2.56 to 4.38 on 1-5 Likert scale). Teaching skills of senior residents were rated high on both self (4.05) and peer (4.25) evaluations. 100% of residents felt that integration of cadaver-based anatomy with hands-on musculoskeletal exam practice on living subjects was more useful than previous separate sessions. In the future, pre-and post-course OSCEs will provide objective data about the effectiveness of the course.

ESMER, Ali Firat, Ayhan COMERT, S. Tuna KARAHAN, Tulin SEN, and Eray TUCCAR. Ankara University Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey. <u>The neurovascular relationships of the oculomotor nerve.</u>
In this study, the arterial supply of the initial and the

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subcavernous parts of the oculomotor nerve (ON) and the relationship between the nerve and adjacent vascular structures were investigated. 140 formalin fixed hemispheres were examined. The dissections were performed using a surgical microscope. The nutrient branches, which reached the initial and subcavernous parts of the ON, and penetrating branches of adjacent vascular structures, which penetrated the nerve and passed through it, were investigated. The ON arose from the mesencephalon in all hemispheres and it continued laterally between the posterior cerebral artery (PCA) and superior cerebellar artery (SCA) or between the PCA and rostral trunk of SCA. But in three hemispheres of specimens the ON ran between the rostral and caudal trunks of SCA. We observed that the branches of the P1 segment of PCA supplied the initial part of the ON in all specimens. In one specimen, the initial part of the ON was supplied by a branch which arose from the rostral trunk of SCA. In four hemispheres, the initial part of the ON was perforated by some branches which arose from the PCA or SCA. They perforated the nerve and passed through it differently. We also observed a tortuous caudal trunk of a duplicated SCA. Whereas the rostral trunk coursed normally, the caudal trunk had an abnormal curly pattern as a rare variation. The anatomy of the ON and its vascular relationships is significant for understanding the compression syndromes and vascular dysfunctions of the oculomotor nerve and is necessary for exact diagnosis and treatment.

FERGUSON, Donald G., and Mary Alice DUESTERHAUS MINOR. Clarkson University, Potsdam, NY 13699, USA.
Evaluation of student retention of basic science material in a PBL-based physical therapy curriculum.
The purpose of this project was to revise an existing PBL first semester, Foundation Science PT course by introducing basic science material in the first few weeks. Previously, the course consisted of a series of physical therapy cases that dealt with injuries to a specific joint. Over four class sessions students explored the anatomy, physiology, and kinesiology of the joint; as well as examining pathology and physical therapy management of the injury. Thus, basic science material was mixed in with clinically-related material. A common concern expressed by instructors in subsequent semesters was that the students did not seem to retain a firm grasp of the basic science knowledge and had to review it before proceeding with the more complex details of a particular problem. It seemed possible that

the clinical considerations caught the attention of the students at the expense of the basic science content. The course was modified so that the first six problems focused on a disease or injury of a particular tissue; e.g., bone, tendon, muscle, nerve, and integument. Thus, for the first six cases student learning focused on the tissue with little emphasis on the pathology. The goal of this approach was to oblige students to concentrate on the basic science material thereby acquiring a more solid knowledge base. The success of this project will be evaluated by comparing scores on a basic science quiz of students from classes taught using each approach. In addition, a rating scale will be developed to assess whether instructors in subsequent semesters observe that students demonstrate a better grasp of the basic science material and an improved ability to apply it to complex cases.

FOGG, Quentin, and Brion BENNINGER. University of Glasgow, Glasgow, United Kingdom. <u>Anatomy of the triangular fibrocartilage complex and the progression of ulnar instability syndromes.</u>
The triangular fibrocartilage complex (TFCC) is a complicated and poorly understood series of structures that supports the ulnar carpus. Its damage or displacement is the most commonly suggested cause of various forms of ulnar instability. Despite this, we do not have an accurate mechanism to explain how such instability develops. Much of the problem may lie in imprecise understanding of the anatomy of this area, complicated by numerous detailed studies that mix terminology and lack consistency. This study aims to accurately describe the ligamentous supports of the TFCC in relation to previously described patterns of ulnar instability. Twenty cadaveric wrists were investigated arthroscopically, allowing intra-articular structures to be defined in a clinically relevant context. This also facilitated staging of observed joint disease. These wrists, plus a subsequent 15 (total n = 35) wrists were dissected to reveal the ulnar, radial and carpal connections of the TFCC. Where no or minimal disease was noted, prominent connections were identified along all margins of the TFCC. Cases with advanced degenerative joint disease demonstrated thinner or absent ulna-triquetrum bands. When present and degenerative, the majority of non-disc pathology was localised upon this prominent ulnar band. These data suggest that specific regions of tissues that support the TFCC are involved in the local progression of degenerative joint disease. Whether the failure of these

structures is the cause of ulnar instability or a result of other factors is unknown, and an important area for further investigation.

FOGG, Quentin, Neil ASHWOOD, and Chao WANG. University of Glasgow, Glasgow, United Kingdom. Quantitative morphometric analysis of the triquetrum-hamate joint's articular surfaces.
The triquetrum-hamate joint (THJ) is commonly described as a sinusoidal joint. It is consistently reported as one of the most degenerative joints in the wrist, yet its structure, function and appropriate clinical management is poorly understood. Recent studies have subjectively defined structural differences between subpopulations of each bone forming this joint. This has resulted in the suggestion of two types of each bone. This study aims to quantify the morphometric characteristics of the articular surfaces of each bone. These data will be analysed to determine which features, if any, are capable of differentiating the bone types. Dry sets of carpal bones (n=50) were used for the study. The THJ articular surfaces were reconstructed using a digital microscribe. These virtual surfaces were measured and subjected to a surface curvature analysis. After all of the measures were complete, the dry bones used in the sample population were typed, independent of the reconstructions and measures. The two sample groups were tested against each other. The results suggest statistically significant difference between mean hamate surface area and curvature. This also applies to the triquetral surface area and curvature. Mean distal surface widths were also significantly different between hamate and triquetrum types. These data suggest that current typing methodologies do distinguish between distinctly different sub-populations. This is suggestive of differences in joint motion, which is suggested in a number of biomechanical studies. These results will inform more specific biomechanical investigations and radiologic investigations that may be instructive for identifying the types in a clinical setting.

FOUNTAIN, T. Kenny. Case Western Reserve University, Cleveland, OH 44106, USA. Professional visions of the dead: An ethnography of gross anatomy students' adjustment to dissection.
For centuries, gross anatomy has functioned as the foundation of medicine and the initiation rite through which one becomes a physician. Medical professionals, historians, and social scientists

have described students' experiences in the laboratory as an almost ritual journey from fear and anxiety to eventual acceptance. This gradual acclimatization is often characterized as a process of desensitization, in which students hyper-focus on the body as specimen data and not as a former person. Ethnography, a qualitative method that combines observations and in-depth interviews, offers a promising lens through which to investigate students' perceptions of dissection, particularly complicating a simplistic "desensitization" hypothesis. This presentation reports on a one-year-long ethnography of the Program in Human Anatomy Education at the University of Minnesota, focusing specifically on medical and dental students' coping mechanisms and adjustment strategies as they learn to interaction with and appreciate cadaveric bodies. The results presented draw from an analysis of audio-recorded interviews with 16 first-year medical and dental students and 14 third-year teaching assistants. The data suggests 5 typical coping responses to the first dissection as well as 3 long-term strategies that not only encourage an ease with cadavers but also operate as a type of perception-formation that renders the body as a complex anatomical tool. Specifically, the data suggests that students do not simply become desensitized by dissection but instead, through the practices of the lab, students develop the habitus, or professional vision, of an anatomist which allows them to value simultaneously the body's humanity and its anatomy.

FRANCISCO Margarida. Faculdade de Medicina de Lisboa, 2775 Carcavelos-Lisboa, Portugal. <u>Anomalous "lusoria" subclavian artery.</u>
INTRODUCTION: Anomalous "lusoria" subclavian artery was first described in 1735 by Hanauld, and is estimated to be present in 1% of general population, making it the most frequent thoracic arterial vascular anomaly. METHODS: On a base of a literature review of subjects such as: embryology, anatomy, imagiology, clinics and therapeutics of this anatomical variant are ascertained. RESULTS: The anomalous "lusoria" subclavian artery is considered the most frequent anomaly of the intrathoracic arterial system and results from an anomalous obliteration of the 4th right aortic arch during embryonic development. In consequence, the right subclavian artery emerges from the aortic arch distal to the left subclavian artery crossing the midline to achieve the right arm. This is usually an asymptomatic condition (with occasional dysphagia) and

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discovered incidentally in thoracic radiology or endoscopy. Nevertheless, the origin of this anomalous artery from the aortic arch is usually dilated (Kommerell´s diverticulum) and can achieve aneurismatical dimensions. In this last situation, if not treated, the spontaneous rupture is associated with a high mortality rate (near 50%).This has fomented the imagiologic follow up and development of endoluminal techniques for elective intervention in otherwise asymptomatic patients.

FRANCISCO, Margarida. Faculdade de Medicina de Lisboa, 2775 Carcavelos-Lisboa, Portugal. <u>Left superior vena cava.</u>
INTRODUCTION: The presence of a left superior vena cava is the most frequent thoracic venous anomaly and is estimated to be present in 0.5-1% of the general population, and 5-10% of patients with congenital heart disease. METHODS: On a base of a literature review of subjects such us: embryology, anatomy, imagiology, clinics and therapeutics of this anatomical variant are ascertained. RESULTS: The presence of a left superior vena cava results from a failure in involution of the left anterior cardinal vein during embryonic development. This vessel usually drains through the coronary sinus in the right atrium (more rarely directly in the left atrium causing a right-left shunt). A right superior vena cava coexists in 80% of cases. If not associated with other cardiovascular anomalies, this is typically an asymptomatic condition without significant hemodynamic consequences other than a slightly more frequent incidence of arrhythmias than what is expect in the general population. The diagnosis can be incidentally made in thoracic x-ray examination or due to an enlarged coronary sinus on echocardiographic examination. Sometimes the diagnosis is made during difficulties in central venous catheterization or implantation of intracardiac devices. New cardiovascular imagiologic techniques can have an important impact in the diagnosis of this vascular anomaly as a way of avoiding complications related to cardiovascular intervention and surgery.

GER, Ralph, and Kathy DOOLEY. Albert Einstein College of Medicine, Great Neck, NY 11020, USA. <u>Anatomic pitfalls in clinical practice.</u>
Our Association was founded so that those involved in patient care would have sufficient knowledge in anatomy to prevent errors in diagnosis and in treatment. This expertise should not be learned in the emergency or operating room. (Beahrs, Chase and Ger, 1986). Much has been written to support the fact that

we, as anatomy educators, still have not made sufficient progress in this area. Solutions to this problem appear to be elusive, and it is suggested that a new approach coupling the clinical situation with the relevant anatomic data might be advantageous. Clinical cases will be presented, followed by the applicable anatomic information for diagnosis and possible treatment. Twenty cases are offered, and the student is invited to describe the anatomic basis for the management of the condition. It is suggested such demonstrations be easily available in dissection rooms, which will become, it is hoped, of improved teaching value to the students/physicians.

GEST, Thomas. University of Michigan Medical School, Ann Arbor, MI 48109, USA. <u>The effects of changes in teaching strategy and curriculum on student performance in gross anatomy.</u>
A decade ago, the University of Michigan embarked on a strategy to decrease passive modes of teaching, such as lecture, and to increase active learning mechanisms, such as peer based teaching and computer assisted instruction. After four years of increased emphasis on active learning, student scores, course evaluations, and average faculty evaluations were all at record levels. In fall of 2003, the first year medical curriculum underwent sweeping changes, and became an integrated presentation of the basic sciences. Integrated systems based sequences replaced courses. Students were required to receive a passing grade in each sequence, but not in any discipline. Initially, gross anatomy average grades decreased slightly (2%) while failures (less than 75%) doubled (from an average of 4.5 to 9). However, students were not required to pass gross anatomy, so these grades were not recorded as failures and did not hinder student progress in school. While the average student score in gross anatomy has remained slightly depressed but stable these past three years, the failure rate in gross anatomy peaked last year at 14, more than 3 times the previous average. Recent strategies to increase student performance have been fairly ineffective, while new strategies, such as a form of discipline based grading, have been formulated and await implementation.

GEST, Thomas. University of Michigan Medical School, Ann Arbor, MI 48109, USA. <u>The University of Michigan gross anatomy web site: A decade of experience.</u>
In 1999, we began to develop a web site to support the gross anatomy course at the University of Michigan Medical School.

During the past decade, we have developed, tested, and refined many features of the site based upon student evaluation data. Several features stand out as very successful, while several others stand out as less well received than hoped. One of the most highly rated features of our web site is the set of practice exam questions. These are mostly clinically phrased multiple choice questions from previous examinations, and each offers a paragraph of feedback. One feature that was less well received overall is our collection of anatomy learning games. Crossword puzzles, anatomy jeopardy, and "Who wants to be a millionaire doctor?" games were created for many subjects. Although well received by those students who used them, these games have been used infrequently by many students. One new feature of the site that is proving to be successful is the addition of the text transcript of the narration of our dissection videos, so that students can read along. Students have also given high marks to the muscle images that were recently linked to our anatomy tables. Another new feature that has been well received is the set of Prelab Learning Modules. These learning modules are javascript based interactive slide shows that accompany each lab and serve as an introduction to the basics of each dissection exercise.

GOGALNICEANU, Petrut, Peter ABRAHAMS, Andrew FLETCHER, Elizabeth MCEVOY, and Jamie ROEBUCK. St. George's Hospital, London W1U 6LD, United Kingdom. From Lister's tubercle to Rotter's nodes - A new experiment in clinical anatomy podcasting.
Introduction: Clinically integrated anatomy teaching requires a multitude of resources drawn from the bedside, the dissection room and the radiology unit. These vary in availability and location to such an extent that it is difficult for students to access all of them in a time efficient manner for revision purposes. Aims and Method: To design a portable, handheld software package to provide an integrated method of revising clinical anatomy and radiology outside the conventional academic environment. Results: A series of anatomy podcasts compatible with MP3 players was designed, using high resolution digital imaging and three dimensional animations combined with narrative and visual explanations. We present two IPod Touch podcasts designed to teach the clinical anatomy of the breast and of the wrist. They incorporate three dimensional simulations, cadaveric dissection, schematic diagrams, angiograms, plain radiographs and computed tomography (CT) reconstructions. Audio and

on-screen text commentary are used in conjunction with digital highlighting techniques to guide the student and explain the clinical relevance of anatomy. Conclusion: Anatomy podcasts provide an affordable and accessible method of teaching clinical anatomy, utilising digital platforms that are increasingly available in the medical student population. Furthermore, they facilitate integration of basic and clinical sciences utilising an extensive variety of anatomical imaging. Whilst podcasts cannot replace traditional methods of teaching, they provide a unique educational opportunity in an accessible, visually engaging and interactive environment.

GOGALNICEANU, Petrut, Peter ABRAHAMS, Andrew FLETCHER, Elizabeth MCEVOY, and Jamie ROEBUCK. St. George's Hospital, London W1U 6LD, United Kingdom.
Validation of anatomy podcasts in undergraduate education.
Introduction: The integration of clinical anatomy in undergraduate teaching requires cadaveric material, radiological imaging, surface anatomy models and simulators. Curricular reforms have made simultaneous access to these resources increasingly difficult. Aims: The study aimed to validate the effectiveness of multi-specialty digital training packages in teaching clinical anatomy to medical students. A Breast Cancer and a Wrist Fracture (Colles' Fracture) Anatomy Podcasts used three dimensional simulations, dissection, angiograms, radiographs and computed tomography (CT) reconstructions to reproduce the increasingly sparse resources traditionally used in anatomy teaching. Method: A cohort of 20 medical students was allowed to watch a 5 minute breast anatomy podcast twice. A second cohort of students was allowed to study a contemporary text on clinical breast anatomy with a matched level of detail, covering the same context in 10 minutes. The performance of both cohorts was tested using an MCQ and diagram annotation exercise. The two groups were then asked to study a different topic (Colles' fractures) using the learning technique not previously employed (i.e. text reading students swapped to podcast viewing and vice versa). MCQ performance using the two different techniques was compared. Results / Conclusions: Principal benefits of Anatomy Podcasts include clinical integration of anatomy, time-efficient learning, low cost, web-based access and portable format on hand-held interfaces. We present validating data regarding the role of handheld digital teaching interfaces in anatomical training and discuss their roles in the future of medical education.

GREENE, Sarah, Frank DALY, Maureen ESTEVEZ, and Todd HOAGLAND. Boston University School of Medicine, Boston, MA 02118, USA. <u>The use of plastinated brain cross-sections improves understanding of three-dimensional neuroanatomy.</u>

The understanding of three-dimensional (3D) neuroanatomy can be challenging for medical students in their first year neuroscience course. This knowledge is crucial in order for students to make correlations between whole brain and cross-sectional neuroanatomy in this course, and to interpret radiological images in the future. The plastination of human tissue has been increasingly applied to provide high quality educational specimens for anatomical instruction. In this study, a plastinated coronally cross-sectioned brain was used to provide supplementary 3D instruction during optional small group sessions in the 2009 neuroscience course at Boston University School of Medicine. Each session included a pre-assessment quiz, discussion of relevant neuroanatomical structures visible in each plastinated section with reference to whole brain models, a post-assessment quiz, and a survey. The assessment quiz challenged students to transition between cross-sectional and whole brain images and to identify structures in unique dissections. Pre- and post-assessment quizzes were compared, and scores of students who attended (n=13) significantly improved from pre-to-post assessment (p<0.01). There were no group differences in final course grades or practical exam scores between students who did and did not attend these sessions. Survey responses indicate all students found these sessions to improve their 3D understanding of neuroanatomy and recommended their use in future years. Results suggest the use of these plastinated sections has great potential in facilitating 3D learning of neuroanatomy. Thus, these sessions will be repeated in 2010 with a larger sample size to evaluate the effectiveness of this pedagogical supplement.

HAUBERT, Lisa M., Kenneth H. JONES, and Susan D. MOFFATT-BRUCE. The Ohio State University Medical Center, Columbus, OH 43201, USA. <u>Surgical clinical correlates in anatomy: Implementation of a first-year medical school program.</u>

Medical students state the need for a clinically oriented anatomy class so as to maximize their learning experience. We hypothesize that first year medical students who take the Surgical Clinical Correlates in Anatomy program perform better than their peers in their anatomy course, their surgical clerkships

and ultimately choose surgical residencies. We designed and recently implemented this program. It consisted of General Surgical Knowledge, Orthopedic Surgery, Plastic Surgery, Urology, Cardiothoracic Surgery, General Surgery, Vascular Surgery and ENT sessions. Each session had defined learning objectives and interactive cadaveric operations performed by faculty members. The program was elective and had 25 participants. A questionnaire was provided before and after the program. 24/25 students felt the program was helpful and would recommend it to others. 23/25 students thought that the class should be continued. The data revealed opinions of surgeons had significantly improved and those interested in surgery had increased for orthopedics, ENT and neurosurgery, but decreased overall. Preliminary analysis of the first year anatomy scores showed that our participants averaged 87.7%, those that volunteered for the class but were not chosen to participate averaged 86.9%, and the rest of the class averaged 85.9%. We will comparatively analyze clinical surgical rotation scores and residency matches. A need exists among medical students to develop a clinically correlated anatomy program that will maximize their learning experience, improve their performance and allow them to make more informed career choices. The recent implementation of this Surgical Clinical Correlates in Anatomy program fulfills this need.

HEBERT-BLOUIN, Marie-Noelle, Nelly AMADOR, Kimberly AMRAMI, Elena PIROLA, and Robert SPINNER. Mayo Clinic, Rochester, MN 55905, USA. <u>Palmaris profundus: MRI evidence to support the term musculus comitans nervi mediani.</u>
The palmaris profundus is a rare, but well known anatomic variation which on occasion may give rise to symptoms and signs of median nerve compression at the wrist. In the past year, we have operated on two such patients both of whom had the presence of a palmaris profundus and palmaris longus. In these cases, median nerve compression was attributed to the course of this extra tendon (forming a common sheath with the median nerve) and its local direct mass effect on the nerve; more commonly the resultant decreased available space for the median nerve within the carpal tunnel due to the presence of an additional (10th) flexor tendon is thought to be responsible. Abnormal vascular markings and deformation of the median nerve in the palm were apparent directly beneath the tendon in both patients, suggesting to us its causal rather than incidental relationship. Release of the carpal tunnels and resection of the

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tendinous insertions resulted in complete resolution of the symptoms in both patients. Postoperative MRI was performed in both cases to demonstrate the full course of the variant tendon; despite variations in the origin and length of the variant tendon, an important similarity was noted: the intimate relationship of the median nerve and the palmaris profundus tendon in the forearm. The MRI relationship of this anatomic variation to the median nerve provides strong support for a previous anatomic description (1) in 2 cadaveric specimens at which time these authors introduced the term musculus comitans nervi mediani.

HOWARD-SWIRZINSKI, Karen A., Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA. Examining the length and geometric patterns of the palatine canal using CBCT.
The palatine canal is an important anatomical structure in dentistry. It transmits the greater and lesser palatine nerves and vessels to their respective foramina for distribution along the hard and soft palate. Superiorly, it communicates with the pterygopalatine fossa, where the maxillary division of the trigeminal nerve is located prior to branching into multiple nerves which provide innervation to the midface. One dental procedure performed is a maxillary division nerve block in which a needle is inserted into the greater palatine foramen and passed superiorly into the palatine canal to gain access to the pterygopalatine fossa. During this procedure, if any bony obstruction is noted and cannot be passed easily, the technique should be abandoned. In this study, we sought to examine the anatomy of the palatine canal from the pterygopalatine fossa to the greater palatine foramen. We evaluated the right and left palatine canals of 100 subjects using cone beam computed tomography (CBCT) in both sagittal and coronal sections for the parameters of length and path traveled. We found that upon exiting the pterygopalatine fossa, the palatine canal would travel immediately inferior in 32% of the canals. The palatine canal traveled in a lateral direction before passing inferiorly in 51% of the canals. In 14.5%, the canals traveled both medially and laterally. This particular path would explain the small incidence of cases where a needle meets resistance in the palatine canal.

HUTCHINS, Bob, and Emet SCHNEIDERMAN. Texas A&M University, Health Science Center, Baylor Dental School, Dallas, TX 75246, USA. A graduate anatomy hybrid course: Is it a better mousetrap?
A graduate course in functional head and neck anatomy has

been taught to dental residents using traditional face-to-face lectures. One of the chief complaints from the residents has been the lack of time between classes and clinic responsibilities. Therefore, a hybrid course was designed where faculty recorded their lectures and made them available for asynchronous delivery to the students. Of the 12 lecture hours, 6 hours were recorded. Practical material is not part of the lecture aspect of this course and was not included in this analysis. The first exam covered material provided primarily from recorded lectures and the second exam covered material that was primarily provided by traditional lectures. 2008 grades (N=18) for the two exams were then compared to the 2007 grades (N=20). They were taught by the same faculty and the exams primarily used the same questions (exams were not returned in 07). Grades were compared between the two years using a Mann-Whitney U-test. Results showed that the hybrid exam 1 grades were significantly higher when compared to the previous year's grades ($P<.0001$) and the grade average of the two exams were again significantly higher for the hybrid course compared to the 2007 grades ($P<.05$). Comparison of the exam 2 grades was no different for the 2 yrs. All 18 residents answered positively in an anonymous evaluation when asked if they liked the online recorded lectures mixed with the traditional lectures as compared to their other traditionally taught lecture courses. Although these data are from a relatively small sample, they support the hypothesis that a hybrid course which allows residents the time outside of the classroom to review lecture material can lead to higher grades.

JONES, Kenneth H. The Ohio State University, Columbus, OH 43210, USA. The "Anatomy Department" today: How to adapt and prevail in the 21st century.
Anatomy faculty today are challenged by changes in departmental structure, curricular design, research relevance, strategic goals set forth by their college/university, and by increased financial pressure for extramural funding. To adapt successfully to these challenges, today's anatomy faculty must recognize the political realities of their home institution and examine the Anatomy unit's strengths and weaknesses. Through this unit analysis, anatomy faculty can develop a strategic plan that will capitalize on their unit's unique contribution to their home institution. Additionally, the faculty must demonstrate how a modest investment by the institution in Anatomy can be leveraged to provide extra value to the home institution. This report describes how the anatomy faculty at a large public

medical school has, over the past 6 years, examined the ''market'' for anatomy and thereby significantly increased enrollment in its own courses and doubled its teaching revenue. Furthermore, the faculty refocused its research interests for better alignment with their larger teaching commitments and created a community environment that is more supportive of individual and group scholarship, as well as faculty development and advancement.

KALMEY, Jonathan, Mathew BATEMAN, Bertlan DUDAS, Randy KULESZA, Theodore MAKOSKE, and Mark TERRELL. . Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA. Case-based learning strategies in LECOM's medical gross anatomy lectures.

The passivity of the learner in most traditional didactic anatomy lectures has been documented to promote rote memorization that is short-lived. We have designed four innovative instructional strategies to optimize active learning and student interaction in our gross anatomy lecture. First, most lectures begin with clinical cases that place the anatomy into a clinically-relevant context. Also, popular media figures and levity are included whenever possible. These strategies increase student motivation and content relevancy, as well as activate prior knowledge needed for successful learning. Second, an audience response system provided a means for infusing student interaction and attention in the lecture while providing formative feedback to students on knowledge deficits and misconceptions, which are corrected prior to the lecture examination. Third, live interactive discussion forums conclude each body region where students apply anatomical concepts to clinical questions. Students are given a series of open-ended clinical questions in advance to guide the preparation for the forum. Through student discussions they apply and reinforce concepts in meaningful, relevant, and deep processing ways that greatly exceed rote memorization. Fourth, an "Upper Limb Throwdown" has replaced the didactic lecture in our Musculoskeletal Systems course, taught in the subsequent spring semester. Students are given a list of 30 clinically-based topics and must review and apply their anatomical knowledge gained from the fall gross anatomy course in order to discuss, teach, and demonstrate mastery of these topics. These reinforcement strategies transform the didactic anatomy lecture into a dynamic, learner-centered knowledge community.

KARASEK, Ryan, Quentin FOGG, Jonathan GUPTA, and Lance

NASH. American University of the Caribbean, Sint Maarten, Netherlands Antilles. <u>Branches of the axillary nerve and it's contribution to motor innervation of the shoulder.</u>

The axillary nerve is commonly involved in a variety of shoulder injuries. It's primary motor and sensory distribution is seemingly well understood, but the extent to which it also provides secondary innervation to nearby muscles is less clear. This study aims to map the branches of the axillary nerve to determine it's contribution to shoulder muscle function. Cadaveric shoulders (n = 30) were dissected. In all cases, the axillary nerve was first identified at its branching point from the posterior cord of the brachial plexus. From here it was followed as far posteriorly as possible to identify any early branches. The shoulder was then turned over to continue following the nerve from the posterior aspect. In all cases (n = 30), the axillary nerve gave branches to the teres minor muscle and distally entered the deltoid muscle. Single branches to the teres major muscle were noted between these two major sections of the nerve (n = 12), as well as multiple smaller branches (n = 9). A number of still smaller branches were noted entering the proximal region of the long head of the triceps brachii muscle (n = 3). These data suggest that the axillary nerve also contributes to local structures other than the teres minor and deltoid muscles. The branching of the distal sensory portion of the nerve was not investigated. These data suggest that suspected axillary nerve injuries may contribute to decreased strength or precision of additional shoulder movements, or contribute to increased sensitivity following shoulder injury, manipulation or repair.

KEITH-STANLEY, Gideon, Ross University of Medicine, Oklahoma City, OK 73132, USA. <u>Anatomical and histological pathology of neoplastic liver nodules.</u>

An abnormally large liver featuring numerous nodules of suspected neoplastic origin was described in a 54 year old male cadaver. A biopsy was performed. The tissue sample was subjected to preparation for pathological examination. The gross anatomical pathology and histopathology was described in contrast to samples of normal tissue. A tentative diagnosis of the biopsied nodule was made.

KENZ, Eric, and Kenneth H. JONES. Division of Anatomy, The Ohio State University, Columbus, 43210, USA. <u>Creating a 3D virtual pelvis from a computed tomography DICOM dataset.</u>
Our objective was to design a stand-alone virtual environment

that facilitates the study of spatial relationships of the human pelvis. Raw CT DICOM data of a human pelvis and L4/L5 vertebrae was obtained from the OsiriX Imaging Software website. This dataset was uploaded into "VolSuite" for surface rendering reconstruction of the bony pelvis and conversion to.obj file format. Autodesk® Maya® 2008 was used to rid the polygonal object of surface artifact and to regionally segment the data by assigning UV coordinates. Surface textures and a series of color maps designed for a Virtools UV-driven labeling system were constructed in Adobe® Photoshop® CS3. The final 3D virtual pelvis was constructed using Virtools™ 4.0, which, using a visual schematic of building blocks, codes for simplistic user-controlled interaction with the 3-D Pelvis objects. The virtual environment created allows for user exploration of structures of the human pelvis by mouse pointer-directed labeling and hotspot buttons. The user may activate buttons that visualize soft tissue structures, show text labels, and indicate individual anatomical structures by pop-up color textures. Unlike many interactive learning tools, each of these features is optional during user-controlled rotation and zoom throughout the entire environment. This 3D construct can serve as a multidimensional learning tool that utilizes a 3D bony pelvis that is proportionally equivalent to bony models found in the anatomy laboratory.

KHAN, Ahmed, Estomih MTUI, Douglas MINTZ, and Audrey CRUMMEY, Department of Clinical Anatomy, Weill Cornell Medical College, New York, NY 10065, USA. Palmar arch of the hand.
INTRODUCTION: Anatomic variants of the superficial and deep palmar arches (SPA, DPA) have significant implications in hand surgery. To better characterize these variations, a comprehensive cadaveric study of the SPA and DPA was performed. METHODS: 400 cadaveric hands were fixed in formalin and glycerin. Hands were dissected under loupe magnification and contributions to the vascular anatomy of the SPA and DPA were recorded. RESULTS: A complete SPA was found in 81% and was formed by an anastomosis between the superficial volar branch of the radial artery (SVRA) and the ulnar artery (UA) (34.5%), entirely from the UA (32.7%), from an anastomosis between the UA and median artery (MA) (10.3%), or from anastomoses between the UA, MA, and radial artery (RA) (3.5%). An incomplete SPA was seen in 19%: the SVRA and the UA coursed in parallel (9.4%), the UA formed the entire arch but did not contribute to the thumb (8.4%), or superficial

vessels from the RA, UA and MA coursed in parallel (1.2%). The DPA was complete in 90.4% and was formed from an anastomosis between the RA and inferior deep branch of the UA (40.2%), the superior deep branch of the UA (29.5%), or both deep branches of the UA (8.4%). An incomplete DPA was found in 9.6%. CONCLUSIONS: A significant degree of variability is inherent to the vascular anatomy of the hand. The "classical" SPA defined as an anastomosis between the SVRA and the UA, occurred in only 34.5% of specimens.

KIENE, Jason, Barbara FREEMAN, Ray LASEK, and Susanne WISH-BARATZ. Case Western Reserve University, School of Medicine, Cleveland, OH 44106, USA. <u>Peer teachers introducing anatomy to first year medical students.</u>
Systems approaches to medical education and principles of experiential and contextual learning have reconfigured the study of anatomy from a concentrated "course" to a longitudinal and integrated theme in many medical school curricula. Consequently, students may be compelled to approach anatomy regionally and without an overall sense of how various body parts and systems relate and work together. We wanted to know: Could a ten-hour introductory anatomy course taught by second-year medical students in a small-group format improve the preparation of first-year medical students for future basic science and clinical courses? The course had five units. Each unit had custom pre-class readings that prepared students for classroom sessions. In-class "practicums" integrated physical diagnosis with anatomy. Volunteer, second-year medical students led group sessions. After each session, participants anonymously completed a quiz and survey. Anatomy exam scores from the next curricular block were compared for control (previous year's class) and intervention groups. Students completed 90% of each of the five practicums. The average score on the final cumulative quiz was 93%. Surveys indicated high satisfaction with the course, positive feedback about the peer teachers, and good pre-class preparation by students. There was no statistical difference in scores on the anatomy assessment in the subsequent curricular block between the two classes. Peer teachers were key to the program's success, contributing to high student satisfaction; however, incremental knowledge was not reflected in test scores. Future plans include looking at different ways to measure both educational outcome and long-term effects of the intervention.

KIM, Soo, Robert BLEAKNEY, Erin BOYNTON, Danley LUNN, and Tim RINDLISABACHER. University of Saskatchewan, Saskatoon, SK S7N 0W3, Canada. <u>Muscle atrophy patterns of supraspinatus in relation to architecturally distinct regions.</u>

To date, the atrophy pattern of supraspinatus (SP) in relation to its architecturally distinct regions has not been described. The purpose of this study was to analyze the pattern of muscle atrophy, as measured by muscle thickness using ultrasound (US), in subjects with a SP tendon tear and to discuss findings in relation to architecturally distinct regions. Seven subjects (3F/4M), mean age 59±6 yrs, with a full-thickness tear of SP were recruited. Supraspinatus was scanned in the relaxed state. Total muscle thickness (MT), muscle thickness above the intramuscular tendon (MTA), and below (MTB) were computed. Fibers of the superficial part of the anterior region of SP are represented by MTA, whereas the fibers of the middle and deep part of the anterior region the MTB. Differences between the MTA and MTB ratio in subjects and age/gender matched normal controls were analyzed and correlation between parameters and tendon tear size and onset of injury evaluated. Mean MT for the pathological SP (1.84±0.32 cm) did not significantly differ from controls (1.94 ±0.20 cm). However, mean MTA to MTB ratio significantly differed ($p<0.05$) between the pathological SP (0.43) and controls (0.61). Larger tendon tears had a greater mean MTA to MTB ratio; no correlation was found between parameters and onset of injury. Findings suggest muscular changes following tendon tears are related to the severity of pathology and are not uniform throughout the muscle volume; the superficial part of the anterior region experiences muscle atrophy with smaller tears and the middle and deep with larger tears.

KULESZA, Randy, Mathew BATEMAN, Bertlan DUDAS, Jonathan KALMEY, Theodore MAKOSKE, and Mark TERRELL. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA. <u>Active learning practices in gross anatomy lab at LECOM.</u>

In the face of dwindling laboratory hours, we have incorporated no-cost instructional innovations into the laboratory portion of our medical gross anatomy course. We have devised a combination prosection/dissection laboratory that follows a lab manual, developed in house, that includes clinical and OMM correlations. Students are recruited to enhance their anatomy skills over the summer by performing a nearly-complete head and neck dissection and skinning the limbs and trunk. These cadavers are then used to maximize laboratory time for OMS1 students. The

class size necessitates three rotating lab sections (A, B and C) into which we have incorporated Peer-led-Team-Teaching, where the B section peer teaches the subsequent C section. Also, we have implemented oral group quizzes to our daily lab sessions to entice completion of the learning objectives. The quizzes are given at the end of each laboratory and administered to an entire lab table in a round-robin format. Additionally, gross laboratory learning is supplemented with hands-on, physician directed surface anatomy labs. The practical exams consist of stations with one identification, one follow-up, second level question and an oral component worth 20% of the total. Finally, to enhance the lab's clinical relevance and to bridge the gap between basic science and medicine, students are required to evaluate their cadaver throughout the term and construct an autopsy report that includes anatomical evidence supporting their hypothesis of the cause of death. Overall, these changes have transformed the lab into a more active learning environment, which is supported by student and peer evaluations.

LACHMAN, Nirusha, Kevin CHRISTENSEN, and Wojciech PAWLINA. Mayo Clinic, Rochester, MN 55905, USA. <u>Prediction of performance on anatomy and histology examinations as a measure of student self assessment.</u>
Self assessment in medicine is integral to the delivery of proficient and safe patient care, as knowledge of strengths and weaknesses is vital to clinical performance. This study aimed to determine first year medical students' ability to predict their performance over two consecutive didactic blocks: histology and gross anatomy. Fifty medical students rated their perceived performance in written portions of histology and gross anatomy examinations. A question was included in the multiple choice section presenting 6 ranked grade ranges (60% to 100%). Predicted scores were recorded and compared with actual student performance. Results were statistically analyzed using a chi-squared test for statistical significance. The total number of students with incorrect prediction in first block of histology was 72% and 44.8% in following second gross anatomy block. 42% overestimated their performance in histology, 34.6% in gross anatomy; whereas 30% underestimated their performance in histology and 10.2% in gross anatomy. Among students who incorrectly predicted, (17/50) 34% did so in both blocks. Of these, (3/50) overestimated scores (actual scores <70%) and 14/50 underestimated their performance (actual scores >85%).

Early results indicate a trend towards improvement of self assessment skills from first to second block (72% incorrectly predicted scores in histology vs 44.8% in gross anatomy, P<0.01). Results indicate the majority of students entering medical school have poor self assessment skills. This may be linked to high number of requests to provide tutorial help, over utilized consulting time of TAs and teaching faculty. Feedback of students' performance would help in developing self assessment skills.

LAMBERT, H. Wayne, Stavros ATSAS, Douglas GOULD, and Bob HUTCHINS. Department of Neurobiology and Anatomy, West Virginia University School of Medicine, Morgantown, WV 26508, USA. How dental students are taught anatomy and neuroanatomy: Survey results from North America faculty.
Members of the Anatomical Sciences Section of the American Dental Education Association (ADEA) recently completed two surveys of the directors of all North American dental gross anatomy neuroanatomy courses to assess: 1) what level of detail are specific topics and content areas being presented; 2) when in the curriculum are specific content areas are taught; 3) what areas are omitted; and 4) what other areas are of concern with regard to North American faculty teaching the anatomical sciences. The survey response was overwhelming, with the dental gross anatomy survey receiving a 100% response rate representing all 67 US and Canadian dental schools. The results of this survey indicate, amongst other things, that: 1) the use of computer-assisted instruction (CAI) tools has increased; 2) emphasis on clinical topics has increased; 3) reliance upon medical school faculty and facilities is high; 4) a pattern of increased use of integrated curricula among dental schools has emerged; 5) a general trend for a decrease in student contact hours is ongoing; and 6) the experience levels of faculty indicate a future need for young faculty competent at teaching in the anatomical sciences. The specific data are currently being analyzed and will be presented. These data will provide the framework by which course directors and administrators, in need of curricular information, can make more informed decisions in the appropriateness of content and even provide guidance in evaluation of their program.

LEE, Lisa, and Douglas GOULD.. The Ohio State University, Columbus, OH 43210, USA. Efficacy of online mastery quizzes in dental anatomy.

The purpose of this study is to evaluate the effectiveness of mastery quizzes in enhancing students' learning and preparedness for examination. First year dental students taking an integrated anatomy course at The Ohio State University were given online mastery quizzes, made available for five days before each examination. Mastery quizzes were composed of ten multiple choice questions, representative of the upcoming examination in content and difficulty. Students were allowed to access this resource as many times as they desired during the five day window before each examination; the highest score for each student was added to the final course grade. The results indicate that almost all students took advantage of this resource and used it to reinforce the material, clarify concepts and prepare for the examinations. The course evaluation revealed students' general satisfaction with the mastery quizzes. In fact, many students stated that they would have benefitted more had there been more than ten questions in each mastery quiz. In conclusion, our online mastery quizzes were an effective resource to engage students in self learning, testing and evaluation. Statistical analysis of the results of the study is ongoing and will be presented.

LOUKAS, Marios, and R. Shane TUBBS. St. George's University, St. George's, Grenada. <u>The clinical anatomy of the moderator band.</u>
Apical ventricular septal defects are rare pathologies of the ventricular septum. The moderator band, or other large trabeculations, is the major obstacle for the repair of such defects. The aim of our study was to identify and describe variations in the size and anatomy of the moderator band. We studied the right ventricular apical trabeculations in 100 adult human cadavers. Overall, we identified the moderator band in 92% of hearts. In just over two-fifths (42%), the band was a short and thick trabeculation, whereas in one-eighth (12%) it was long and thick. In just under one-quarter of the hearts (24%), the band was short and thin, while it was long and thin in 14% of the hearts. In the remaining 8 hearts, we were unable to identify the moderator band. The mean thickness of the band was 4.5 ±1.8 mm, and its mean length was 16.23±2.3 mm, ranging from 11.3 mm to 24.3 mm. According to these measurements, we were able to classify the band as originating less than 45% of the distance from the tricuspid valve to the apex, seen in 12 hearts, between 45% and 55% of the distance from the valve to the apex, seen in 45 hearts, and greater than 55% of this distance,

seen in 39 specimens. These data may prove useful in the setting of the surgical repair of apical ventricular septal defects through the right atrium.

LOZANOFF, Scott, Michael FARRELL, Kris KAWAMOTO, Steven LABRASH, Beth LOZANOFF, and Selcuk TUNALI. University of Hawaii School of Medicine, Honolulu, HI 96813, USA. <u>Generating 3D computerized models from plastinated anatomical specimens.</u>

An educational developer must either purchase pre-existing anatomical models or obtain software that reconstructs 3D models from 2D sectional images when generating electronic atlases or books. A problem occurs when models required for a specific learning objective do not exist. A potential solution for this issue is to utilize plastinated anatomical material enabling a developer to generate dissections tailored for specific pedagogical objectives. The purpose of this study was to develop a method to generate computerized 3D anatomical models from plastinated material for use in electronic media. A formalin-fixed cadaveric adult human heart was dissected free and injected with inr-seal (Dodge) so that the cavities remained expanded. The specimen was subsequently dehydrated in an acetone bath of increasing concentrations (90%-99.5%) for six weeks followed by degreasing for 2 weeks. Forced impregnation was accomplished with PR10 polymer and Cr20 cross-linker (4 days) and cured by applying sequential coats of Ct32 cross-linker. The resulting plastinate was digitized using a hand-held scanner (Polehmus), exported and edited in Maya (AutoDesk) and WinSURF (Akuaware), and finally saved in.xdf format. Audio files (.wav) were recorded based on the individual cardiac components. The model was incorporated into an electronic dissection guide (.pdf) and viewed with SURFviewer (Akuaware). Using the.pdf file, students could call the heart model as they worked through electronic dissection guide using a standard Dell computer stationed at each dissection table. Results from this study demonstrate how specific dissections can be generated and tailored for electronic dissections guides.

MACPHERSON, Brian, Thomas DOLAN, Derek EGGERS, Matt HAZZARD, and Kathryn WONG. University of Kentucky, Lexington, KY 40503, USA. <u>The Perineum. A student-centered learning tutorial.</u>

One of the more difficult areas for students to understand is the

perineum. This HTML software-based tutorial was designed to assist students in assimilating the details and spatial relationships of this area in a time of shortening courses and dissection effort. A perineum of each sex was dissected in the lithotomy position. At each of six levels the dissection was photographed in the anterior-posterior and side-to-side planes at five degree intervals. These rotatable images were then added to a DreamweaverTM-based template that incorporates explanatory text, digital artwork and a "compare to" dissection image for each level. The user can then rotate the dissection level through both planes to get a three dimensional understanding of the relationships in this region.

MATUSZ, Petru, Agneta Maria PUSZTAI, and Delia Elena ZAHOI. University of Medicine and Pharmacy, Timisoara 300041, Romania. <u>Intraparenchymatous spatial distribution of a single renal artery. Study on corrosion casts.</u>
According to the Anatomical Terminology (1998), the renal artery (RA) divides into an anterior and a posterior branch. The anterior branch (ABr) gives rise to 4 segmental arteries: artery of superior segment, artery of anterior superior segment, artery of anterior inferior segment and artery of inferior segment. The posterior branch (PBr) continues as the artery of posterior segment. In the anatomy literature there is a huge variability of intraparenchymatous distribution of a single renal artery, likewise, a relatively frequent presence of (20-25%) supranumerary renal arteries (multiple). In this study of material represented by 200 corrosion casts we analysed the ways of branching in a single renal artery. The casts were obtained by injecting the renal vaso-ductal system with plastics followed by corrosion of parenchyma with hydrochloric acid. The model ramification pattern into one ABr and one PBr was present in 88% of the cases. There were also seen; in 0.5% cases, presence of a single ABr; in 10.5% cases, presence of three branches (10% cases – ABr, PBr and superior branch - SBr, and in 0.5% cases, ABr, PBr and inferior branch - IBr); in 1% cases, presence of four branches (ABr, PBr, SBr and IBr). The number of segmentary arteries varied between 4 and 8. The modal distribution of segmentary arteries (omologated by Anatomical Terminology) of 5 segmental arteries was seen in 57.5% of cases. Although model type (recognised by Anatomic Terminology) is majority, the distribution of branches of single renal artery presents a huge variability which should be kept in mind while performing surgical interventions on renal

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parenchyma (Supported by CNMP 42097/2008).

McARTHUR, Angela, and David LEE. University of Minnesota, Minneapolis, MN 55455, USA. Competing for whole body donations in a free market system: one medical school's approach.
With the formation and rapid growth of non-academically housed whole body donation programs, many medical school whole body donation programs are struggling to procure the numbers of donations needed to satisfy their internal education and research requirements. Many non-academically housed whole body donation programs market to, and procure donations from, the entire continental United States. As such, these practices create a competition for whole body donations with local medical school donation programs. Additionally, many non-academically housed whole body donation programs use marketing approaches and resources that are cost prohibitive for most academically housed donation programs. Beginning in 2006, the University of Minnesota Anatomy Bequest Program (ABP) implemented proactive internal policy revisions in an attempt to remain competitive and ensure access to whole body donations in the state of Minnesota. By revising policies related to donor transportation reimbursement and transplantable organ, eye and tissue donation, as well as, implementing advocacy and education initiatives, whole body donations to the ABP increased 16%, in 2007. Similarly, requests for ABP donor materials have increased and pre-death ABP donor registrations have grown exponentially with the latter increasing 32% from 2007 to 2008, demonstrating both short and long term successes with the new approach.

McMAHON, Luke A, Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA. Examining the path of the facial nerve in the temporal bone using CBCT.
The temporal bone is composed of the squamous, petrous, and temporal parts as well as the styloid process. The petrous part is the most difficult portion of this bone to analyze as its structures are within the bone. Structures within include the facial nerve, vestibulocochlear nerve, the ear ossicles, cochlea, and semicircular canals. These structures are important in hearing, balance, muscles of facial expression, taste, sensation to the nasopharynx, and autonomics to the submandibular and pterygopalatine ganglia. The path of the facial nerve through the

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bone is tortuous and difficult to visualize. Due to the location of the nerve in a bony canal, pathology of the nerve can cause compression and a lack of function of facial nerve. In this study, we used cone beam computed tomography (CBCT) to 3-dimensionally illustrate the course of the facial nerve as it passes through the temporal bone and highlight the internal anatomy of the temporal bone. Fifty randomized CBCT scans of 0.3 mm were evaluated in axial, coronal, and sagittal planes. Measurements of the internal acoustic meatus were taken halfway between the ostia and the bony termination of the canal coronally (height) and axially (width). Understanding of the temporal bone anatomy provides the clinician with a clear visualization of the relationship of the structures within the bone and their importance for any pathology or clinical procedure performed in the area.

MILLET, Brock, Craig GOODMURPHY, and Timothy BUNTON, Eastern Virginia Medical School, Department of Pathology and Anatomy, Norfolk, VA 23501, USA. <u>The branching patterns of the nerve to mylohyoid and nerve to posterior belly of digastrics.</u> The digastric muscle is unique in that each of its two bellies is independently innervated by a nerve that has a companion muscle. The anterior belly and its companion, the mylohyoid, are innervated by the nerve to mylohyoid branch of V3. The posterior belly and its companion, stylohyoid, are innervated by the posterior digastric branch of cranial nerve VII. These muscles and their nerves are gaining interest as potential donor sites for facial or pharyngeal reanimation. The current study was designed to further characterize the nerve branching patterns of these muscles and their companion muscles. The study used 24 formalin-fixed and 3 unfixed cadavers with a total of 25 usable hemisections being identified. Each hemisection was dissected to reveal the nerve to mylohyoid with its branches to the anterior belly of digastric, and the nerve to posterior digastric with its branches to the stylohyoid. Morphometric data were gathered and measured using digital imaging and JMicrovision 1.2.5© software. Results reveal that the nerve to mylohyoid may provide suitable length to be anastomosed to the temporofacial branches of the facial nerve while the nerve to stylohyoid may provide suitable length to reach the pharyngeal plexus. In addition, the data suggest that these nerves would be renamed within current protocol to better describe the fact that they arise from trunks that then divide into components supplying each muscle and their companion muscle. We suggest that the nerve to mylohyoid

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be named the mylodigastric nerve and the nerve to posterior digastric be renamed as the stylodigastric nerve to better describe their actual branching.

MISHALL, Priti, and Lakshmi RAJGOPAL. Albert Einstein College of Medicine, Bronx, NY 10461, USA. A study of morphometry and ductal variations of extrahepatic biliary apparatus in cadavers from Mumbai.
BACKGROUND: The widespread use of laparoscopic cholecystectomy has increased the need for awareness about the variations in the extrahepatic biliary apparatus. Reports of ductal variation in Indian populations are limited to individual case reports and studies of the morphometric characteristics of each ductal segment are not available in the literature. Hence, the present study was undertaken. METHODS: Extrahepatic biliary apparatus of 60 cadavers, ranging in the age from 20-70 years, were dissected from 2005 to 2008 at the Seth G.S. Medical College in Mumbai, India. The dissected cadavers represented a heterogeneous sample derived from the multiple native groups resident in India's most cosmopolitan city. The pattern of ductal union was observed and photographed for each cadaver following dissection. In addition, measurements were taken of the length and internal diameter of individual components of the biliary tree and the distance between pyloro-duodenal junction and major duodenal papilla. A statistical analysis was conducted to determine basic distributional attributes of each measurement. RESULTS: Multiple ductal variations were seen in 26 cases or 43% of the sample. CONCLUSION: The present study makes available data on the extrahepatic biliary apparatus in the Indian population (which constitutes 4% of the total immigrant population in the USA) as compared to North American and European populations. As the number of patients undergoing surgical treatments for cholesystectomy increases, this serves as additional comparative data to make surgeons aware of the high frequency of variations in this region to minimize injuries to the duct during surgery and prevent post-operative complications.

MOHIALDIN, Vian, and Bruce WAINMAN. McMaster University, Hamilton, ON, Canada. How to teach anatomy to students pursuing a career in medical and health sciences.
Anatomy is a very important subject in medical practice. One can reach a diagnosis on a purely anatomical basis. However,

teaching anatomy to students with varying levels of prior learning, as well as, students from different programs, such as undergraduate and postgraduate in medical, occupational and physiotherapy programs can be a challenge. As has been the case for generations, most students invest a significant amount of time studying human structure using a variety of anatomy resources. In the Anatomy program at McMaster, we believe there must be a better way to teach human anatomy so that students can appreciate its application to their practice. The fact that anatomy, especially surface anatomy, is used on a daily basis in clinical practice makes it necessary for students to learn the clinical significance of anatomy and how to apply it to medical problems. Our aim is to integrate basic sciences such as anatomy and physiology with clinical skills procedures, and also to integrate images and pathology problems. All these components will add depth to the subject, which helps orient the student. Medical students here at McMaster will be exposed to human cadavers before examining a real patient which allows them to develop deeper understanding of the human body and prepares them to become better practitioners. Students here at McMaster think anatomy teaching is more clinically relevant, stimulating, and appreciate the integration part which demonstrate the real value of anatomical understanding and enable students to grasp the concepts more easily.

MORRISON, Stuart, Jennifer MCBRIDE, and Larry RABER. Cleveland Clinic Foundation, Cleveland, OH 44195, USA.
<u>Anatomy of the cartoid and vertebral artery as demonstrated by ultrasound.</u>
Ultrasound is a non-invasive imaging modality that is performed clinically to visualize the common carotid artery, together with the carotid bulb, external and internal carotid arteries in the neck. The subclavian arteries and vertebral arteries in between their foramen transversarium are also interrogated by ultrasound. A knowledge of the normal anatomy of these vessels is essential for correct interpretation. Ultrasound provides both anatomical information and physiological information with flow velocity from the Doppler waveform and flow direction. Carotid and vertebral artery ultrasound is performed for the diagnosis of both intracranial and extracranial vascular disease including transient ischaemic attacks and stroke. The importance of extracranial carotid artery stenosis secondary to atheromatous plaque producing symptoms of a stroke is now widely recognized. External carotid artery branches may provide collateral pathways

for occluded internal carotid and vertebral arteries. Screening.of asymptomatic patients to detect significant internal carotid artery narrowing is also an important indication for ultrasound examination. Normal vascular variants will also be described together with examples of clinical cases that highlight the importance of a thorough knowledge of the neck vascular anatomy.

MORRISON, Stuart, Jennifer MCBRIDE, and Larry RABER. Cleveland Clinic Foundation, Cleveland, OH 44195, USA. Ultrasound demonstration of intracranial vascular anatomy.
The bony skull produces a barrier to the transmission of sound waves for ultrasound examination. However, by scanning through anatomical spaces and the thinnest parts of the calvarium, ultrasound can provide clinically important information about the intracranial vasculature. Ultrasound scanning through the foramen magnum can visualize both vertebral arteries and the basilar artery. Similarly, scanning through the orbit allows visualization of both the ophthalmic artery and portions of the carotid siphon. Scanning through the relatively thin squamous part of the temporal bone and greater wing of the sphenoid bone provides an excellent "window" to identify the circle of Willis and its branches. Knowledge of the normal anatomy, including the depth of each vessel from the skin surface, is essential for correct interpretation. With this combination of imaging views, an overall view of the intracranial vasculature is possible. Normal variants are an important part of anatomical knowledge that can have very relevant clinical implications. For example, variability of the vertebral artery size is frequent and termination of a vertebral artery as the posterior inferior cerebellar artery is a rare normal variant, not to be interpreted as blockage of the ipsilateral distal vertebral artery. The circle of Willis is also frequently incomplete. Ultrasound imaging provides anatomical information of the vasculature together with functional information of velocity and flow direction. Exciting new areas of research include therapy with ultrasound to break up a symptomatic thrombus that may be responsible for a stroke and the introduction of ultrasound contrast agents.

MUELLER, Dean, Mary BERNIER, Shiow-Hwa GAU, Thomas GEST, and Jianfeng WANG. University of Michigan Medical School, Ann Arbor, MI, USA. Automating requests for anatomical specimens.
Human cadaver material requests have traditionally been mailed

or faxed to the Anatomical Donations Program at the University of Michigan Medical School. However, poor handwriting and the addition of notes may cause poor communication between the requestor and the program. After a request has been approved, the document is transferred to the Anatomical Donations database by retyping the information, providing another opportunity for mistakes. In order to alleviate the need for retyping and to remove potential sources of error, we have developed a system that allows our requestors to complete a request via a password secure web site. This online request system provides ease of use, reduces paperwork, and removes sources of error. After acceptance of a request, the information is downloaded to the database for a permanent yet modifiable record. A weekly time sensitive report is automatically sent to the coordinator for review and organization of requests needing to be filled, which adds the benefit of accurate, legible records that are arranged in order by date required. This new online request system will save time, increase accuracy, and automatically creates searchable permanent records of the requestor and the request.

NASH, Lance, Lauren PORTNOW, Quentin FOGG, and Vaughn JACKSON. American University of the Caribbean, Sint Maarten, Netherlands Antilles. <u>Attachments and innervation of the thenar musculature revisited.</u>
The thenar muscles play an essential role in the positioning and precision of thumb movements. Diminished function is noted early by patients with a variety of causative conditions, and is often of high concern to the individual. Loss of function is often closely associated with a dramatic reduction in quality of life for many patients. Despite this, anatomical descriptions and understanding of the musculature are generally quite basic. This study aims to clarify and quantify the anatomic relationships within the thenar eminence such that better understanding of the mechanisms of normal function and typical patterns of dysfunction can be achieved. Cadaveric hands (n = 40) were used for the study. Latex was injected in the radial and ulnar arteries to highlight blood vessels in the region. Subsequent layers of tissue in the thenar eminence were dissected and photographed. This enabled the distribution of blood vessels and nerves, and the area of muscle attachment to be measured digitally. For each group of muscle the angle of fibres was also measured. The results of this study provide quantitative rationale for the function of each muscle in the thenar eminence. These

data also provide more precise detail regarding localised blood supply and innervation for each muscle and related tissue. These data will aid students of anatomy in better rationalising the link between structure and function of these muscles. These data will also be of interest to clinicians dealing with progressive degeneration of patients' thumb function, and may aid more precise diagnosis and treatment of injuries.

NASH, Lance, Lauren PORTNOW, Michael DI LORETO, Jonathan GUPTA, and Ryan KARASEK, American University of the Caribbean, Sint Maarten, Netherlands Antilles.Digital measurement of the palmaris longus tendon in a Dutch population: A cadaveric study.
This study examined 28 forearms from 14 adult cadavers to determine tendinous length of the palmaris longus (PL) muscle using digital analysis in a Dutch population. The purpose was to predict the sizes of these tendons based on PL tendon to forearm (cubital fold to wrist joint) length ratios. Two cadavers presented with bilateral absence and two with unilateral absence of the PL tendon. Three limbs contained anomalies in morphology and topography. The overall mean length of PL tendons for the sample population was 132.5 mm. No statistical differences were observed between male and female tendon length. The mean forearm lengths were 257 mm in male specimens and 239 mm in female specimens. No significant differences were observed between right and left forearm lengths within male and female subpopulations. The ratio between tendons to forearms length was 52% in males and 56% in females. A significant correlation was found in length of tendon versus forearm in females ($r=0.62$) and males ($r=0.88$). Therefore, at least 50% of total forearm length could be used to determine the tendinous portion length of the PL muscle when present. These results indicate that it is possible to estimate the viable PL tendon length, by first determining forearm length, that can be harvested for surgical tendinous reconstruction.

NIEDER, Gary, and Nicole BORGES. Wright State University Boonshoft School of Medicine, Dayton, OH 45435, USA. Longitudinal study of online lecture use and performance in a gross anatomy and embryology course.
Course content delivery in the basic science medical curriculum is increasingly accomplished by lectures outside the traditional physical classroom. Over the past six years, lecture material in our gross anatomy and embryology course has been available

only in an online format comprised of html pages with audio tracks. Although students appreciate the availability of online lectures, previous work has shown a wide variance in students' use of online resources in our course. We have now examined students' online lecture use behaviors over six years. Students accessed lectures throughout the course via a secure server which logged each page request so behaviors of individual students could be tracked. Over the six years, use of lectures increased beyond that accounted for simply by the volume of materials available (i.e., students spent more time with all the available materials). Another apparent trend was an increase in student use occurring off campus, as broadband connectivity increased, and more recently toward wireless connection on campus, with a corresponding decline in use of the campus computer labs. Looking at individual use data, the amount of online content viewed during the course varied more than four-fold among students in this pooled population. There was a small, but statistically significant positive correlation between online use and performance on course exams and quizzes. We were also able to show a significant difference in both online use and performance between males and females with males tending to use the online lectures more and scoring higher on exams and quizzes.

NIKFARJAM, Jeremy, Ralph GER, A. VAN SCHOOR. Albert Einstein College of Medicine, Great Neck, NY 11023, USA. The enigmatic syndrome of meralgia paraesthetica.
This enigmatic syndrome is a relatively poorly understood condition whose treatment is equally puzzling. The name, 'Meralgia Paraesthetica' (MP), derives from meros and algos, Grecian words meaning thigh pain. The condition is usually diagnosed when patients experience radiating pain, paraesthesia and numbness in the area of distribution of the lateral femoral cutaneous nerve (LFCN). Interest is further aroused when the symptoms suggesting nerve entrapment arise during the course of a concurrent illness. When the symptoms are sufficiently troublesome and not responding to conservative treatment, operative treatment may be a consideration. The available literature suggests that the underlying cause is related to compression of the LFCN as it passes deep to or through the inguinal ligament (IL). The studies carried out at two medical schools, The Albert Einstein College of Medicine, in New York, USA and The Faculty of Medicine, Pretoria, South Africa, were directed towards the relationship of the LFCN to both sides of the

pelvic outlet in adult cadavers. The Pretoria study showed that the nerve ran superficial to the IL on the left side in 60% of cases and in 65% on the right side. A statistically significant correlation between the distances covered by the LFCN as it crosses the anterior superior iliac spine (ASIS), superficially on both sides, also establishes that the closer the relationship of the LFCN to the ASIS, the more likely is the former to enter the lower limb superficial to, rather than deep to, the IL.

NORTON, Neil S., Terry F. LANPHIER, Paul C. EDWARDS, Laura C. BARRITT, Margaret A. JERGENSON, and Tarnjit S. SAINI. Creighton University, Omaha, NE 68178, USA. <u>An evaluation of dental induced air emphysema by CBCT a review of the fascial spaces.</u>

Dental induced air emphysema can be defined as air entering the facial spaces during or shortly after dental treatment. These dental related cases have been reported following the extractions of third molars, root canal therapy, implant placement, periodontal cleaning, crown preparations, and restorative dental procedures. While the most common symptom is sudden swelling of the skin, the most diagnostic sign is crepitus on palpation of the skin swelling. For dental induced air emphysema to occur, air must enter the facial spaces by passing through an intra-oral barrier such as the apex of a root, the dentoalveolar membrane, or gingival sulcus. We report a case of dental induced air emphysema that occurred during a normal restorative dental procedure along the buccal side of the 2nd right mandibular molar. Upon sudden swelling of the area around the right cheek, an oral surgeon was immediately consulted and a CT evaluation was performed. The CT scans provided for three dimensional reconstruction of the anatomical path of the air's passage through the lateral pharyngeal, submandibular, and retropharyngeal spaces until it ended in the superficial fascia of the face. This case serves as an excellent teaching demonstration and review of the importance of the fascial layers and spaces of the head and neck.

OLINGER, Anthony, and Brion BENNINGER. Western States Chiropractic College, Portland, OR 97230, USA. <u>Thoracic outlet syndrome and the axillary artery - Part I: The frequency of the arterial anomaly.</u>

Thoracic outlet syndrome refers to a neurological or vascular compromise of the brachial plexus and associated vasculature as they travel from the neck along the superior thoracic wall into

the axilla. Provocative diagnostic tests for thoracic outlet syndrome have been unreliable. Part one of this study will quantify the frequency of anomalous positioning of the axillary artery with respect to the brachial plexus as they travel through the coracopectoral tunnel. A total of 162 bilateral, male and female preserved cadaver axillae were dissected to examine the axillary artery and the brachial plexus as they traverse the coracopectoral tunnel. Data were collected regarding the position of the axillary artery with respect to the roots of the median nerve. Besides the classical relationship between the axillary artery and the brachial plexus, the axillary artery was observed both unilaterally and bilaterally entirely anterior to the medial and lateral roots of the median nerve. The findings of this study suggest that a population of individuals possess a neurovascular anomaly where the axillary artery is positioned entirely anterior to medial and lateral roots of the median nerve. This unique relationship results in an anterior freedom of the artery that differs from the classic neurovascular relationship. Variations exist in the distribution and course of the axillary artery with respect to the brachial plexus of nerves, and these variations may affect the compression of that vessel in the coracopectoral tunnel when performing provocative diagnostic tests for thoracic outlet syndrome.

PARK, Jin Seo. Dongguk University School of Medicine, Gyeongju, Republic of Korea. <u>Outlined images and 3D models based on sectioned images of the cadaver head.</u>
Serial-sectioning of the human body has certain advantages in learning and teaching of human anatomy. Therefore, we made sectioned images of the head with real color and high resolution. The sectioned images are exclusively used for realistic three-dimensional (3D) models. For making realistic 3D models, each structure of sectioned images has to be outlined in detail. Therefore, we made sectioned images, outlined images and 3D models as follows. The cadaver head was serially sectioned at 0.1 mm intervals and sectioned surfaces were photographed to make 2,434 sectioned images (0.1 mm pixel size and 48 bit color). Intervals of the sectioned images were increased from 0.1 mm to 1 mm. On the sectioned images, 172 head structures were outlined semi-automatically by using the 'magic wand tool' and 'quick selection tool' in Adobe Photoshop to make 234 outlined images (1 mm intervals, 0.1 mm pixel size, TIFF format, and 8 bit color). It was also helpful to use a tablet pen instead of a computer mouse for outlining. Using the outlined images,

outside of head skin in the sectioned images was automatically erased in Photoshop. Using MRIcro software, the sectioned images were reconstructed by volume modeling to acquire a head 3D model (1 mm voxel size and 8 bit gray). Likewise, after outside of other head structures were erased, 3D models of the structures were made. Then, the 3D model was rotated and arbitrarily sectioned to display the sectional planes. The 3D models were carefully observed to verify the outlining. In case of incorrect 3D models, the incorrectly outlined images were reformed. The outlined images were satisfactory in quality, which were verified by the 3D models of head structures.

PEARSON, John. Wright State University Boonshoft School of Medicine, Dayton, OH 45435, USA. <u>Teaching neurologic localization skills using a team-based learning module.</u>
We introduced a team-based learning (TBL) module, Neurologic Localizations, into the Year 2 Medical Neuroscience course to replace problem-based learning (PBL) sessions used in the past. We evaluated the effectiveness of this module by comparing its use in a three-year period (2006-08) to the use of similar PBL material over an eight-year period (1995-2002). There were no significant differences in student performance on major course exams (TBL ave=83.4 vs. PBL ave=82.9) or learning effectiveness ratings on student numerical evaluations (TBL ave=4.30 vs. PBL ave=4.27). In written evaluations, students preferred the peer interaction in TBL over the faculty facilitation within PBL. Students considered problem resolution within PBL to be equivocal compared to the end-points reached through multiple-choice questions (MCQs) in TBL. Faculty noted that (1) students were better prepared for TBL sessions, (2) intragroup discussion was about the same in both formats, and (3) intergroup discussion seemed more prolific in PBL. The faculty felt less involved in the TBL process and criticized the TBL MCQ format as a measure of reasoning skills compared to the open-ended questions in PBL. Based on student exam performance, student numerical and written course evaluations and faculty observations, we conclude that the Neurologic Localizations TBL module effectively helps medical students learn basic neuroscience content knowledge and neurology problem-solving skills.

PORTA, David, and Anna HARVEY. Bellarmine University, Louisville, KY 40205, USA. <u>The effect of selective bone component damage on bovine rib strength and fracture pattern.</u>

Bone is a composite material made up of organic (collagen protein) and inorganic (minerals and water) components. Disease processes (e.g. osteoporosis, osteogenesis imperfecta, etc.) affect different components and the effect on strength and fracture pattern will vary. In order to investigate extreme cases, 20 fresh ribs were dissected from 5 bovine slabs. Using 4 ribs from the same animal allowed for testing of multiple parameters on relatively uniform bone- 1 control and 3 treatments. Treatment groups included demineralization (via HCl bath), dehydration (105°C for 24 hrs), or denaturation (600°C for 24 hrs). Each rib was fixed in a vise and broken by a 2 inch steel pipe attached to a swing arm machine. The bending strength (N) was measured using an Omega DLC101-5k force transducer and Instrunet software. Average fracture strength of the control ribs was 358 ± 68 N. Demineralized and dehydrated cow ribs failed at approximately 60% of the force of their controls. Denatured bones failed at an average of 46% of their controls, thus the loss of proteins had the greatest affect on bending fracture strength in this study. Fracture patterns were documented and the amount of fragmentation increased successively from the control group, to the dehydrated group, to the denatured bones. Demineralized ribs showed the least fragmentation. Testing was captured on digital high speed video (up to 600 fps).

RAOOF, Ameed, Lowell FISHER, Sabine HILDEBRANDT, Anuja JAIN, Dennis LEE, Jennifer MCDONALD, Monica MICHELOTTI, and John STRIBLEY. University of Michigan Medical School, Ann Arbor, MI 48109, USA. <u>Improving undergraduate students performance in anatomy: Employing medical students as teaching assistants and introducing lab sessions with plastinated anatomical specimens.</u>

A challenge of the undergraduate anatomy course at the University of Michigan Medical School has been the diverse educational background of the enrolled students. Questionable motivation and poor course performance of more than 50% of our students caused us to introduce an array of innovative teaching measures starting during the Fall 2002. The objectives for introducing the new measures were both the effective administration of a relatively large class size, and improving students' learning and retention of anatomical information across the various academic disciplines represented. In 2002, the course was lecture based. Certain groups of students performed well; however, over 50% of the class had difficulty with the material exhibited by marginal performance on exams. After

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reviewing class evaluations, administering several surveys, and discussing with students, it was determined that the students were dealing with the following issues: difficulty understanding complex three dimensional relationships of the structures, inability to effectively cope with the information density of the course, and failure to see broader relevance of the material. In response to these issues, medical student teaching assistants (TAs) and laboratory sessions were added to the course. The students were given the opportunity to visit the laboratory during the semester where they interacted with the plastinated specimens and were able to visualize the complex anatomical relationships. The TAs allowed for a better faculty to student ratio, and their proximity in age to the students created an environment for effective mentorship.

RAVICHANDIRAN, Kajeandra, Mayoorendra RAVICHANDIRAN, Michele OLIVER, Karan SINGH, Nancy McKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S 1A8, Canada.
Computation of physiological cross-sectional area of skeletal muscles using finite element modeling.

Introduction: Physiological cross-sectional area (PCSA) is used to compare force-producing capabilities of skeletal muscles and fiber bundle length (FBL) for excursion range. One limitation of PCSA is that it cannot be measured directly from a specimen, as usually there is no area within the muscle belly that is traversed by all of its fibers. Therefore, a formula requiring averaged architectural parameters has been traditionally used: PCSA=MuscleVolume/FiberBundleLength*cos(PennationAngle). Purpose: (1) Develop a finite element method (FEM) to calculate PCSA directly from digitized fiber bundle data obtained throughout the volume of the muscle. (2) Compare PCSA computed using the finite elements to PCSA calculated with the formula. Methods: Previously collected digitized data of extensor capri radialis longus (ECRL) and brevis (ECRB), pectoralis major (PM), and supraspinatus (SS) were used to develop the finite element method. The PCSA computed using the finite element and the formula method were compared using the paired t-test. Results: A FEM model was developed that used generalized cylinders as the volumetric representation of digitized fiber bundles. PCSA was computed as the summation of the cross-sectional area of each finite element within the muscle volume. The PCSA of ECRL, ECRB and SS were significantly different between the FEM and formula methods. In PM, an architecturally homogeneous muscle, no significant difference

was found. Conclusions: The FEM provides an approach that takes into account architectural variances while minimizing the need for averaged architectural parameters. A future application includes the use of finite elements to create a contractile model based on neuromuscular partitions.

RAVICHANDIRAN, Mayoorendra, Michele OLIVER, Karan SINGH, Winnie TSANG, Nancy McKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S1A8, Canada. Development of an educational 3D contractile model of forty-one forearm and hand muscles.

The study of dynamic hand function requires an accurate model that is biomechanically and anatomically accurate. Earlier models have focused on appearance of movement rather than the accuracy of musculotendinous interdependencies. The purpose of this project was to design an anatomically accurate interactive contractile muscle model of forearm and hand muscles using 3D computer simulation (Autodesk® Maya®). The bony skeleton, i.e. radius, ulna and hand, were adapted from a 3D skeleton and modeled as polygon meshes. The joints acted as hinges that allowed rotation about the primary axes with defined range of motion constraints. In total, forty-one muscles (musculotendinous units) were represented as single contractile units that attached at their respective sites of origin and insertion. To give each muscle contractile properties to simulate force generation, the Hill's three-element muscle model was used. Using slider controls, a user interface was designed that allowed selection and activation of single muscles or a group of muscles. The observed movement was a result of the interaction between the activated muscles and the defined joint constraints. Further user manipulation of the model was also possible for visualization purposes; for example, the model could be rotated in 3D and muscles could be spread or made transparent in order to visualize deeper muscles. The educational value of this program can be enhanced by continued work on anatomical accuracy, clinical relevance (through inclusion of various preset pathological scenarios, such as tendon lesions), and rapid computation of movements.

RAVICHANDIRAN, Nisanthini, Mayoorendra RAVICHANDIRAN, Kajeandra RAVICHANDIRAN, Nancy McKEE, and Anne AGUR. University of Toronto, Toronto, ON M5S 1A8, Canada. Intramuscular innervation of extensor carpi radialis longus and brevis using 3D computer modeling.

Previous studies have been descriptive and focused on the origin and entry points of the branches of the radial nerve to extensor carpi radialis longus (ECRL) and brevis (ECRB). No study was found that investigated the intramuscular innervation of these muscles. The purpose is to determine the intramuscular innervation of ECRL and ECRB using three-dimensional computer modeling. Radial nerve branches entering the muscles were identified, and exposed in short segments in five formalin embalmed specimens. Each segment was digitized until nerve branches could no longer be followed microscopically. Throughout this process, the muscle surface was digitized for volumetric reconstruction. Three-dimensional models of the nerve within the muscle volume were constructed (Maya®). Intramuscular nerve distribution was documented. On analysis, it was found that the radial nerve trifurcated with two branches (anterior and posterior) entering the ECRL and one branch (proximal branch) entering the ECRB. The anterior branch supplied approximately one-third of the thickness of the ECRL muscle belly superficially and the deep branch, the remainder. The proximal branch entering ECRB innervated the proximal half of the muscle belly and the distal branch, which originated from the deep branch of the radial nerve, supplied the distal half. In conclusion, ECRL and ECRB both have neuromuscular partitions based on their innervation pattern. ECRL is divided longitudinally into anterior and posterior regions, whereas ECRB is divided obliquely into approximately proximal and distal halves. Further study is needed to investigate if there is differential activation of these regions for performance of functional activities.

RICHARDSON, April, Jennifer BRUECKNER, Sandra CHALLMAN, Thomas CUNNINGHAM, Frank DAVIS, Matt HAZZARD, David RITCHIE, and Jacqueline YOON. University of Kentucky, Lexington, KY 40536, USA. A novel simulation of cadaver-based learning in a virtual anatomy experience using Second Life (SL).
Our study objectives were to evaluate the use of a virtual anatomy lab experience in Second Life (SL) among undergraduates and medical professionals. SL introduces a new perspective of student engagement in the classroom. A small population of students from pre-professional and professional medical programs was selected to navigate through a virtual anatomy lab in SL created on the University of Kentucky island. As students of the millennial generation, participants were highly

interested in innovative approaches to anatomy that incorporate the most recent technologies. Students created avatars for themselves and convened on the island in the virtual anatomy lab, where they were asked to complete a list of study objectives regarding the anatomy of the lower limb. Cadaveric images were posted in this virtual world application, and students worked in teams through clinical case studies regarding the lower limb. The virtual anatomy lab provided the extra component of collaborative learning that is lacking in the independent study of cadaveric images. Students felt that the SL anatomy experience allowed them to not only identify structures on the cadaver and comprehend this information in a multisystem format (i.e. arterial, nerve, muscular, skeletal, etc) for the lower limb, but also enabled them to freely discuss the information among fellow students without reservation. This project highlights an innovative approach to anatomical science education and suggests that the millennial student responds positively to this specific pedagogical style.

ROSS, Allen, and Brion BENNINGER. Oregon Health and Science University, Portland, OR 97239, USA. <u>Side-by-side simultaneous use of 3D cross-sectional cadaver, normal and pathological CT/MRI imaging.</u>
Being able to differentiate and navigate cross-sectional anatomy is critical in reading radiographic imaging regardless the medium for healthcare professionals. Several computer software programs provide the trainee with the opportunity to practice anatomical identification. Many professionals believe teaching normal CT/MRI imaging is necessary before viewing pathological CT/MRI imaging. In classic educational programs using horizontal curriculum, the traditional sequencing from gross anatomy to normal to pathological imaging is the format. In a vertical curriculum, the trainee is exposed to gross anatomy in the morning and patient clinics in the afternoon. There was a demand by the students to be better prepared to read multiple mediums of radiology. We set up formal tutorial sessions twice weekly during a clinical anatomy course. Students were presented an image section of gross anatomy first, followed by a normal CT/MRI, then a pathological CT/MRI resulting in viewing 3 images side-by-side. Students were then given a questionnaire with numerical rating. Results revealed an extremely helpful score using the 3 separate images in a single setting. Using colorful cross-sectional cadaver images allowed the students to see well-defined borders and shapes of various structures. They

could then superimpose these structures onto the normal and pathological CT/MRI images. This study suggests that the side-by-side viewing of three images representing gross anatomy, normal CT/MRI architecture, and pathological CT/MRI imaging was a successful instructional technique.

SAGA, Tsuyoshi, Keiicihro NAKAMURA, Makoto TETSUKA, and Koh-ichi YAMAKI. Kurume University School of Medicine, Kurume 830-0011, Japan. A case of a middle mesenteric artery.
In 2007, we found a very rare anomaly of a middle mesenteric artery in a 77-year-old Japanese female cadaver that had been donated for student dissection at Kurume University School of Medicine. The middle mesenteric artery arose from the ventral wall of the abdominal aorta between the superior and inferior mesenteric artery. It ran 106 mm to the right and anastomosed with a right colic artery that branched from the superior mesenteric artery at the right colic flexure. It then inflected to the left and mainly supplied the transverse colon. Finally, it anastomosed with a left colic artery that branched from the inferior mesenteric artery at the left colic flexure. The area of the blood supply for this middle mesenteric artery was parallel with the normal area for the middle colic artery, which primarily branched from the superior mesenteric artery. Therefore, it was thought that this anomalous artery was comparable to a middle colic artery. There was, however, a normal rotation of the intestine. Thus, this was a very rare anomaly case of a middle mesenteric artery directly arising from the abdominal aorta with a normal morphology of the intestine.

SAKAMOTO, Yujiro. Tokyo Medical and Dental University, Tokyo 113-8549, Japan. Spatial relationships between scalene and anterior vertebral muscles and their innervations.
The scalene and anterior vertebral muscles are innervated by the ventral rami of the cervical spinal nerves. To clarify the positional relationships between these muscles and their innervations, the muscles and the ventral cervical rami were gross anatomically examined under a binocular microscope in 12 Japanese cadavers. The scalenus anterior arose from the lower cervical vertebrae and descended ventral to the ventral cervical rami. The scalenus medius was divided into two parts arising from upper and lower cervical vertebrae, respectively, and descended dorsal to the ventral rami. The scaleni anterior and medius were inserted into the first rib. The scalenus posterior arose from the lower cervical vertebrae and descended to the

second rib. The longus capitis arose from the cervical vertebrae and ascended to the occipital bone. The longus colli arose from the cervical and upper thoracic vertebrae and ascended to the upper vertebrae. The ventral branches from the lower ventral rami passed between the origins of the scalenus anterior to supply it and extended to the lower half of the longus colli. Some ventral branches ascended to supply the scalenus medius. The ventral branches from the upper ventral rami ran between the longus capitis and the upper half of the longus colli to supply them. The dorsal branches from cervical rami supplied the scalenus medius, and the lower branches penetrated it to supply the scalenus posterior. The innervations suggested that the scalene and anterior vertebral muscles are classified into upper ventral and dorsal and lower ventral and dorsal groups.

SATO, Tatsuo, Hirokazu SAKAMOTO, and Yoko TSUBOI. Tokyo Medical and Dental University, Tokyo 101-0062, Japan. <u>DVD demonstration of topographic anatomy of axillary lymph nodes for breast cancer surgery.</u>
Previously, the primary treatment for breast cancer was radical surgery, however, in the recent decade the emphasis has been shifting away from radical and more towards function preservation for improved QOL. Interestingly, this trend can also be well explained from the anatomical viewpoint. Based on my research and collaboration with the Japanese Breast Cancer Society, I have found that in addition to the infraclavicular node groups, the central and subpectoral lymphatic groups are critical and must be recognized in order to develop optimal therapeutic protocols. In this dissection DVD, the important lymphatic pathways are traced and their relationships to the surrounding structures are shown. In the left side of this specimen well-developed lymphatics are seen along the long thoracic nerve; this chain ascends behind the axillary blood vessels and brachial plexus, reaches the supraclavicular triangle and drains into the venous angle. This finding indicates the significance of the lymphatics of this area which was previously overlooked.

SATTI, Uzma, Peter ABRAHAMS, Stephen BRYDGES, Emma ESQUILANT, Ann-Marie FEELEY, and Gregory SMITH. University of Warwick, Coventry CV4 7AL, United Kingdom. <u>Plasticast: a podcast of plastinated specimens to illlustrate facial anaesthesia techniques.</u>
Students often find it difficult to apply knowledge of anatomy to the clinical setting. Using professionally dissected plastinated

specimens we have developed a podcast which clearly demonstrates how to perform a practical clinical procedure and well illustrates its anatomical basis. The aim of this project is to help students to understand how a sound knowledge of anatomy can be directly applied to improve their clinical practice. We chose facial anaesthesia for our first podcast as this technique is clinically important and can be effectively taught through a digital platform using plastinated specimens and live demonstration. This podcast will provide an easily accessible and long lasting resource for students of anatomy, both undergraduate and postgraduate. Our project is the first of several podcasts created as part of a digital resource library demonstrating the anatomical basis for clinical skills and procedures. We will be undertaking studies to assess objectively the educational value of these podcasts.

SAWAYA, Zachary, and Thomas GEST. University of Michigan Medical School, Ann Arbor, MI, USA. The effect of dissection and peer teaching on student performance in medical gross anatomy.
Although many anatomy faculty believe that dissection improves student learning of gross anatomy, there have been few studies that demonstrate a relationship between dissection and student scores in anatomy. At the University of Michigan Medical School, students perform dissections in two teams of three students in alternating sessions. A team of three students that performs a dissection will present this material to the other team of three students at the following session, and teams alternate throughout the year. To get an accurate measure of the relationship between student performance and dissection, we recorded attendance at each lab session. Student performance on questions that pertained to material covered in each dissection was analyzed for practical exams and computer based multiple choice exams. Students who dissected and presented a specific lab session tended to score higher on questions related to that session than those who had not dissected that session.

SCHMITT, Brandi, Mark BROOKS, Andrew CORSON, Dean Fisher, Herb HAWLEY, and Charlotte WACKER. University of California, Oakland, CA 94607, USA. Serological testing to reduce risk in the University of California's whole body donation

programs.

The University of California (UC) has five Body Donation Programs statewide. These programs supply human anatomical specimens for education, research and clinical practice. To ensure the safety of specimen users, a system-wide practice of testing post-mortem serological samples from all donors has been established. The purpose of this testing is to determine the incidence of contagious disease and reduce the contributory risk factors for users. Methods. UC received 1,934 donations in 2007 and 2008. Before a decedent is physically accepted into a program, screening questions are asked to determine if the body is acceptable for use, including questions about contagious disease. Decedents known to have a history of contagious disease are not accepted. Those meeting the program criteria are accepted and a routine work-up, including sampling and testing of donors' sera by an independent laboratory, is performed. Standard tests include HIV I & II Antibody, Hepatitis B Surface Antigen and HCV Antibody. One UC program uses Nucleic Acid Tests (NAT) to reduce the likelihood of missing recently acquired disease. Results. Results for tests performed between January 1, 2007 and December 31, 2008 include reactive results in 4 of 1,940 HIV tests (0.2%); in 49 of 1,920 Hepatitis B tests (2.6%), and in 69 of 1,963 tests for Hepatitis C (3.5%). Conclusion. Verbal questioning about infectious diseases does not eliminate potential risk. Serology testing is a viable way to reduce risk and ensure laboratory safety. NAT testing may provide greater protection, particularly when used to screen high risk populations.

SCHOENHAGEN, Paul, Richard DRAKE, and Stuart MORRISON. Cleveland Clinic Foundation, Cleveland, OH 44195, USA. Aortic root anatomy assessed with high-resolution computed tomography.

Degenerative aortic stenosis has become the most common native valve disorder in the US. Many patients require eventual aortic valve replacement. For those not considered surgical candidates, because of age or significant co-morbidities, less invasive transcatheter approaches for valve replacement/implantation are becoming a viable alternative. 3-D imaging is increasingly used for planning of these complex procedures but also for device design, because it allows for quantification of the in vivo anatomy and deformation and subsequent modeling of the aortic root. Computed tomography is particular attractive, because it allows fast acquisition of

high-resolution data-sets of the root, including the leaflets and coronary artery ostia with sufficient temporal resolution to allow for multi-phasic analysis. Such volumetric datasets allow subsequent 3-D display, reconstruction in unlimited planes, and mathematical modeling of the root. Procedural planning and device design based on 3-D imaging has already become routine for aortic endovascular stent grafts, but is a novel approach for transcatheter valve development. We will discuss aortic root anatomy as visualized by CT in patients with and without aortic stenosis and its potential use for procedural planning of trans-catheter valve procedures. We will also hypothesize that such imaging data can developed into a tool to understand and teach anatomy.

SEN, Tulin, Ali Firat ESMER, and Eray TUCCAR. Ankara University, Faculty of Medicine, Department of Anatomy, Ankara 06100, Turkey. <u>Anatomy and clinical significance of the trigeminocerebellar artery.</u>
The trigeminocerebellar artery (TCA) is a unique branch of the basilar artery supplying both the trigeminal nerve root and the cerebellar hemisphere. In this study, we described and demonstrated the microanatomy of the TCA in 45 brainstems and discussed the neurological, neuroradiological and neurosurgical significance in the largest series of cadavers. The close relationship of the TCA to the trigeminal nerve root may have clinical implications, like trigeminal neuralgia, so the neurosurgeon must be aware of the vasculature of the trigeminal nerve root area and the anatomical variations.

SHEEDLO, Harold J.[1], Rustin REEVES[1], Cara FISHER[1], Robert ROUTH[1], Victor KOSMOPOULOS[2], Brian WEBB[2], and Robert BUNATA[2]. Department of Cell Biology and Genetics[1], Department of Orthopedic Surgery[2], University of North Texas Health Science Center, Fort Worth, TX 76107, USA.
<u>Lateral wear of the humeral capitulum related to tennis elbow?</u>
Tennis elbow may result from degeneration of the extensor carpi radialis brevis (ECRB) tendon, termed tendinosis. We propose that degeneration may be initiated by attritional wearing of the common extensor group origin rubbing against the humeral capitullum. We searched for anatomic evidence of tennis elbow and associated effects. Reciprocal cartilage wear patterns were detected on the lateral capitullum that may be related to abrasion of the extensor origin against the capitullum. We examined over 150 elbows to classify the cartilage wear patterns where the

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extensor origin contacts the lateral capitullum. In additional elbows, we marked the location of the most medial extensor origin to determine if ECRB location correlated with wear patterns. A more distal attachment of ECRB had a high correlation with capitullum wearing. Four wear patterns, from minor cartilage loss to extensive wear that extended into subchondral bone were documented. These wear patterns involve areas of the elbow apart from the usual regions of degenerative elbow joint disease. A classification of the capitullum wear patterns was developed. Our classification is grade 0 = no wear; grade 1 = minimal wear limited to the lateral capitullum; grade 2 = wear of whole lateral capitullum which may or may not extend into subchondral bone; grade 3 = wear extending onto the radiocapitullum surface. A grade of 0 = absent and + = present was used to identify wear in the superior lateral capitullum. A better understanding of the cause of tennis elbow may lead to improved treatments of tennis elbow.

SMITH, Gregory, Peter ABRAHAMS, Stephen BRYDGES, Birgit FRUHSTORFER, Paul GAZZANI, Tim RATTAY, Anil VOHRAH, and Richard WELLINGS. St. Mary's College of California, Moraga, CA, USA. <u>RARITY: a new e-learning tool integrating radiology and anatomy for medical students.</u>
At U.K. medical schools, basic radiology is traditionally taught as part of the anatomy course. However, time and resources available vary considerably among institutions and electronic learning tools incorporating radiological images are scarcely used. Warwick Medical School has recently replaced cadaveric dissection with the use of plastinated prosections and axial slices. As a part of the new anatomy course, students rotate through prosections and weekly radiological-anatomy tutorials. To complement the radiological anatomy component of the course, a new web-based interactive tutorial, RARITY, was created by a team of anatomists, radiologists, medical tutors, and an e-learning technologist. RARITY places 120 normal radiological images alongside correlating images of plastinated slices and prosections. Up to twelve key structures are highlighted on both. Students are invited to undertake two interactive tasks: "name the highlighted structure" and "locate the highlighted structure". The students are asked to do ten images each week corresponding to the contents of the anatomy session. Student participation is recorded and exposed on a high score table. Correlation of high scores and exam results together with the results of a student evaluation suggest that the

integrated nature of this e-learning resource has improved student learning of radiological anatomy and represents a unique e-learning resource to supplement the weekly teaching session.

SMITH, Kyle D., Paul C. EDWARDS, Tarnjit S. SAINI, and Neil S. NORTON. Creighton University, Omaha, NE 68178, USA. <u>Using CBCT to study the incidence of concha bullosa in the nasal cavity.</u>

The anatomy of the nasal cavity and paranasal sinuses are complex and a variety of clinical conditions such as sinusitis, deviation of the nasal septum, and epistaxis occur. One anatomical variation that can be observed within the nasal cavity is a concha bullosa, which is a pneumatization of one of the conchae. In this study, we sought to evaluate the incidence and location of concha bullosa in dental patients with no sinonasal symptoms. Dental cone beam computed tomography images (CBCTs) of the nasal cavity of 882 patients collected between September 2005 and June 2008 were evaluated in axial, coronal, and sagittal planes for the presence of concha bullosa. We found concha bullosa in 605 (68.6%) of the total number of cases. Of the 68.6% with a concha bullosa, 109 (18.0%) were located only on the right side, 114 (18.8%) were located only on the left side, and 382 (63.1%) were located bilaterally. We observed that 181 (20.5%) of the total cases had a deviated septum. Eighty-two (13.6%) of the nasal septum deviations were associated with a concha bullosa. The deviations associated with concha bullosa are believed to make patients more susceptible to blockages and sinusitis. In conclusion, dental CBCTs provide 3-dimensional imaging at sub-millimeter resolution that allowed us to examine the overall incidence of concha bullosa within the nasal cavity including the incidence related to deviation of the nasal septum.

SPINNER, Robert, Bernd SCHEITHAUER, Jean Francois VINCENT, and Alexandra WOLANSKYJ. Mayo Clinic, Rochester, MN 55905, USA. <u>Intraneural ganglion cyst: A 200 year old mystery solved.</u>

We describe the first reported case of an intraneural ganglion cyst, an ulnar ("cubital") intraneural cyst, which, on literature review, dated to 1810. For over 80 years, its original brief

description by Beauchene was wrongly attributed to Duchenne, effectively making the reference and specimen inaccessible to scrutiny. Fortunately, the intact cyst had been safely housed in the Musee Dupuytren, Paris, France, thus permitting its examination. Although originally described as a "serous" cyst, our present understanding of the anatomy of the ulnar nerve and of peripheral nerve pathology allowed us to reinterpret it as a mucin filled, elbow level, ulnar intraneural ganglion cyst. In addition to its description as a fusiform cystic enlargement of the nerve, we documented similar enlargement of a lumen bearing branch, the articular branch at the level of the elbow. Based on our assessment of the specimen and with a modern perspective, we concluded that the origin of the cyst was from the posteromedial aspect of the elbow joint and that its fluid content, having dissected through a capsular defect, followed the path of the articular branch into the parent ulnar nerve. The purpose of this report is to clarify historical misconceptions regarding the pathogenesis of this controversial entity.

STEFAN, Ancuta M., Eileen MOSER, and Cristian STEFAN. Touro University College of Medicine, Hackensack, NJ 07601, USA. Designing a "histology without borders" longitudinal program in a new and integrated curriculum.
One of the key concepts in designing and planning our new medical school curriculum consists of longitudinal programs and threads related to various disciplines and educational needs that transverse the frame of system-based courses. The material traditionally taught in a Histology course has been incorporated across the first two years of study as a carefully orchestrated scaffold that took into consideration logistics regarding the: coverage and succession of topics; priority given to practical relevance; timing of the material presented within various courses; integration with other basic sciences as well as clinical topics in both teaching and testing; and identification of the appropriate pedagogical modality for each session. A combination of classroom and independent study activities was devised, complemented by the planning of a robust online instructional component. Although some sessions are specifically devoted to clinical histology alone, preference was given to a blended, multidisciplinary format. Emphasis was placed on active learning and on ensuring the logical continuity between: a) structure and function; b) microscopic and macroscopic level; c) normal and pathological; d) morphological features and findings provided by physical examination, laboratory medicine tests, and

diagnostic images. Further planning for focused instructional activities (both in small groups and online) strategically distributed in several clerkships in the third and fourth years includes the review of and building upon the previous knowledge, skills, and attitudes acquired in relation to the teaching of clinical histology.

TAM, Matthew, and Tom TURMEZEI. The Radiology Academy, Norwich NR4 7UB, United Kingdom. <u>Semantic groups in the anatomical lexicon of Modern English.</u>
Study of anatomy has been shown to be enhanced by considering the etymology of Classical Latin and Greek terms during teaching. A representative sample of 709 single-word terms used in current English anatomical terminology was created using the index of the 40th edition of Gray's Anatomy. These were cross-referenced in the Oxford English Dictionary, the gold standard etymological dictionary for the Modern English language. The languages of origin were found to be Classical Latin (63%), Classical Greek (26%), Old English (6%), Post-classical Latin (2%) and other (3%), encompassing Old French, Old Norse, Anglo-Norman, Middle English, Arabic and unknown. Terms were then categorized into semantic groups which included the human form itself (36%), instruments (11%), geographical forms (5%), agents of action (6%), geometric forms (5%), animals (5%), items of clothing (5%), spatial relations (4%), plants (4%), food (3%), architecture (3%), numbers (2%), the home (1%), transport (1%), size (1%), colours (1%), astronomy (1%), and letters (1%). We discuss how anatomical terms have been named after form, function and sometimes erroneously. We also pictorially present the following terms from these semantic groups: ala, amygdala, carina, cortex, clinoid, clivus, cricoid, cruciate, hyoid, falx, fornix, flavum, labyrinth, lentiform, lunate, mandible, meniscus, pituitary, quadrate, rete, scaphoid, scutum, sphenoid, stellate, turbinate, trapezoid, uncus, and vermis. This review reveals that the linguistic origin of modern anatomical terms is varied and that they can be divided into broad semantic groups. Insight into this should promote a greater understanding and enjoyment of anatomy for students and teachers alike.

TAVANGARI, Ricky, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA. <u>Can measurements of the axillary, femoral and popliteal arteries be used as predictors of</u>

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hypertension?

Hypertension has multi-factorial risk factors and can lead to the development of life-threatening vascular pathology. The prevalence of primary hypertension is global and not fully understood. Mean arterial pressure (MAP) is stroke volume x heart rate x total peripheral resistance (TPR). Individuals at risk of hypertension may have different peripheral arterial dimensions contributing to TPR. Seemingly, axillary, femoral, and popliteal arteries contribute to TPR. We dissected 43 cadavers, measuring the vessel and intraluminal diameter of the axillary, femoral and popliteal arteries. Parameters (potential risk factors of hypertension) examined were age 34- 100 years, sex 22F/21M, body mass index (BMI) height 5' 0"-6', weight 90-210 lbs, sidedness, and ethnicity. Results revealed arterial dimensions were larger with increasing age. Women had larger vessel and intraluminal dimensions compared to men. Increased BMI was proportional to decreasing arterial diameter. Uniformity across each side was unequal; right-sided vasculature was larger than left-sided in vessel and intraluminal diameter. Black individuals had smaller arterial diameters than non-blacks, potentially contributing to increased risk for hypertension and related complications. The data provides a baseline of arterial diameter measurements and suggests that TPR may be greater on the left-sided vasculature. Older individuals had larger vessels, potentially decreasing TPR. Increased BMI and black males exhibited smaller vessel diameters. This may suggest increased TPR and thus higher risk for primary hypertension and its progression into fatal illnesses.

TERRELL, Mark, Mathew BATEMAN, Jon KALMEY, and Randy KULESZA. Lake Erie College of Osteopathic Medicine, Erie, PA 16509, USA. Characteristics of effective and scholarly anatomy teaching: An imperative for the 21st century.

Describing what makes an exceptional teacher is challenging. How does scholarly activity fit into the picture? A comparative analysis of relevant medical education literature reveals numerous and conflicting attributes. This study's objectives were to construct effective teaching characteristics that are: 1) validated by underlying cognitive and socio-environmental principles of learning and 2) specific and applicable to anatomy instruction. Pedagogical characteristics that best predict excellence in teaching anatomy include using a case-based format, lecture clarity, engaging and interacting with the learner, and using authentic and formative assessments. These

characteristics were then used in a scholarly way to inform the instructional redesign of our gross anatomy course, which now consists of an infusion of innovations. These instructional innovations include case-based lectures and forum discussions, an audience response system (clickers), student-led team teaching, a hybrid cadaver dissection / prosection lab, an autopsy lab report, oral lab quizzing, and collaborative group assessment. Results from these efforts: improve student learning outcomes beyond the simple recall of factual information, meet the needs of a competency-based medical curriculum, and advance the scholarship of teaching anatomy.

THAI, Al, Piroska SZABO, and Anne AGUR. University of Toronto, Toronto, ON M5R 1K9, Canada. Three-dimensional innervation of popliteus muscle.
Although attachments of popliteus muscle have been extensively investigated, in the literature the innervation has been described broadly as the tibial nerve. The entry points and intramuscular distribution have not been considered. The purpose was to map and visualize the nerve entry points and three-dimensional intramuscular innervation of popliteus. Eighteen formalin embalmed specimens were dissected to map nerve entry points. 3D computer models were used to analyze the intramuscular innervation of popliteus. The models were constructed by a process of dissection, digitization, and data reconstruction using Maya®. Two branches from the tibial nerve, superior and inferior, were usually seen entering the muscle at the middle third of the superior and inferior borders, respectively. The superior branch gave off up to 7 articular branches prior to entering the popliteus and on entering the muscle supplied the proximal third of the belly. The inferior branch curved superiorly to enter the inferolateral margin to supply the remainder of the muscle. There was minimal overlap of innervation of the two branches. From this pilot study, it is suggested that popliteus is partitioned by innervation into smaller proximal and larger distal parts by superior and inferior branches of the tibial nerve. In light of these findings, it is interesting that the proximal part of popliteus has been reported to insert into the posterior capsule and lateral meniscus and has been suggested to have retractory action. Further study is needed to determine if this function is related to the individual neuromuscular partitions.

THOMAS, Pamela, Gretchen DUNFORD, and Sara PYLE. Kansas City University of Medicine and Biosciences, Kansas

City, MO 64106, USA. <u>Gift Body Program biographical data at Kansas City University of Medicine and Biosciences.</u>

Descriptive statistics of the 484 living donors on file as of July 2008, to the Kansas City University of Medicine and Biosciences Gift Body Program, were assessed for purposes of establishing a profile of the typical anatomical donor. Of those who have bequeathed their bodies to the University for purposes of education and research, information regarding their 1) sex, 2) age upon bequeathal, 3) marital status, 4) race, 5) region and county of residence within the state of Missouri, 6) military service, 7) highest level of education completed, 8) occupation, 9) birthplace, and 10) disposition of cremains were collected. Of those who donate their remains to KCUMB, the typical donor is female, between the age of 61 and 80, married, white and resides in the northeastern region of Missouri. They have not served in the armed forces, they do have a high school diploma, and they have worked in an occupation related to education, health care, construction and repair, or office and administrative support. The typical donor was born in the Midwestern United States and requests that their cremains be returned to their families for burial. By analyzing these common donor traits, we will be able to effectively use this information in our efforts to establish and maintain interest in anatomical donation within our community.

TODD, Gordon, Chandrakanth ARE, and Hugh STODDARD. University of Nebraska Medical Center, Omaha, NE 68198, USA. <u>Balancing reduced time in gross anatomy with incorporation of clinical correlation content.</u>

Gross anatomy remains a stable component of medical and allied health student education in more than 90% of the departments in the US and Canada according to the AAA. The amount of time devoted to dissection has been gradually declining. Our program used to have weekly clinical correlation lectures, but were eliminated with curricular revision. Simultaneously, there has been a decrease in the level of interest in the field of General Surgery. The aims of this project were to 1) stimulate the clinical relevance of gross anatomy; 2) establish mentoring paths between general surgeons and first year medical students and 3) conduct a pilot study to garner feedback from students. A Department of Surgery faculty member provided a review of pancreatic anatomy, malignancies and management to first year medical students during their anatomy lab. Using a lightly embalmed cadaver, the clinically

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relevant anatomy was detailed and a pancreaticoduodenecotmy was performed with the help of student volunteers. A seven-question survey with a 5-point Likert response scale was utilized to obtain feedback. A total of 145 responses were collected for a response rate of 70.38%. The majority of students (99%) felt that this type of surgical demonstration was extremely beneficial, and improved their understanding of the relevant anatomy and its clinical importance. The survey also demonstrated that the majority of students would like these surgical demonstrations to be repeated in future. Less than 1% of the students did not find this demonstration beneficial. The results of this study demonstrated the dual benefits of surgical demonstrations; however, due to time constraints, they must be limited.

TODD, Gordon. University of Nebraska Medical Center, Omaha, NE 68198, USA. <u>Gross anatomy lab teaching environment to maximize learning.</u>
The gross anatomy lab at the University of Nebraska Medical Center was computerized in 2004 to improve the laboratory teaching for both students and faculty. After four years of use with tremendous success, the entire lab was rebuilt from the ground up for the fall of 2008. Each of the 63 tables is equipped with a computer connected to a video projector and displayed on a 50" pull-down screen. To maximize student interaction and efficient use of their time, we developed a fully interactive dissection guide (IDG) for display on the computer screens. The students use an in-house developed dissecting guide linked to Netter's atlas plates for each of the bolded terms throughout the lab period. The system is driven by a standard USB optical mouse on a moveable mouse tray. The IDG has been expanded with supplemental text and links to PowerPoint collections of radiologic images. Old TV monitors were replaced with 32" plasma screens around the lab for display on a rotating basis of a question of the day, x-ray of the day or anatomical clinical case from the New England J. Medicine. We added a Teaching Gallery with surgical lights and video camera that can be displayed on all the screens for demonstrations. Connected to the gross lab is a radiology/osteology study room. A new area is an adjoining Advanced Anatomy lab with four surgical stations for lightly embalmed cadaver use. All of these components work extremely well together to create a productive environment to maximize the students' learning and serve as a model for other institutions of a gross anatomy laboratory for the future.

TODD, Gordon, and Shantaram JOSHI. University of Nebraska Medical Center, Omaha, NE 68198, USA. Student surveys to help enhance virtual microscopy histology course.

UNMC medical students have used virtual microscopy (VM) for the past 4 years for histology and histopathology. Digital images from student glass slides were scanned using a MicroBrightField system and displayed with custom-designed software. Informal feedback supported the benefits of the system, but no formal review has been conducted. In 2008 the Medical Center moved into a state-of-the-art education building with a technology lab containing 72 computers. With this move a three stage survey of first year medical students was made to assess their experiences before using VM, midway, and at the conclusion of the histology course. The peak return rate of 128 was 79% (74 males and 52 females). While essentially all the students had used a microscope, only a quarter of the class has taken a formal course in histology. All had access to high speed connections off campus and reported their comfort level with technology and internet navigation as 4.4 and 4.5, respectively, on a 5-point Likert scale. Half of the class is in lab at a time, yet two thirds prefer to work in pairs at a computer. Students felt VM could adequately replace microscopes (4.71) and was an improvement over static images (4.82), but were neutral (3.01) about whether they should be exposed to both. The quality of the images was very good (4.37) as was the benefit to their learning (4.31). Many of the images are annotated but the students felt they could be improved (3.86). These surveys identified areas for improvement such as the adequacy of the quiz questions (3.38), the lab manual (3.66) and time spent previewing slides (3.64). Student responses were very helpful in focusing on future enhancements and further refinements in the course.

TUBBS, R. Shane, and Marios LOUKAS. Children's Hospital, Birmingham, AL 35233, USA. A novel method for cerebrospinal fluid diversion utilizing the sternum: A cadaveric and animal study.

Introduction: Additional distal sites for placement of cerebrospinal fluid (CSF) diversionary shunts may be necessary in some patients. The present study aimed to investigate the sternum as a potential receptacle for CSF for potential application in patients with hydrocephalus. Materials and Methods: Five fresh adult human cadavers less than four hours from time of death underwent cannulation of the manubrium in a

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suprasternal location. Tap water was infused via a metal trocar for approximately 60 minutes. Additionally, morphometric examination of the manubrium from 40 adult human skeletons was performed including the height, width, and thickness of this part of the sternum. Lastly, two anesthetized rhesus monkeys underwent cannulation of the manubrium with infusion of 50 cc of saline over approximately one hour while monitoring vital signs. Results: A total of 30 L of water was easily injected into all cadaveric specimens without overflow from the infusion site or noticeable edema of the body. Upon inspection of the thoracic and abdominal cavities, no fluid accumulation was identified insuring that all infused fluid had gone into the vascular system. The manubrium had a mean length, width and thickness of 5.1 cm, 5.0 cm and 1cm, respectively. The two animal specimens tolerated the infusion of saline into the sternum without vital sign changes or evidence of saline leakage into the pleural cavity. Conclusions: Based on our cadaveric, osteological and animal study, the manubrium of the sternum is an ideal location for the placement of the distal end of a CSF diversionary shunt. In vivo human studies are now required to verify our findings.

WACKER, Charlotte, Natalie LIQUORI, and Elizabeth MEGELIN. University of California, Davis, Body Donation Program, Sacramento, CA 95817, USA. <u>Comparison of embalming techniques and solutions used at the University of California.</u>
Methods: The standard embalming solution used by UC Davis Body Donation Program is a premixed solution containing only formaldehyde, glycerin and isopropanol. This solution is diluted and used for embalming along with an anticoagulant, phenol, additional disinfectant, and a humectant. We aim to always use a single point injection via the right common carotid artery with hypodermic injection of areas that seem poorly preserved. UCLA orders Carolina's Perfect Solution®. The composition of the solution is proprietary and a trade secret, but is known to contain 10% undiluted concentrate of phenol and a small amount of formaldehyde, a blood clot thinner, hemolytic agent and concentrated moisturizers already pre-mixed in the concentrate. No additional co-injections are used. Ideally, UCLA tries to use a one-point femoral injection site. Results: Initial, external preservation seems to be long lasting with both solutions. The difference noted with the technique. Using the high phenol content of the Carolina Perfect Solution® is the need for much hypodermic injection.

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WARD, Peter, and Jandy HANNA. West Virginia School of Osteopathic Medicine, Lewisburg, WV 24901, USA. <u>AnataChat: Benefits and pitfalls of using a chatroom to complement a medical gross anatomy course.</u> Medical educators have been attempting to utilize the vast array of personal electronics in ways that will improve teaching of basic science and clinical courses. The generational divide that sometimes appears between faculty and their students can lead to problems in dealing with students' preferred modes of learning and decreasing the cognitive load associated with the difficult coursework in medical school. To provide options for the students in the gross anatomy course at the West Virginia School of Osteopathic Medicine, the faculty initiated a weekly online chatroom, AnataChat, so that students could ask questions and have them answered by faculty. Transcripts of the chat room are available to all students and faculty, so even students who did not attend could browse the discussion for topics of interest. Initially, students were frequently making use of the scheduled chat sessions, Monday evenings from 9:00-10:00 PM, but attendance dropped as the course continued. Not surprisingly, attendance at the chat sessions increased immediately before exams and dropped immediately thereafter. Student feedback was solicited to find their perception of how useful, convenient and effective this tool was in their learning of medical anatomy. Possible improvements to the tool include streamlining the response times of faculty to crowded conditions in the chatroom and the inclusion of small visual attachments in replies.

WARD, Peter, Robert FISK, and Jandy HANNA. West Virginia School of Osteopathic Medicine, Lewisburg, WV 24901, USA. <u>Medical students as gross anatomy instructors - The Anatomy Graduate Teaching Assistant Program</u> The anatomy graduate teaching assistant (GTA) program at the West Virginia School of Osteopathic Medicine was initiated to improve student learning of anatomy and to add qualified assistants in the gross anatomy laboratory. During their second year of medical school students can submit an application to become a GTA in the gross anatomy course. For the next two years, the GTA spends half of the year teaching in the anatomy lab and the other half in clinical rotations. Even though this delays their graduation by one year there has been no shortage of high-caliber applicants. This program benefits everyone

involved in several ways. First, student GTAs have stated that the additional expertise in anatomy will make them more competitive in the residency match and increase their effectiveness as physicians. The anatomy GTAs at WVSOM have matched with their first choice of residencies (including orthopedics, surgery, etc.) nearly every time. Second, GTAs are exempted from tuition for the remaining three years of their medical education. The institution benefits by: 1) an increase in the gross anatomy teaching staff, 2) improved communication between faculty and students, and 3) recruitment of staff who experienced the course as students and are able to integrate clinical and basic science topics in ways that junior students find particularly helpful. This program benefits the medical community by increasing the level of expertise in future clinicians. It also increases the number of qualified trainers and promotes the integration of clinical material into gross anatomy.

WENGER, Lindsay, and Brion BENNINGER. Oregon Health and Science University, Department of Integrative Biosciences, Portland, OR 97239, USA. General morphology and patterns of the external intercostal muscle and its link to rib fractures.
External intercostal muscle (EIM) fibers extend from the tubercles of the ribs dorsally to the costochondral junctions ventrally and between upper and lower borders. EIM fibers are directed anteroinferiorly elevating the ribs during inspiration. EIM's are conventionally represented a consistent distance from the midline of the sternum, or insert slightly lateral to each other in descending order. The orientation of EIM's relative to each other has not been studied directly. Fractures commonly occur at the angle between the 4th-9th ribs. EIM contracts during inspiration, possibly displacing the fragment and causing pain and delayed healing. The objective of this study was to analyze EIM morphology for patterns, determining whether there is a correlation between morphology and rib fractures. We reviewed anatomical texts, journals, websites and investigated rib fractures and repair. We dissected and measured 28 embalmed cadavers (14-male and14-female). Distance between the most inferior medial insertion of the EIM to the midline of the sternum was measured using digital calipers. Results revealed a consistent crescent-shaped pattern. EIM of the first intercostal space-right averaged 59.50 mm, left averaged 57.04 mm. The EIM of the second intercostal space-right averaged 79.21 mm, left averaged 77.99 mm. The third EIM averaged 89.63 mm and 86.01 mm for right and left, respectively. EIM's progressively

inserted more lateral from 1-4, where an apex was noted and then EIM's inserted gradually more medial (averages of the fourth EIM, right-87.36 mm, left-81.95 mm). This study found a pattern of the EIM not formally mentioned and collected data that may help understand why surgical repair is more common between the 4th-9th ribs.

WILSON, Donald, and Pedro NAVA. Loma Linda University School of Medicine, Angwin, CA 94508, USA. <u>Student responses to clinical procedure teaching in the anatomy lab.</u>
With increasing emphasis on the clinical significance of gross anatomy, simple but innovative techniques may be used to simulate surgical procedures in the anatomy lab. Several procedures (trachesotomy, thoracentesis, subclavian vein cannulation, pericardiocentesis, and insertion of chest tubes for pneumonthorax, tension pneumothorax and pleural effusion) were demonstrated on cadavers to the 1st year medical students (Class of 2012) at Loma Linda University. Video clips of some procedures will be presented. A survey was conducted to assess the impact and level of acceptance. 153 students returned the survey sheet. 100 percent indicated that this teaching made their anatomy course more relevant; 95 percent considered it made the anatomy easier to understand, and 83 percent said it made anatomy easier to learn. The most appreciated procedure was tracheostomy, followed by pericardiocentesis, and then chest tube insertion; 16 percent of students felt all procedures were equally valuable. 78 percent of students said the time devoted was appropriate, although 19 percent felt that more time would have been better. Only 2 students (1.3 percent) said too much time was spent. 85 percent of students stated there was adequate time for questions. To assist the other 15 percent, further time was given in later labs. Almost all students were enthusiastic and gave valuable suggestions on how to improve future procedure teaching. An analysis of students' comments and suggestions will be included.

Bulent YALCIN, R. Shane TUBBS, Ayhan COMERT, and Hasan OZAN, Gulhane Military Medical Academy, Department of Anatomy, 06018, Ankara, Turkey. <u>Branching pattern of the external branch of the superior laryngeal nerve.</u>
There is variance in reports of the external branch of the superior laryngeal nerve. Because of that we aimed to investigate the branching pattern and course of the nerve. This study was performed on thirty specimens (60 sides). The vagus nerve

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gave off the superior laryngeal nerve, which runs 5-20 mm before dividing into its external and internal branches. The external branch was observed in all specimens. The branch was smaller than the internal branch. Its mean diameter was about 0.3-0.8 mm. This branch descended parallel or deep to the superior thyroid artery and then pierced the inferior constrictor muscle 12-35 mm proximal to the cricothyroid junction. Branches of the external branch of the superior laryngeal nerve were observed to be variable. The nerve gave off a branch to the inferior constrictor muscle in all sides. Numbers of branches were variable, from one to three. A branch to the thyroid gland was observed in all sides. The branches passed between the inferior constrictor muscle and thyroid gland. A branch connecting the inferior laryngeal nerve was observed in one side. The branch travelled on the posterolateral surface of the thyroid gland. Furthermore, a connection to the cervical sympathetic chain was usually observed. In conclusion, we observed that the external branch of the superior laryngeal nerve had variable course and branching pattern. Injury to the nerve results in changes both to the quality of the voice and the production of high-pitched sound. Because of that, detailed knowledge about the nerve and its branches should be known by the surgeon.

YAZAR, Fatih, Cenk KILIC, Hasan OZAN, and Erkan YILDIZ. Department of Anatomy, Faculty of Medicine, Gulhane Military Medical Academy, Ankara 06018, Turkey. Lingular vein of the left lung and its drainage patterns.

Detailed knowledge of the normal size and shape of the pulmonary veins is important to confidently diagnose. The purpose of the present study was to determine the variations in the drainage patterns of the lingular vein of the left lung. Left lungs of formalin fixed cadavers were dissected carefully to expose the variations in the venous drainage of their superior lobes. After identifying the pulmonary veins for each lobe, lingular vein (LV) drainage patterns were followed to their openings. The diameters of the LV and its superior and inferior parts were measured with a caliper. The length of the LV trunk was also evaluated. Different types of venous drainage patterns were observed. Type-I: Union of superior and inferior parts to form LV as a trunk and opening of this vein to the left superior pulmonary vein. Type-II: Union of superior and inferior parts to form the LV trunk and opening of this vein into the left atrium. Type-III: There is a single LV opening of this vein to the left superior pulmonary vein. Type-IV: There is a single LV and

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opening of this vein into the left atrium. The venous drainage patterns of lingular lobe reveal variations. Knowing the frequency of different types of drainage patterns classified in this study is extremely important for the surgeons performing pulmonary surgery, atrial fibrillation and imaging techniques.

ZHANG, James. University of Kentucky, Lexington, KY 40506, USA. <u>Integrated anatomy class learning.</u>
The first year anatomy course is an important one for medical students because it introduces the student to the foundation of medical education, which is the human body. However, it is also a stressful time of transition as students adjust to the vast amount of information. Unfortunately, much of that information is scattered throughout lectures, notes, textbooks and anatomy labs. One of the disadvantages of existing study tools is that it takes a lot of time to find the information and cross-reference it with the anatomy lab. Therefore, a new study tool was made that integrates an anatomy atlas with lecture material so that the material is presented in context. This document uses images from the Rohen and Yokochi atlas and groups them based on the anatomy lab curriculum at the University of Kentucky College of Medicine. The images were selected based on the context of each lab. They were incorporated into a Microsoft Word document and color-coded arrows were drawn to each anatomical feature. The document was then exported to Adobe Acrobat. In Adobe Acrobat, the commenting feature was used to add descriptions and names for each anatomical feature. Relevant information such as innervation, muscle attachment and relationship to other features was included. The descriptions were written from a medical student's perspective. The author believes that this study tool can help anatomy students prepare for anatomy lab and integrate it with lectures and textbooks.

ZOLLER, Lawrence. University of Nevada Las Vegas, School of Dental Medicine, Las Vegas, NV 89106, USA. <u>Banning laptop computers in anatomy lectures and discussions.</u>
The use of laptop computers in the classroom has become almost omnipresent. However, there is a push by some professors to curtail or even ban their use during lectures and discussions. This year, laptop use in lectures and discussions in the neuroanatomy portion of the anatomical sciences curriculum was eliminated. It was the hope that as a result of this ban student participation would increase as distractions from the use of laptops for non-class related activities decreased. At the

completion of the neuranatomy portion of the course a survey was distributed to the students to assess their reaction to the laptop ban. The use of laptops during class for purposes other than the topics being discussed was analyzed. Some of these extraneous uses included playing games, contacting individuals via email or other forms of interpersonal communication, surfing the net, and perusing material from other courses. Many, but not all, of the students felt that the ban on laptops was beneficial to their learning process. The vast majority of students felt that laptop computers in the classroom were a source of distraction. However, others felt that the ban lessened their ability to take notes and incorporate the material. In this presentation additional rationales and reasons for the ban, the reaction of the students and faculty to the ban, and the future of laptop use in anatomical science lectures and reviews will be discussed.