25th Anniversary Meeting of the American Association of Clinical Anatomists

jointly sponsored by the

American Association of Clinical Anatomists

and the

Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada

July 15 – 18, 2008

Chelsea Delta Hotel, Toronto, Ontario

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.

Officers of the AACA Council

President
Lawrence M. Ross, M.D., Ph.D.

President-Elect
Todd R. Olson, Ph.D.

Secretary
Brian R. MacPherson, Ph.D.

Treasurer
Neil S. Norton, Ph.D.

Past-President
Thomas H. Quinn, Ph.D.

Program Secretary
Gregory R. Smith, M.S.

Councilors

David L. Bolender, Ph.D.
Sherry A. Downie, Ph.D.
Thomas R. Gest, Ph.D.
Noelle Granger, Ph.D.
David J. Porta, Ph.D.
Rustin E. Reeves, Ph.D.
Alan T. Richards, M.D.
Cristian Stefan, M.D.
Ronald S. Wade, B.S.

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

Editor-in-Chief – Stephen W. Carmichael
AACA Co-Editors – Anne M.R. Agur, Mark F. Seifert,
Robert J. Spinner, R. Shane Tubbs, and Joel A. Vilensky
BACA Editor – Stuart McDonald
ASSA Editor – Nirusha Lachman
ANZACA Editor – Helen Nicholson

Founding Editors: Ralph Ger and Ray J. Scothorne

Editorial Board - 2008

Associate Editors

Robert D. Acland
Seyedhossein Aharinejad
Peter C. Amadio
Robert H. Anderson
Nihal Apaydin
David H. Bernanke
David R. Bowsher
Jennifer Brueckner
H. Hamdi Celik
Carmine D. Clemente
Gene L. Colborn
John M. Cooke
Arthur F. Dalley II
Peter H. Dangerfield
Raffaele DeCaro
Adrian K. Dixon
Fabrice Duparc
Harold Ellis
Georg Feigl
Christian J. Fontaine
Raymond F. Gasser
Ralph Ger
Thomas R. Gest
Daniel O. Graney
Noelle A. Granger
N. Alan Green
John T. Hansen
Malcolm Howard Hast
David J. A. Heylings
David A. Hogg
David B. Jenkins
D. Gareth Jones
Jan L. Kasperbauer
Subramaniam Krishnan
J. Thomas Lambrecht
Robert J. Leonard
Marios Loukas
Scott Lozanoff
Terrence P. Ma
Pasuk Mahakkanukrauh
Vishy Mahandevan
W. Stanley Monkhouse
Keith L. Moore
Janusz Moryś
Robert P. Myers
Richard L. M. Newell
Wojciech Pawlina
Kathryn E. Peek
Sepp Poisel
Andrew T. Raftery
Cornelius Rosse
Jose R. Sanudo
Tatsuo Sato
Kapil S. Satyapal
Louise Scheuer
Hans-Martin Schmidt
Carol E. H. Scott-Conner
Mohammadali M. Shoja
Shizuko Shoumura
Reon Somana
Phillip R. Waggoner
Marvin Wagner
Anil H. Walji
Huan Wang
Andreas H. Weiglein
Peter L.T. Willan
Gary E. Wise
DaChuan Xu
Shao-Xiang Zhang

Annual Banquet

Thursday, July 17, 2008

Chelsea Delta Hotel

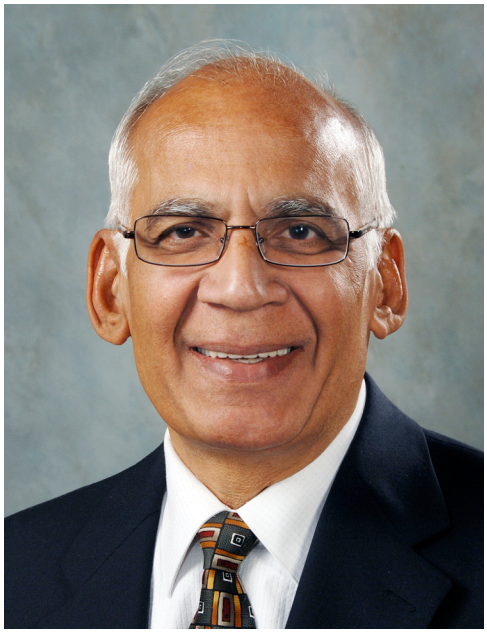
6:00 pm – Reception – *Mountbatten Salon*
7:00 pm – Dinner and presentation of *Honored Member*

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
Roy 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

* deceased

Honored Member, 2008



The American Association of Clinical Anatomists

Recognizes and awards Honored Member to

Vid Persaud

☐ Clinical Anatomist ☐ Educator ☐ Author

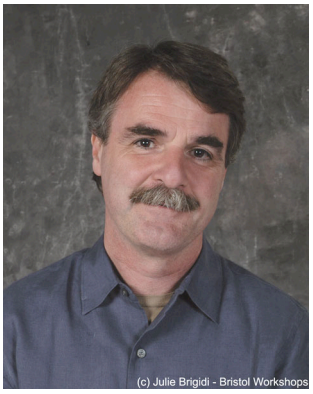
For his distinguished career in, and enthusiasm for, clinical anatomy, as demonstrated by his anatomical/surgical publications, the insight of his anatomical, developmental, and surgical illustrations, and his pioneer efforts in internet-based surgical education.

The 2008 Keith L. Moore/Lippincott, Williams & Wilkins Presidential Speaker

Wednesday, July 16, 1:15 – 2:15 pm

David Macaulay

Presented at the 25th Anniversary Meeting of the AACA,
Toronto, Ontario



David Macaulay, born in 1946, was eleven when his parents moved from England to Bloomfield, New Jersey. He found himself having to adjust from an idyllic English childhood to life in a fast paced American city. During this time he began to draw seriously, and after graduating from high school he enrolled in the Rhode Island School of Design (RISD). After spending his fifth year at RISD in Rome on the European Honors Program, he received a bachelor's degree in architecture and vowed never to practice. After working as an interior designer, a junior high school teacher, and a teacher at RISD, Macaulay began to experiment with creating books. He published his first book, Cathedral, in 1973. Following in this tradition, Macaulay created other books—including City, Castle, Pyramid, Mill, Underground, Unbuilding, and Mosque—that have provided the explanations of the how and the why in a way that is both accessible and entertaining. From the pyramids of Egypt to the skyscrapers of New York City, the human race's great architectural and engineering accomplishments have been demystified through Macaulay's elaborate show-and-tells. Five of these titles have been made into popular PBS television programs.

The range and breadth of his talent is also showcased in the more lighthearted picture books Rome Antics and Shortcut, as well as Black and White, which received the prestigious Caldecott Medal in 1991.

Macaulay is perhaps best known for the award-winning international bestseller The Way Things Work, which was expanded and updated in 1998 and renamed The New Way Things Work. This brilliant and highly accessible guide to the workings of machines was dubbed "a superb achievement" by the New York Times and became a New York Times bestseller. Using a humorous woolly mammoth to illustrate principles, Macaulay offers even the least technically minded reader a window of understanding into the complexities of today's technology. He uses this same humorous approach and uncanny ability to explain complicated systems in The Way We Work, which tackles the most intricate machine of all: the human body.

David Macaulay's detailed illustrations and sly humor have earned him fans of all ages. His books have sold more than three million copies in the United States alone, and his work has been translated into a dozen languages. His many awards include the Caldecott Medal and Honor Awards, the Boston Globe–Horn Book Award, the Christopher Award, and the Washington Post–Children's Book Guild Nonfiction Award. He was a two-time nominee for the Hans Christian Andersen Award and received the Bradford Washburn Award, presented by the Museum of Science in Boston to an outstanding contributor to science.

In 2006 he was awarded a prestigious MacArthur Fellowship, given "to encourage people of outstanding talent to pursue their own creative, intellectual, and professional inclinations." As "an individual of distinction in the field of children's literature," Macaulay delivered the esteemed 2008 May Hill Arbuthnot Honor Lecture, an honor bestowed on him by the American Library Association.

David Macaulay lives with his family in Vermont.

Educational Affairs Presentation

Thursday, July 17, 10:15 – 11:15 am

Wayne Weston



W. Wayne Weston MD, CCFP, FCFP, is a Professor Emeritus of Family Medicine in the Schulich School of Medicine and Dentistry at the University of Western Ontario, London, Ontario, Canada. After graduating from the University of Toronto in 1964, he practiced in Tavistock, Ontario, for 10 years before joining the faculty at Western. He has a special interest in patient-physician communication and faculty development.

He has published 160 articles and book chapters in such journals as *Canadian Family Physician; Canadian Medical Association Journal; Families, Systems and Health;* and *Academic Medicine*. He is co-author of two books on patient-centered medicine: "Patient-Centered Medicine: Transforming the Clinical Method" and "Challenges and Solutions in Patient-Centered Care: a casebook". He has led over 300 workshops for faculty on patient-centered interviewing, problem-based learning, and clinical teaching in Canada, New Zealand, Scotland, the United States and the United Arab Emirates.

He is currently consultant to the Dean on faculty development; Co-director of GAMES (The Group for Advocacy and Advancement of Medical/Dental Education Scholarship) for the Schulich School of Medicine and Dentistry at Western and chair of the Canadian Operating Committee of the Institute for Health Care Communication.

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

Churchill Court

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

Bone Clones, Inc.

Carolina Biological Supply, Co.

Elsevier

Elsevier, Canada

Holt Anatomical, Inc.

Mopec, Inc.

Touch of Life Technologies

Thermo Fisher Scientific

Thieme Medical Publishers

Wiley

Wolters Kluwer Health - LWW

Accompanying Person Programs

Wednesday, July 16, 2008 - **A Day in Niagara**

A trip to Southern Ontario would not be complete without a visit to this most beautiful of the world's wonders! A licensed tour guide will provide commentary en route to Niagara Falls regarding the famous Queen Elizabeth Way, Ford Motor Company and, of course, the Niagara Fruit Belt.

Once in the Niagara area, a detailed tour will begin, outlining the historical, cultural and geographical highlights of the region. At Niagara Falls, stand at the very edge of the spectacular Falls. Aboard the Maid of the Mist, feel the spray and see the Falls from the Whirlpool Rapids below. Lunch will be provided at a restaurant, the Falls – a wonderful way to relax while witnessing the majesty of Niagara.

The next stage of the tour is in Niagara-on-the-Lake, one of the oldest settlements in Ontario, famous for the War of 1812 between Canada and the United States. The town has been beautifully restored to depict its heritage. En route, the tour follows the Niagara River, passes the Whirlpool Rapids, some of the 65 wineries, and the historic sites of the Brock Monument and Laura Secord House.

Duration:	8 hours
Timing:	9:00 am – 5:00 pm
Cost:	$130.00 CAD per person Estimated at $135.00 USD per person

Price includes taxes and gratuities and is based on a minimum of 25 passengers per bus.

Thursday, July 17, 2008 - **City Highlights Tour with CN Tower**

The perfect activity to capture a glimpse of the many wonderful sites available in Toronto! This "get acquainted" tour will include such famous attractions as Queen's Park, the Parliament Buildings, Old and New City Halls, Nathan Phillips Square, Royal Ontario Museum, Art Gallery of Ontario, the Annex, University Avenue – Hospital Row, St.

Lawrence Market and Hall, SkyDome Stadium, Roy Thomson Hall, the four city block shopping complex Eaton Centre, the Bay-King financial district, Harbourfront, Chinatown, the elegant neighbourhood of Forest Hill and the trendy Yorkville area.

The highlight will be a visit at the CN Tower, the tallest free standing building in the world. No facility in the world can compare! Guests will board a glass-faced elevator for a thrilling 58-second ride while enjoying the view of Toronto followed by a visit to the Observation Deck. This level features an outdoor observation balcony, and the latest and most exciting addition – a glass floor! Imagine walking 1,122 feet above the ground on the highest glass floor in the world. It will exhilarate guests if they dare cross it, and the faint of heart can walk around it instead!!

Duration:	3 hours
Timing:	9:00 am – 12:00 pm
Cost:	$80.00 CAD per person $84.00 US per person

Price includes taxes and gratuities and is based on a minimum of 25 passengers per bus.

25th Meeting of the American Associations of Clinical Anatomy

Pre-Conference Activities

Tuesday, July 15th, 2008

8:00 - 9:30 a.m. **Journal Committee Meeting** - (members of Journal Committee) - *Baker Room*

9:30 a.m. - 5:00 p.m. **AACA Council Meeting** – (AACA Officers and Councilors) - *Baker Room*

Anatomical Services Committee

11 a.m. – 1:00 p.m. **Anatomical Services Committee Meeting –** *Wren Room*

2:30 – 5:00 p.m. **Anatomical Services Committee Symposium –** *Churchill Ballroom A*

2:30 - 3:10 p.m. **Cadaveric CT: An Innovative Teaching Tool in the Anatomy Lab**

First year medical students at Mayo Clinic School of Medicine have the unique opportunity to learn radiology from CT images of the cadavers dissected during their gross anatomy course. This presentation will provide details on the practical and educational aspects used in this innovative approach to radiology teaching.

John Barlow, M.D., Dept. Of Radiology, Mayo Clinic School of Medicine, Mayo Clinic

3:20- 4:00 p.m. **The Unembalmed Cadaver: A Unique Educational Experience**

The Cleveland Clinic Lerner College of Medicine (CCLCM) of Case Western Reserve University welcomed its first group of

medical students in the summer of 2004. While most aspects of the CCLCM program are unique, maybe the most striking innovation is the exclusive use of unembalmed cadavers in the anatomy program. Discussed in this presentation will be why this approach was chosen, what special situations the unembalmed cadaver presents, and does the benefit outweigh the challenges.

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

4:10- 4:50 p.m. **Cadaver Trauma Research and Its Role in Anatomical Education**

Anatomical specimens are routinely and most often used for teaching future healthcare professionals their basic anatomy. This is certainly a worthwhile and honorable use of bequeathals. However, cadavers serve an equally honorable utility in the performance of inductive and deductive research. This talk will mainly focus on biomechanical experiments using human cadavers in an effort to quantify tolerance to traumatic forces.

David J. Porta, Ph.D., Human Anatomy & Trauma Biomechanics, Bellarmine University

Career Development Committee Reception

5:00 – 6:30 p.m. **Career Development Committee Reception** – *Baker Room*

Welcome Reception

6:30 – 8:30 p.m. **Welcome Reception**
Market Garden Patio

Sponsored by Elsevier

For all meeting attendees
and accompanying persons

Scientific Session Wednesday - Friday

Wednesday, July 16th, 2008

7:00 - 8:00 a.m. **Editorial Board Breakfast Meeting for Editors/Associate Editors of *Clinical Anatomy* –** *Baker Room*

7:00 - 8:30 a.m. **Career Development Committee Breakfast Meeting** – *Seymour Room*

7:30 - 4:00 p.m. **Registration –** *Churchill Court*
Commercial Exhibits – *Churchill Court*

7:00 – 8:30 a.m. **Continental Breakfast –** *Churchill Court*

9:00 a.m. **Accompanying Persons' Program Departure**
A Day in Niagara
Departure site – Churchill Court, Registration Desk

Session Schedule

8:00 – 8:30 a.m. **Opening Ceremonies /Remarks**:
- Churchill Ballroom

Richard K. Rezneck, MD, Med, FRCSC, FACS

R. S. McLaughlin, Professor and Chair, Department of Surgery, University of Toronto, Vice-President of Education, University Health Network

Michael J. Wiley, PhD, Professor and Chair, Division of Anatomy, Department of Surgery, University of Toronto

Poster Sessions

Poster Session 1 – HEAD/NECK, EXTREMITIES AND BIOCHEMICAL
- Mountbatten Room

All posters will be on display throughout the day from 7:30 a.m. to 4:30 p.m.

Poster presenters assigned to this session **must** be present at their posters **during the morning and afternoon breaks.**

The list of the posters (authors and titles) for this session is found on pages 28 to 42.

Symbols used in the program:
* Not a member of the AACA.
§ Eligible for the Presidential Travel Award Presentation.
+ Eligible for Ralph Ger Student Platform Presentation Award.
¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award.

Oral Presentations

8:30 a.m. **Platform Session 1**: Extremities.
Moderator – Jennifer Brueckner, *Churchill Ballroom*

8:30 The course of the inferior gluteal nerve and surgical landmarks for its localization during posterior approaches to the hip. **APAYDIN, Nihal***[1], Marios LOUKAS[2], Richard S. TUBBS[3], Ali F. ESMER*[1], Murat BOZKURT*[4], [1]Department of Anatomy, Ankara University School of Medicine, Ankara, Turkey, [2]Department of Anatomical Sciences, St. George's University, Grenada, West Indies, [3]Section of Pediatric Neurosurgery, University of Alabama at Birmingham, Birmingham, AL, [4]Third Clinic of Orthopaedics and Traumatology, S.B. Diskapi Yildirim Beyazid Research and Education Hospital, Ankara, Turkey.

8:45§ The pectoralis minor and scapula reveal the "coracopectoralis" or Benninger's Maneuver and Sign, a shoulder girdle diagnostic examination tool. **BENNINGER, Brion**. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR.

9:00+ The clock face guide to fibular intraneural ganglion cysts: critical "times" and sites for accurate diagnosis. **DESY, Nicholas M.**, Kimberly K. AMRAMI*, Gauri LUTHRA*, Meredith L. ANDERSON*, Robert J. SPINNER. Departments of Neurosurgery, Radiology, Orthopedics and Anatomy, Mayo Clinic, Rochester, MN.

9:15§ Anatomical interactions within the wrist related to carpal movement patterns and surgical adaptation. **FOGG, Quentin A.** and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; Modbury Public Hospital, Adelaide, Australia; Queens Hospital, Burton, UK.

9:30+ Use of motion capture to quantify normal and abnormal hand function. **RAVICHANDIRAN Mayoorendra**[1], Kajeandra RAVICHANDIRAN[1], Karan SINGH[1]*, Michele OLIVER[3]*, Nancy MCKEE[1]* and Anne AGUR[1.] [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada, [2]Department of Computer Science, University of Toronto, Toronto, Ontario, Canada, [3]Biological Engineering, University of Guelph, Guelph, Ontario, Canada.

9:45+ Muscle architecture of the gastrocnemius and soleus in boys with Duchenne Muscular Dystrophy. **YUEN Chris**[1], Anne AGUR[2], Nancy MCKEE[2]* [1]Department of Exercise Science, University of Toronto, Toronto, Ontario, Canada [2]Department of Surgery, University of Toronto, Toronto, Ontario, Canada.

10:00 – 10:45 a.m. **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

TechFair

10:45 – 11:45 a.m. TechFair Session 1
Moderator – Greg Smith, *Churchill Ballroom*

10:45 The Virtual Human Embryo: a progress report. **CORK, R. John**, and Raymond F. GASSER. Department of Cell Biology & Anatomy, LSU Health Sciences Center, LA.

10:55 Interpreting three-dimensional structures from two-dimensional images: a web-based interactive 3D model of the liver to enhance surgical residents spatial understanding of structural inter-relationships. **CROSSINGHAM, Jodi L.**, Jodie JENKINSON, Nicholas WOOLRIDGE, Steven GALLINGER, Carol-Anne

MOULTON, and Gordon TAIT. Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto, Toronto, ON and Department of Surgery, Division of General Surgery, Toronto General Hospital, Toronto, ON.

11:05 Interactive 3D PDF human anatomy medical software for education. **GIELECKI, Jerzy** and **Anna ZURADA**. Departament of Anatomy, Medical University of Silesia, Poland.

11:15 A digital temporal bone program designed as an interactive teaching module. **HUTCHINS, Bob**. Department of Biomedical Sciences, TX A&M Univ. Sys. HSC, Baylor College of Dentistry, Dallas, TX.

11:25 High-calibre skating: comparing skating techniques between low- and high-calibre hockey skaters with anatomically accurate three-dimensional animation. **LEYNES*, Peter**, Marc DRYER*, Nicholas WOOLRIDGE*, David PEARSALL, and Anne AGUR. Biomedical Communications, Institute of Communication and Culture, University of Toronto at Mississauga, ON, Institute of Medical Science, Division of Anatomy, University of Toronto, ON, Department of Kinesiology and Physical Education, McGill University, Montreal, QC.

11:35 Coachpod – students of the 21st century – anatomy onthe move. MCEVOY, Elizabeth M.*, **Robert T. PADWICK***, S. James COEY*, Daniel E. FIELDING*, Peter J. GOLD*, Laura E.A. HARRISON*, P. Narasimha MURTHY*, Chia Tsyh TAN*, Stephen BRYDGES*, Peter ABRAHAMS. Institute of Clinical Education, Warwick Medical School, UK.

11:45 a.m – 1:15 p.m. **Lunch**. (the Market Garden Patio is located in the hotel to purchase food) This is also a time for hands-on interaction with the TechFair presentations and to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

1:15 – 2:15 p.m. Presidential Address

Keith L. Moore/Lippincott, Williams & Wilkins Presidential Address

David Macaulay

The Way We Work: Building a Body Book.

Moderator – Larry M. Ross, AACA President

2:15 - 2:45 p.m. **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

2:45 – 4:15 p.m. Educational Affairs Symposium

Educational Affairs Syposium

Exploring the Visual Communication of Science and Medicine

Biomedical Communications, Institute of Communication & Culture, University of Toronto at Mississauga, Mississauga, Ontario, Canada

Cranial Nerves in Health and Disease: production methodology
Linda Wilson-Pauwels

Educational technology in undergraduate medicine
Jodie Jenkinson

Animating the embryology of sex development and DSD for paediatric counseling
Shelley Wall

A new approach to forensic facial reconstruction: leveraging digital technology to aid police investigations
Marc Dryer

The visualization of pain
Linda Wilson-Pauwels

The simulation and visualization of cell biology
Nick Woolridge

4:15 Open Tour of Grant's Museum and the University of Toronto Anatomy Department
Departure site – Churchill Court, Registration Desk

Thursday, July 17th, 2008

7:00 - 8:00 a.m. **Past Presidents' Breakfast –** *Turner Room*

7:00 - 8:30 a.m. **Financial Affairs Committee Breakfast** - *Baker Room*

7:00 – 8:30 a.m. **Continental Breakfast –** *Churchill Court*

7:30 - 4:00 p.m. **Registration –** *Churchill Court*
Commercial Exhibits – *Churchill Court*

9:00 a.m. Accompanying Persons Program – City Highlights Tour with CN Tower
Departure site - Churchill Court, Registration Desk

Poster Sessions

Poster Session 2 – EDUCATIONAL, THORAX/ABDOMEN/PELVIS AND ANATOMICAL SERVICES – *Mountbatten Room*

All posters will be on display throughout the day from 7:30 a.m. to 4:30 p.m.

Poster presenters assigned to this session **must** be present at their posters **during the morning and afternoon breaks.**

The list of the posters (authors and titles) for this session is found on pages 42 to 55.

Oral Presentations

8:00 a.m. **Scientific Platform Session 2:** Thorax/ Abdomen/ Pelvis. Moderator – Shane Tubbs, *Churchill Ballroom*

8:00 Hemoperitoneum and prolonged hematuria after retrograde treatment of a proximal ureto-pelvic junction stenosis. **BEST, Irwin M.** and Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

8:15 Surface models of the gastrointestinal tract and neighboring structures made from the Visible Korean Human. **CHUNG* Min Suk**, Dong Sun SHIN*, Jun Won LEE*, and Jin Seo PARK* (sponsored by Chang-Seok Oh). Department of Anatomy, Ajou University School of Medicine, Republic of Korea, and Department of Anatomy, Dongguk University College of Medicine, Republic of Korea.

8:30 CT enterography: An imaging window of the bowel. **MORRISON Stuart C,** and Jennifer M McBRIDE. Department of Radiology, and Cleveland Clinic Lerner College of Medicine, Cleveland Clinic, Cleveland, OH.

8:45+ Anatomical landmarks for pediatric spinal anaesthesia. **PATHER, Nalini** and Sanushka PILLAY*. School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa.

9:00 Pre and Postganglionic innervation of rat adrenal gland by fluorescent tract tracer – Fast blue. **SANGARI, Santosh** K. and Kamlesh KHATRI * Cell Biology and Anatomy, Weill Cornell Medical College.

9:15 DVD demonstration of topographical anatomy from the posterior approach: minute dissection of the fine peri-aortic lymphatics and their relationships with various structures. **SATO, Tatsuo**. Professor Emeritus, Tokyo Medical and Dental University (Clinical Anatomy), Tokyo Japan.

9:30 – 10:15 a.m. **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

10:15 – 11:15 a.m. Educational Affairs Presentation

Educational Affairs Presentation

Wayne Weston

Patient-Centred Medicine and Professionalism – What's Anatomy Got to Do with It?

Cristian Stefan – Moderator, *Churchill Ballroom*

11:15 – 11:30 a.m. **Quick Break**

TechFair

11:30 a.m. – 12:15 p.m. TechFair Session 2
Moderator – Brian MacPherson

11:30 SpecimenTrak: a demonstration of the anatomical specimen tagging and tracking. **PRABHU Shiv***[1], Charlie QIU*[1], Brandi SCHMITT[2], Chi-Cheng CHU*[1], GADH, Rajit*[1]. [1]Wireless Internet for the Mobile Enterprise Consortium (WINMEC), UCLA, Los Angeles, CA. [2]Univ. of California, Office of the President, Oakland, CA.

11:40 Visualizing anatomic transitions using morphing software. **SMITH, Gregory**. Department of Biology, Saint Mary's College of California, Moraga, CA.

11:50 Interactive cross-sectional human anatomy. **WILLIAMS, Jarrett G.***, Ramon BROWN*, Virgil WILLIAMS*, Rebecca SEALAND*, Christopher MAY*, Lawrence E. WINESKI. Department of Anatomy & Neurobiology, and Division of Information Technology, Morehouse School of Medicine, Atlanta, GA, and Catholic Healthcare West, Oakland, CA.

12:00 Diffusion of innovations: Smartphones and mobile anatomy learning resources. **TRELEASE, Robert B**. Department of Pathology and Laboratory Medicine, David Geffen School of Medicine at UCLA, CA.

12:15 a.m – 1:45 p.m. **Lunch**. (the Market Garden Patio is located in the hotel to purchase food) This is also a time for hands-on interaction with the TechFair presentations and to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

1:45 p.m. **Scientific Platform Session 3:** Education, Moderator – Brion Benninger, *Churchill Ballroom*

1:45+ Undergraduate anatomy teaching – a consumer-led market? **GOGALNICEANU Petrut***, Jason PALMAN*, Hardi MADANI*, Yezen SHEENA* and Wendy BIRCH, *London Surgical Anatomy Group*, London, UK.

2:00 Anatomy of the CNS – a phase 2 demonstration: the sensory system. **GOULD, Douglas J.**, Sean M. HAEZEBROUCK*, Barney P. FLEMING* and Jo FLEMING* The Ohio State University College of Medicine, Columbus, OH. Neural Groove, Columbus, OH and ORCCA Technology, Seattle, WA.

2:15 The neuroanatomy curriculum: Current trends and future implications in medical education. **KRISHNAN, Subramaniam**. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

2:30 Digital Histology 1.0 – A Newly Incorporated Digital Product For Medical Histology. **MacPHERSON, Brian R.**, Zachary B. FULKERSON*, Gregory L. REPASS*, and Pamela COFFEY*. Anatomy and Neurobiology, University of Kentucky College of Medicine. Lexington, KY.

2:45 The Generalist Physician Anatomy Faculty (GPAF) Program: anatomy and dissection as a patient-centered clinical learning experience. **OLSON, Todd R.**[1], Charles E. SCHWARTZ[2], Alice FORNARI[2], Elizabeth LEE-REY[2],

Sherry A. DOWNIE[1]. [1]Department of Anatomy and Structural Biology, [2]Department of Family and Social Medicine, Albert Einstein College of Medicine, Bronx, NY.

3:00 A multi-lingual computerized 3D anatomical instructional system for use in outreach education. **TUNALI*, Selcuk**[1,2], Michael FARRELL[2]*, Ian C. SHARP[2]*, Beth K. LOZANOFF[2]*, Sara DOLL[3], Frederik GIESEL[4]*, and Scott LOZANOFF[2]. [1]Department of Anatomy, Hacettepe University Faculty of Medicine, Ankara, Turkey, [2]Department of Anatomy, Biochemistry & Physiology, University of Hawaii School of Medicine, Honolulu, HI, [3]Institut fur Anatomie und Zellbiologie, University of Heidelberg, Heidelberg, Germany, [4]Department of Radiology, DKFZ, Heidelberg, Germany.

3:15 - 3:45 p.m. **Refreshment Break** – You are encouraged to browse the posters and commercial exhibits **–** *Mountbatten Room and Churchill Court*

Business Meeting

3:45 – 5:15 p.m. **AACA Annual Business Meeting** (Open to all current members and membership applicants) – *Churchill Ballroom*

Banquet and Reception

6:00 – 7:00 p.m. **Banquet Reception** (cash bar) – *Churchill Court*

7:00 – 9:00 p.m. **Annual Banquet** and presentation of the Honored Member, Ralph Ger Student Platform Presentation and Sandy C. Marks, Jr. Student Poster Presentation Awards.

Friday, July 18th, 2008

7:30 -8:30 a.m. **Educational Affairs Committee Breakfast** – *Baker Room*

7:00 – 8:30 a.m. **Continental Breakfast –** *Churchill Court*

7:30 a.m. – 12:00 p.m. **Registration**, *Churchill Court*
Commercial Exhibits, *Churchill Court*

Oral Presentations

8:30 - 10:00 a.m. **Scientific Platform Session 4**: Head/Neck, Moderator – Lonie Salkowski, *Churchill Ballroom*

8:30 Bleeding sources during sinus floor elevation surgery. BIBLEKAJ* Robert R[1], **Andreas H WEIGLEIN**[1] and Lumnjie KQIKU*[2]. [1]Institute of Anatomy, and [2]Dept. of Conservative Dentistry, Dental Clinic, Medical University Graz, Austria.

8:45 Surgical access to the sphenopalatine ganglion via the oral cavity for placement of a stimulating electrode in treatment of ischemic stroke patients. **LORIAN *, Adi**, Ilan KOREN*, Mimi EINREICH*and Tamar SCHIRMAN*, Research division of Brainsgate Inc.

9:00 The existence of arachnoid villi along the hypoglossal nerve. TUBBS, R. Shane, **Marios LOUKAS**, Mohammadali SHOJA*,. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran.

9:15 Anatomy and surgical considerations for endoscopic third ventriculostomy. an institutional experience. **TUBBS, R. Shane**, Marios LOUKAS, Mohammadali SHOJA*, John C. WELLONS*. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran.

9:30 Circumferential compression of trachea and esophagus by hypertrophied tubercles of Zuckerkandl. **UPADHYAYA *, Prashant K.**, and Alan T. RICHARDS. Department of General Surgery, Creighton University Medical Center and Department of Head and Neck Surgery, University of Nebraska Medical Center, NE.

9:45 *Special Historical Presentation* by **Keith Moore**.
Dr. Moore will talk about the originations of the American Association of Clinical Anatomists and the first AACA meeting at the University of Toronto.

10:00 – 10:30 a.m. **Refreshment Break** – You are encouraged to browse the commercial exhibits **–** *Churchill Court*

10:30 – 11:45 a.m. **Special Presentation**

Robert Acland

Anatomical Videography: How To Do It

11:45 a.m. - 12:00 p.m. **Closing Remarks**

12:00 – 12:45 p.m. **New AACA Council Meeting,** *Baker Room*

Saturday, July 19th, 2008

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



25th Anniversary Meeting Postgraduate Course

Clinical Anatomy of the Hand: Selected Surgical Procedures and Orthotic Intervention

Sponsored by: Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto

Course coordinator: **Anne Agur Ph.D.**
Professor, Division of Anatomy

Objectives:
• Understand the anatomical principals of selected surgical procedures of the arm, forearm and hand.
• Obtain an overview of the exposures and techniques used to carry out the surgical procedures.
• Understand the clinical and anatomical rationale for orthotic intervention of hand and upper limb pathologies.
• Gain insight into the types of orthoses used to compensate for lost motor function; to stabilize unstable joints; to promote healing and to avoid the need for surgery.
• Take home novel ideas to incorporate into the teaching of musculoskeletal anatomy of the upper limb.

8:30 – 11:45 a.m. Surgical Skills Laboratory,Mount Sinai Hospital, 600 University Ave. Toronto

8:30 - 9:00 a.m.	Continental breakfast
9:00 - 9:10 a.m.	Welcome
9:10 - 9:45 a.m.	Is it just a cut? Nancy McKee MD FRCS(C) Professor of Surgery University of Toronto Toronto, Ontario
9:45 - 10:30 a.m.	Principles, exposures and techniques for nerve surgery and tendon transfers of typical nerve-related conditions in the upper limb:

Part I

Nerve repair:	**Robert Spinner M.D.** Professor of Anatomy, Neurosurgery and Orthopedics, Mayo Clinic, Rochester, Minnesota
Tendon transfer:	**Huan Wang M.D., Ph.D.** Visiting Fellow, Department of Neurosurgery, Mayo Clinic, Rochester, Minnesota, Associate Professor, Department of Hand Surgery, Huashan Hospital, Fudan University, Shanghai, P. R. China
10:30 - 10:45 a.m.	Break

10:45 - 11:45 a.m.	Principles, exposures and techniques for nerve surgery and tendon transfers of typical nerve-related conditions in the upper limb

Saturday, July 19

Part 2
11:45 a.m. -4:00 p.m. Rehabilitation Sciences Building, 500 University Ave., Toronto

11:45 a.m. - 12:00 p.m.	Walk to 500 University Avenue (3 buildings south the Surgical Skills Laboratory)
12:00 - 1:00 p.m.	Lunch - Café area of Rehabilitation Sciences Building
1:00 - 2:30 p.m.	Clinical and anatomical considerations for orthotic intervention of nerve-related conditions, tendon disorders and arthritic joint pathology (Room 140) **Pat McKee M.Sc., OT Reg.** (Ont.), OT(C) Associate Professor, Department of Occupational Science and Occupational Therapy, University of Toronto
2:30 - 4:00 p.m.	Small group laboratory: orthotic fabrication and demonstration, participants will take home a custom made orthosis for use in clinical anatomy teaching. (Rooms 420 and 453)

Poster Listing

Symbols:
* Not a member of the AACA.
§ Eligible for the Presidential Travel Award Presentation.
+ Eligible for Ralph Ger Student Platform Presentation Award.
¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award.

Poster Session 1

Head/Neck

001¶ Clinical measurements of the hard palate and implications for subepithelial connective tissue grafts with suggestions for palatal nomenclature. ANDREWS*, Kelly, Brion BENNINGER and Karen RICHARDS, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Periodontal Surgery, Oregon Health and Science University, Portland, OR.

002§ The asymmetry of the carotid bifurcation: a cadaver study. BAJIC, Nicholas A*., Fiona STEWART, and John P. HARRIS*. Department of Medicine, Graduate Medical Program, University of Sydney, NSW, Australia.

003 The tentorium cerebelli: morphologically an acute peak contrary to representation. BENNINGER, Brion, Laura R. WHEELER*. and Gary Wind. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR.

004 Anatomic relationships for safe trans-jugular tunneled venous catheter placement. BEST, Irwin M. and Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

005¶ The contribution of the cerebellum in the neurocognitive sequelae of posterior fossa tumor treatment. CANTELMI, David, Tom A. SCHWEIZER*, Anne M. AGUR, and Michael D. CUSIMANO*. Division of Neurosurgery, Department of Surgery, St. Michael's Hospital, University of Toronto, Toronto, Ontario,

Canada. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada.

006 Thymus gland enhances costoclavicular compression of the vascular supply to the brachial plexus in patients with thoracic outlet syndrome (TOS): MRI/MRA AND MRV. COLLINS, James D., Ernestina H. SAXTON*, Samuel S. AHN*, Hugh GELABERT*, and Alfred CARNES*. Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA, Los Angeles, CA.

007¶ Five Most Common Genetic Diseases Affecting the Maxilla and Mandible in the United States. EDWARDS*, Isaac, Brion BENNINGER, Yi-Li LIN* and Marisa REICHMUTH*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Pediatric Dentistry, Oregon Health and Science University, Portland, OR.

008 Topography of the depressor anguli oris with a relation to the mental foramen and intramuscular nerve innervation pattern. HUR[1]* Mi-Sun, Sung-Yoon WON[1]*, Jae-Gi LEE[1]*, Kwan-Hyun YOON[1]*, Kyung-Seok HU[1]*, Christian FONTAINE[2], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea [2]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France.

009 A variation in origin of the left vertebral artery and its impact on cerebral hemodynamics- clinical significance and embryological basis- a case study. JAYARAM, Prathap*, L. MOUNT* and Alan HRYCSHYN*, Department of Anatomy, American University of Antigua College of Medicine, St. John, Antigua and Barbuda.

010 Female-to-male proportions of the head and face in Koreans. KIM, Jeong-Nam*, Soon-Heum KIM*, Ki-Seok KOH*, Wu-Chul SONG*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea.

011 Morphometric studies on the hypoglossal canal. KRISHNAN, Subramaniam, and Munisamy MAHALINGAM. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

012¶ Morphology and nomenclature of the distal attachment of the temporalis tendon. LEE*, Byung-il, and Brion BENNINGER, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

013 Anatomical study of the superficial layer of the temporalis muscle. LEE, Jeong-Yong*, Soon-Heum KIM*, Ki-Seok KOH*, Wu-Chul SONG*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea.

014 Analysis of lower face in Korean - An anthropometric study. LEE, Sat-Byol*, Jeong-Yong LEE*, Wu-Chul SONG*, Ki-Seok KOH*, Soon-Heum KIM*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea.

015¶ Relative direction and position of recurrent laryngeal nerve for anatomical configuration. LEE, U-Young[1]*, Mi-Sun LEE[1]*, Jae-Hoon LEE[1]*, Yong-Seok NAM[2]*, Seung-Ho HAN[1]. [1]Catholic Institute for Applied Anatomy and Department of Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea, [2]Department of Plastic Surgery Research Professor and BK21 project, College of Medicine, Inha University, Incheon, Republic of Korea.

016¶ Killian-Jamieson diverticulum: case report and review. MAERTINS, Benjamin A*, Ryan P. WIPPLER, Thomas H. QUINN and James P. PHALEN*, Department of Anatomy, Creighton University School of Medicine, Department of Radiology, Creighton University Medical Center, Omaha, NE.

017¶ Why oral clinicians (dentists) should administer botulinum toxin. McCAIN*, Danial, Allan ROSS and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

018¶ Identifying the most common acutely injured tooth by assessment of etiological literature from sports-related trauma to primary and permanent dentition. MCNEIL* Chris and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

019¶ Dental implant placement investigation: is the anterior loop of the mental nerve clinically relevant. MILLER, Dan*, Brion BENNINGER, and Anand MAHARATHI*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Periodontal Surgery, Oregon Health and Science University, Portland, OR.

020 An anomalous split of the lingual nerve within the infratemporal fossa. NORTON, Neil S., Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE.

021¶ Maternal carbon monoxide exposure and its effects on fetal cleft lip and palate development. O'BRIEN*, Stacey A.[1], Michael H. CARSTENS*[2], John R. MARTIN, III[1]. [1]Center for Anatomical Science and Education, [1,2]Department of Surgery, Saint Louis University School of Medicine, Saint Louis, MO.

022 A study on the development of upper eyelid in Korean embryos and fetuses. PARK, Hyuoung Woo[1], Won Kyu KIM[2], Tae Ho BYUN[3], Jeong Tae KIM[3.] Dept. of Anatomy, College of Medicine, Yonsei University[1] 134 Shinchondong, Seodaemungu, Seoul, 120-752, Korea; Dept. of Anatomy[2] and Plastic Surgery[3], College of Medicine, Hanyang University; 17 Hangdangdong, Sungdonggu, Seoul, 133-791, Korea.

023 Early surgical interference in juvenile otosclerosis : a clinical and histological study. RADI*, Sanaa H., and Mohamed B., ATTALLAH*. Alexandria Faculty of Medicine, Departments of Histology and Otorhinolaryngology.

024 Non-metrical variations of basioccipital region. RAY, Biswabina*, Brijesh KUMAR*, Shahin A. HUNNARGI*. Department of Anatomy, Kasturba Medical College, Manipal, KA.

025 Thyroid goiters crimp the great vessels in patients with thoracic outlet syndrome (TOS) and hypothyroidism: Role of MRI/MRA/MRV in management of these patients. SAXTON*, Ernestina H., James D. COLLINS, Samuel S. AHN*, Hugh GELABERT*, and Alfred CARNES*. Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA, Los Angeles, CA.

026 A novel approach to the anatomy of the pharynx and larynx. SILVERMAN, Bruce*, and David J. ELIOT, Basic Science Department, Touro University California, Vallejo, CA.

027¶ Using cone beam computed tomography (CBCT) imaging technology to demonstrate the clinical anatomy of the nasal cavity. SMITH*, Kyle D., Terry F. LANPHIER*, Tarnjit S. SAINI*, Margaret A. JERGENSON, and Neil S. NORTON. Departments of Oral Biology, Oral & Maxillofacial Surgery, and General Dentistry, School of Dentistry, Creighton University, Omaha, NE.

028 C4 contributions to the brachial plexus without prefixation. TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, Nihal APAYDIN and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, Ankara University School of Medicine, Ankara, Turkey.

029 Surface landmarks for the junction between transverse and sigmoid sinuses: application for surgical planning. TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, E. George SALTER and Aaron COHEN-GADOL*. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, and Clarian Neurological Institute and Indianapolis Neurosurgical Group, Indianapolis, IN.

030 The contralateral long thoracic nerve as a donor for upper brachial plexus neurotization procedures: cadaveric feasibility study. TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI.

031 The existence of hypoglossal root ganglion cells in adult humans: potential clinical implications. TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, Nihal APAYDIN and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, Ankara University School of Medicine, Ankara, Turkey.

032 Morphometry and variations of the auricle in adults. TUNALI* Selcuk, and Ruhgun BASAR*, Hacettepe University Faculty of Medicine Department of Anatomy, 06100 Ankara, Turkey. (Sponsored by Scott LOZANOFF.)

033¶ The Anatomy Regarding Centric Relation and the Temporomandibular Joint. TURNER*, John, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

034 Comparative study on trabecular bone pattern of the maxilla and mandible using Micro-CT in Koreans. WON[1]* Sung-Yoon, Jae-Gi LEE[1]*, Wu-Cheol SONG[2]*, Doo-Jin PAIK[3]*, Hee-Jin KIM[1]*, Kyung-Seok HU[1]*.

[1]Division in Anatomy & Developmental Biology, Department of Oral Biology, Human Identification Research Center, Brain Korea 21 project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Anatomy, College of Medicine, Konkuk University, Seoul, Korea, [3]Department of Anatomy and Cell Biology, College of Medicine, Hanyang University, Seoul, Korea.

035 Ultrastructure of submandibular glands and expression of aquaporin-5 in Sjögren's syndrome mice after administration of cevimeline. YAKEISHI*, Akira, Tsuyoshi SAGA*, Kei-ichiro NAKAMURA*, and Koh-ichi YAMAKI*. Department of Anatomy, Kurume University School of Medicine, Kurume, Japan (sponsored by M. Miura).

036 Functional analysis of the masticatory system of the dog with relation to the human. YANG[1]* Hun-Mu, Da-Hye KIM[1]*, Jong-Tae PARK[2*], Kyung-Seok HU[1]*, Heung-Joong KIM[2*], Christian FONTAINE[3], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Oral Anatomy, College of Dentistry, Chosun University, Gwangju, Korea, [3]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France.

037 Morphometric analysis of trajectory for C2 crossing laminar screws. YUE Bin[1]*, Dai-Soon KWAK[1]*, Moon-Kyu KIM[2]* and Seung-Ho HAN[1], [1]Department of Anatomy, Catholic Institute for Applied Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Korea. 2Department of Neurosurgery, Kangdong Sacred Heart Hospital, Hallym University, Seoul, Korea.

038 3-D interactive virtual reality analysis of the middle cerebral artery. ZURADA, Anna and Jerzy GIELECKI, Departament of Anatomy, Medical University of Silesia, Poland.

Extremities

039 Anatomic study of the localization of motor points and the intramuscular nerve supply to the hamstring muscles. AN Xiao-Chun*, Je-Hoon LEE*, Seung-Ho HAN, Department of Anatomy • Catholic Institute for Applied Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Korea.

040 Latissimus dorsi – evidence that the shoulder joint complex is connected to the knee joint complex. BENNINGER, Brion, and Gary WIND. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR.

041 Rotator cuff muscles or a 'compressor muscle unit'- the CMU. BENNINGER, Brion. Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health and Science University, Portland, OR.

042 The 'deep pes anserine complex' of the medial knee: an original concept. BENNINGER, Brion, Laura R. WHEELER*, and Gary WIND. Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health & Science University, Portland, OR.

043 Ultrasound-Guided Posterior Approach for the Saphenous Nerve Block and Anatomical Description. BENNINGER, Brion, Francis SALINAS, Trevor PITSCH, and Jean-Louis Horn. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Anesthesiology and Perioperative Medicine Oregon Health and Science University, Portland, OR. Department of Anesthesiology, Virginia Masson, Seattte, WA.

044 Anatomical aspects of the gastrocnemius aponeurosis and its muscular bound portion – a cadaveric study. BLITZ*, Neal M., David J. ELIOT Department of Orthopedics and Foot & Ankle Surgery, Kaiser North Bay Consortium Residency Program, Kaiser

Permanente Medical Centers, Santa Rosa, CA and Department of Anatomy, Touro University California, Vallejo, CA.

045¶ The incidence and relationship between the presence of palmaris longus and fibularis tertius. BUNTON, Timothy J*, Craig W GOODMURPHY, and Stephanie FREUND*. Department of Pathology and Anatomy, Eastern Virginia Medical School, Norfolk, VA.

046 Intramuscular distribution of the median and ulnar nerves of the flexor digitorum profundus muscle. CHUNG[1], In-Hyuk, Kyu-Seok LEE[2], Chang-Seok OH[3], and Seung Min KIM[4]. [1]Department of Anatomy, Yonsei University College of Medicine, [2]Department of Anatomy, Kwandong University College of Medicine, [3]Department of Anatomy, Samsung Biomedical Research Institute, Sungkyunkwan University School of Medicine, [4]Department of Neurology, Yonsei University College of Medicine.

047 Frequency of third extensor compartment drill bit perforation in case of volar plating of radius fractures. CLEMENT Hans[1]*, Stephan GRECHENIG[1]*, Wolfgang PICHLER[1]*, Norbert P. TESCH[2]*, Andreas H. WEIGLEIN[2]. [1]Department of Traumatology and [2]Institute of Anatomy, Medical University Graz, Austria.

048§ Distal biceps brachii tendon anatomy revisited from a surgical perspective. FOGG, Quentin A., Benjamin R. HESS*, and Neil ASHWOOD*.University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK.

049 Radiographic circularity of the capitellum and its surgical implications. FOGG, Quentin A., A. Jay FREEMAN and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK.

050 Sensory Nerve Endings in Guinea Pig Knee Articular Tissues – A Morphological Investigation. HE, Xiaohua and Hansuc JUNG*. Palmer College of Chiropractic Florida FL and HanSeo University, South Korea.

051 Variation in contribution of ulnar artery to the deep palmar arterial arch. JACKSON, R. Brent*, John E. ASCHENBRENNER*, Rustin E. REEVES, and Harold J. SHEEDLO. Department of Cell Biology and Genetics, University of North Texas Health Science Center, TX.

052 Multiple and congenital limb deformities- a case study. JEVOOR, Praful S., and Sharad M. ANTIN*. Departments of Anatomy and Orthopaedics, Jawaharlal Nehru Medical College, Belgaum, INDIA.

053 In vivo ultrasonographic investigation of the musculotendinous architecture of supraspinatus in subjects with rotator cuff tears: a pilot study. KIM, Soo Y., Robert R. BLEAKNEY*, Tim RINDLISBACHER*, Erin L. BOYNTON*, Denyse RICHARDSON*, and Anne M. AGUR. Division of Anatomy, Department of Surgery, Departments of Medicine and Medical Imaging, University of Toronto, Cleveland Clinic Canada, Sports Medicine Institute, Toronto, Canada.

054¶ Clinical anatomy of proximal tibial autogenous bone graft harvest for Head and Neck Procedures. LEE*, Ilkyu, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

055 Calf angiozome of posterior tibial artery. MATUSZ Petru L., Agneta Maria PUSZTAI*, Mihaela MASTACANEANU*, Bogdan HOGEA*, Eniko-Christine HORDOVAN*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.

056¶ A morphometric study of articular surfaces of the glenohumeral joint in cadavers. MISHALL*, Priti L. and Lakshmi RAJGOPAL. Department of Anatomy, Seth G.S Medical College and K.E.M Hospital, Mumbai, India (Sponsored by Greg Smith).

057 Origin of the supraspinatus and infraspinatus. MOCHIZUKI*, Tomoyuki[1], Kumiko YAMAGUCHI[2]*,

Keiichi AKITA[2]*. [1]Department of Orthopedic surgery, Tokyo Medical and Dental University, JAPAN, [2]Unit of Clinical Anatomy, Tokyo Medical and Dental University, JAPAN (sponsored by Tatsuo Sato).

058¶ Complex anatomy of the extensor carpi radialis tendons in the hand. NAYERI, Zainab*, A. Vaughn Jackson*, Quentin A. FOGG and Lancelot G. NASH. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA.

059 The origin of the radial nerve branch innervating the brachialis muscle. OH[1], Chang-Seok, Hyung-Sun WON[2], Kyu-Seok LEE[3], and In-Hyuk CHUNG[2]. [1]Department of Anatomy, Samsung Biomedical Research Institute, Sungkyunkwan University School of Medicine, [2]Department of Anatomy and Brain Korea21 Project for Medical Sciences, Yonsei University College of Medicine, [3]Department of Anatomy, Kwandong University College of Medicine.

060 Correlation between the branching pattern of the subscapular and posterior humeral circumflex artery and their spatial relationship to the posterior cord of the brachial plexus. OLINGER*, Anthony, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Western States Chiropractic College, Portland, OR.

061 Unique course of the infrequent extensor carpi radialis accessorius muscle observed bilaterally. OLINGER*, Anthony[1], and Brion BENNINGER. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Western States Chiropractic College[1] Portland, OR.

062 Relation of Sciatic Nerve to Piriformis Muscle in South Indian Human Cadavers. PAI, Shakunthala R.*, Huban THOMAS*, Mamatha SRINIVASAN* and Anuj JAIN*.

063 CT-aided three dimensional measurements of the Lister's tubercle and its consequences on volar plate

fixation of distal radius fractures. PICHLER Wolfgang[1]*, Gunther WINDISCH[2]*, Gottfried SCHAFFLER[3]*, Stephan GRECHENIG[1]* and Andreas H. WEIGLEIN[2]. [1]Department of Traumatology, [2]Institute of Anatomy, and [3]Department of Radiology, Medical University Graz, Austria.

064 Incidence of Extensor digitorum brevis manus muscle and the other additional extensor tendons to the index finger: An emphasis on its anatomic and clinical aspects. PRABHU, Latha V. *, Anu V RANADE*, Rajalakshmi RAI*, Prameela MD*. Department of Anatomy, Kasturba Medical College, Mangalore, KA, India.

065§ Patterns of intraneural ganglion cyst descent. SPINNER, Robert J., Stephen W. CARMICHAEL, Huan WANG*, Thomas J. PARISI*, John A. SKINNER*, Kimberly K. AMRAMI*. Departments of Neurologic Surgery, Orthopedics, Anatomy and Radiology, Mayo Clinic and Mayo Clinic College of Medicine, Rochester, MN.

066¶ The surgical relevance of significant variations within a sample population of cadaveric biceps brachii muscles. STAIDLE, Jonathon*, Quentin A. FOGG, Benjamin R. HESS*, Lance G. NASH and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK.

067¶ The neurovascular bundle of the extensor compartment of leg in relation to treatment of tibia fractures with the 9-hole and 11-hole less invasive stabilisation system. TESCH[1], Norbert P*, Wolfgang PICHLER[2]*, CLEMENT Hans[2]*, Angelika SCHWARZ[1]*, Andreas H. WEIGLEIN[1]. [1]Institute of Anatomy and [2]Department of Traumatology, Medical University Graz, Austria.

068¶ Architecture of the musculotendinous complex of the popliteus muscle: a 3D computer modeling study. THAI, Al[1], Kajeandra RAVICHANDIRAN[1], Piroska L. SZABO[2] and Anne M. AGUR[1]. [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada. [2]Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, New York, USA.

069 Medial pectoral nerve to musculocutaneous nerve neurotization for the treatment of brachial plexus birth injuries: a ten year institutional experience. TUBBS, R. Shane, Marios LOUKAS, Mohammadali SHOJA*, John C. WELLONS*. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran.

070 Vascularization of the fibularis longus and brevis muscles with emphasis on fibular graft harvesting. UZ, Aysun[1]*, Nihal APAYDIN[1]*, Marios LOUKAS[2], Richard S. TUBBS[3], Simel KENDIR[1]*, [1]Department of Anatomy, Ankara University School of Medicine, Ankara, Turkey, [2]Department of Anatomical Sciences, St. George's University, Grenada, West Indies, [3]Section of Pediatric Neurosurgery, University of Alabama at Birmingham, Birmingham, AL.

071 Vascularization of the fibularis longus and brevis muscles with emphasis on fibular graft harvesting. UZ, Aysun[1]*, Nihal APAYDIN[1]*, Marios LOUKAS[2], Richard S. TUBBS[3], Simel KENDIR[1]*, [1]Department of Anatomy, Ankara University School of Medicine, Ankara, Turkey, [2]Department of Anatomical Sciences, St. George's University, Grenada, West Indies, [3]Section of Pediatric Neurosurgery, University of Alabama at Birmingham, Birmingham, AL.

072¶ Success rate of intra-articular puncture of finger joints - physician's experience. WEINBERG[1], Annelie M.*, Wolfgang PICHLER[2]*, Stephan GRECHENIG[2]*, Hans CLEMENT[2]*, Angelika SCHWARZ[3]*, Andreas H. WEIGLEIN[3]. [1]Department of Pediatric Surgery. [2]Department of Traumatology, and [3]Institute of Anatomy, Medical University Graz, Austria.

073¶ The important layers of the medial knee : 'superficial and deep' pes anserine complexes. WHEELER*, Laura R., Brion BENNINGER, and Gary WIND. Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health and Science University, OR.

074 Extra- and intramuscular nerve distribution patterns of the muscles of ventral compartment of the forearm. WON[1]* Sung-Yoon, Mi-Sun HUR[1]*, Vadim SHEVERDIN[1]*, Hyun-Ho KWAK[2]*, Kyung-Seok HU[1]*, Christian FONTAINE[3], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Oral Anatomy, School of Dentistry, Pusan National University, Busan, Korea, [3]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France.

075 Is the superior glenohumeral ligament a true ligament? YAMAGUCHI*, Kumiko[1], Tomoyuki MOCHIZUKI[2]*, Keiichi AKITA[1]*. [1]Unit of Clinical Anatomy, Tokyo Medical and Dental University, JAPAN, [2]Department of Orthopedic surgery, Tokyo Medical and Dental University, JAPAN (sponsored by Tatsuo Sato).

076 Functional analysis of the masticatory system of the dog with relation to the human. YANG[1]* Hun-Mu, Da-Hye KIM[1]*, Jong-Tae PARK[2*], Kyung-Seok HU[1]*, Heung-Joong KIM[2*], Christian FONTAINE[3], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Oral Anatomy, College of Dentistry, Chosun University, Gwangju, Korea, [3]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France.

Biochemical

077 Can neurotracers be used successfully on embalmed human cadaver nervous tissue? BENNINGER, Brion, and Jon McNeil*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR.

078 Identification of Brain-Derived Neurotrophic Factor (BDNF) in the adult human trigeminal ganglion and its colocalization with Calcitonin Gene-Related Peptide (CGRP). BENNINGER, Brion, and Agnieszka, BALKOWIEC. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

079 Testicular effects of two cycles of cisplatin chemotherapy and concomitant administration of L-Ascorbic acid in a mouse model. KILARKAJE, Narayana., Susan VARGHESE,* Saju S. JACOB.* Department of Anatomy, Faculty of Medicine, HSC, Kuwait University, Safat, Kuwait.

080 Role of administration of vitamin E on the histopathological changes in the rat testis following torsion and detorsion. Testicular torsion is a medical emergency, especially in neonatal or adolescent males. RANADE Anu V*, Raghuveer C. VASUDEVAN*, Vinodini N. ANANTHARAYA*, Rekha D. KINI*, and Nayanatara A KUMAR**.

Poster Session 2

Education

081 Design and Implementation of a Problem Based Dissection Course. BELBECK, Larry W.*, Bruce C. WAINMAN*, Alexander K. BALL* and Stephanie L. CAMPBELL*. McMaster University, Department of Pathology and Molecular Medicine, Hamilton, ON Canada (sponsored by Michael J Wiley).

082 Anastomosis, an important clinical term with multiple non-standardized definitions and no formal classification. BENNINGER, Brion, and Ilkyu LEE*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

083 Increased grade emphasis (60%) should be placed on lab performance in a clinical anatomy course.

BENNINGER Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, Oregon Health and Science University, Portland, OR.

084 Using radiology to demonstrate normal and pathological structures improved student comprehension in a clinical anatomy course. BENNINGER Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, OHSU, Portland, OR.

085 Exploring a clinical anatomy course for translational teaching and research. BENNINGER Brion. Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR.

086 Recruiting the next generation of educators through creation of a graduate certificate in anatomical sciences instruction. BRUECKNER, Jennifer K., Douglas GOULD, Geoffrey GUTTMANN, Brian R MACPHERSON, Bruce MALEY, Don M. GASH*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY and The Ohio State University College of Medicine, Columbus, OH.

087 Integration of gross anatomy and introduction to clinical medicine. CLEARY, Leonard J., Edie SHULMAN* and Joanne OAKES*. Integration of Gross Anatomy and Introduction to Clinical Medicine, Depts. of Neurobiology and Anatomy, Internal Medicine and Emergency Medicine, The University of Texas Medical School Houston, Houston, TX.

088¶ Simultaneous presentation of anatomy and radiology using interactive object movies. DETTON*, Alan J. and Robert M. DEPHILIP. Division of Anatomy, College of Medicine, The Ohio State University, Columbus, OH.

089 Philosophical viewpoint of the notion of cadaver as the student's first patient. FLEMING, James* and Jennifer BRUECKNER. University of Kentucky College of

Medicine, Department of Anatomy and Neurobiology, Lexington KY.

090 A web-based cadaver medical histories database used for collection of anatomical variation data. GEST, Thomas R., and Kevin O'BRYAN, Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI.

091 The effectiveness of the anatomy component of a summer program for disadvantaged kids desiring a career in the health professions. GOULD, Douglas J., Anthony HARTSFELD*, James BALLARD*, James NORTON*, Laurie DAVIS*, Lesley GILMER* and Jennifer BRUECKNER. The Ohio State University College of Medicine, Columbus, OH. and the University of Kentucky College of Medicine, Lexington, KY.

092 Leonardo da Vinci, anatomist. GRANGER, Noelle A. The University of North Carolina, School of Medicine, Department of Cell and Developmental Biology, Chapel Hill, NC.

093¶ Teaching the neurological exam strengthens medical student knowledge of the cranial nerves. GREENE, Sarah J., and Todd M. HOAGLAND. Department of Anatomy and Neurobiology, Boston University School of Medicine, MA.

094 The assessment of study skills in gross anatomy for physician's assistant and physical therapy students. GUTTMANN, Geoffrey D., and Brian R. MACPHERSON, University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY.

095 The assessment of study skills in the anatomical sciences for dental students. GUTTMANN, Geoffrey D., and Jennifer K. BRUECKNER, University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY.

096 Learning the ins and outs of the peripheral nervous system. HANSON*, Elizabeth, Nichole BOETTCHER*, Katharine BYRON*, Jeremiah EISENSCHENK*, and

Arlen SEVERSON. University of Minnesota Medical School, Duluth, MN.

097 Clinical anatomy of an autopsy. HUNT, Allison G.* and Jeffrey SOSNOWSKI. Department of Pathology, University of South Alabama, Mobile, AL.

098¶ Online learning: bringing the teacher to the student using Camtasia Studio software. JOHNSON, Nathan F., April D. RICHARDSON, and Jennifer K. BRUECKNER. Department of Anatomy and Neurobiology, University of Kentucky, KY.

099 Assessment of Surface Anatomy in Objective Structured Clinical Examinations. JUDSON, John P., Joachim PERERA*, Nilesh K MITRA*, Daw Khin WIN* and Nagarajah LEE**. Departments of Human Biology* & Community Medicine**, International Medical University, Kuala Lumpur, MALAYSIA.

100 Enhancing medical students' clinical reasoning ability through visualization of spatially complex gross anatomy with a computer-based, three-dimensional model of the pterygopalatine fossa. KRYSKI*[1], Diana G., Michael J. WILEY[2], Jodie JENKINSON*[3], Nicholas WOOLRIDGE*[3], Michael CORRIN*[3]. [1]Graduate student Msc.BMC Program, Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto; [2]Department of Surgery, Division of Anatomy, University of Toronto; and [3]Biomedical Communications, Institute of Communication and Culture, University of Toronto Mississauga.

101 Cardiac anatomy and embryology: correcting anatomical errors. LOUKAS, Marios and R. Shane Tubbs. Department of Anatomical Sciences St. George's University, Grenada, West Indies. Department of Cell Biology, UAB, AL.

102 Central-line placement "clinic," a cadaver-based learning exercise. MARSKE, Cynthia*, Robert ANDERSON*, Bruce SILVERMAN*, and David J.ELIOT, Touro University California, College of Osteopathic Medicine.

103 Animal bones referred for forensic anthropological identification in the West of Scotland. McDONALD, Stuart W.*[1], and Jennifer MILLER*[2], [1]Laboratory of Human Anatomy and [2]Glasgow University Archaeological Research Division (GUARD), University of Glasgow, Glasgow, Scotland, UK.

104¶ Interprofessional peer teaching of the musculoskeletal system in a combined medical and physical therapy gross anatomy class. McHERRON*[1] Tony I, Brandon J YUAN*[1], Steven S HAMILTON*[1], Nathan HELLYER*[2], David KRAUSE*[2], John HOLLMAN*[2], James YOUDAS*[2], Wojciech PAWLINA[1] and Nirusha LACHMAN[1]. [1]Department of Anatomy, Mayo Medical School, Rochester, MN, [2]Department of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, MN.

105¶ A cultural anthropological study: how human cadavers become healthcare students' first patients. MOORE*, Mallory C. and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR.

106 Anatomic correlations in plastic replica and diagnostic image for clinical anatomical education. NAGATO*, Yasukazu., Komazo YAZAWA*, Yutaka IMAI*, Tsutomu OKAZAKI*, Munetaka HAIDA* and Yasuo HARUKI*. Tokai University, School of Medicine, Isehara, Kanagawa, Japan and Yazawa Zokei Laboratory, Tokyo, Japan.

107 "Da Vinci Nights" in the dissection studio: a source of artistic and humanistic inspiration from the Renaissance to today. OLSON, Todd R.[1], Peter DAMA[2], Andrew LATTIMORE[3], Norman GOLDBERG[4], Sherry A. DOWNIE[1]. [1]Department of Anatomy and Structural Biology, [2]Graphic Arts Center, Albert Einstein College of Medicine, Bronx, NY; [3]Atelier Studio, Cornwall, NY; [4]Department of Communications, Yeshiva University, New York, NY.

108 A novel approach to teaching and learning embryology through origami. PURDY, Lisa*, Cady BLACKEY*, Jennifer BRUECKNER. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY.

109¶ Using 3D visual anatomy; Visual Human Dissector Pro™ improves navigation of imaging anatomy. RASK*, Ted, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR.

110¶ Comparison of computation of physiological cross sectional area directly from a 3D computer model and indirectly from equation based methods. RAVICHANDIRAN Kajeandra[1], Mayoorendra RAVICHANDIRAN[1], Karan SINGH[1]*, Michele OLIVER[3]*, Nancy MCKEE[1]* and Anne AGUR[1] [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada, [2]Department of Computer Science, University of Toronto, Toronto, Ontario, Canada, [3]Biological Engineering, University of Guelph, Guelph, Ontario, Canada.

111¶ Radiological virtual anatomy course for first-year medical students: is there an additional benefit compared to the traditional dissection course? RENGIER*, Fabian, Sara DOLL, Joachim KIRSCH*, Hendrik VON TENGG-KOBLIGK*, Hans-Ulrich KAUCZOR*, and Frederik L. GIESEL*. Department of Radiology E010, German Cancer Research Center Heidelberg, Germany and Department of Anatomy, University of Heidelberg, Germany.

112¶ Comparison of podcasting as a learning tool for cross-sectional anatomy among populations of medical professional students. RICHARDSON, April D., Nathan F. JOHNSON, Brian MACPHERSON, and Jennifer K. BRUECKNER. Department of Anatomy and Neurobiology, University of Kentucky, KY.

113 Use of a three-dimensional interactive web-based module for understanding anatomical relationships and

the clinical techniques associated with sciatic nerve block. SAKAI, Ryo*, Jodie JENKINSON*, Nicholas WOOLRIDGE*, Marcin WASOWICZ*, and Gordon TAIT*. Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto, ON, Biomedical Communications, Institute of Communication and Culture, University of Toronto Mississauga, ON, and Department of Surgery and Department of Anaesthesiology, University of Toronto, ON (sponsored by A. Agur).

114 Innovative three-dimensional rendering of human anatomy incorporated in a medical procedures lab session for interns and residents in internal medicine. STEFAN, Cristian[1], Richard Forster[2]*, Charles Mayo[3]*, and Thomas J. FitzGerald[3]*. [1]Academy of Medical Educators, Touro University College of Medicine, Hackensack, NJ, [2]Department of Medicine and [3]Department of Radiation Oncology, University of Massachusetts Medical School, Worcester, MA.

115 The anatomy of self defense. STEIN, Pamela S., Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, KY.

116 Coping with stress: a comparison between 1st and 2nd year medical students. TURCHIN* Katie, Monica BRANIGAN*, and Anne AGUR. Department of Surgery and Department of Family and Community Medicine, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada.

117 Dissection-based anatomy retreats – An international exchange stretching from the busy streets of Tokyo to the hills of West Virginia. WARD, Peter J. Division of Structural Biology, West Virginia School of Osteopathic Medicine, WV.

118¶ Bringing anatomy to life: clinical emergency procedures laboratory for first-year medical students (*pilot study*) WILSON, Adam B.[1]*, Christopher ROSS[2]*, James M. WILLIAMS[1], and Laura E. THORP[1]. [1]Department of Anatomy and Cell Biology, Rush University Medical Center, Chicago, IL and [2]Department of Emergency

Medicine, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL.

119 Production of a series of gross anatomy dissection videos. ZHANG, Han and Leonard J. CLEARY. Dept. of Neurobiology and Anatomy, Univ. Texas Medical School Houston, Houston, TX.

Thorax/Abdomen/Pelvis

120 Spermatogenic disturbance induced by testicular torsion and detorsion is significantly prevented by treatment with antioxidant vitamin C in the rat. ANANTHARAYA Vinodini N*, Anu V RANADE*, Raghuveer C. VASUDEVAN*, Rekha D. KINI*, and Nayanatara A KUMAR*. Kasturba Medical College, Mangalore, KA, India.

121 The Splenomesenteric vein: formally recognizing a section of the portal venous drainage system. BENNINGER, Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, OR.

122 Case study of an infrequent cause of right lower lobe consolidation. BEST Irwin M., Abbas CHAMSUDDIN*, Brandon KANG*, Louis G. MARTIN*, Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

123 Hypoxemia and filling defect on pulmonary angiogram several days after a long road trip. BEST, Irwin M. and Louis G. MARTIN*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

124 Percutaneous recovery of an embolized patent foramen ovale closure device. BEST, Irwin M., Brandon KANG*, Abbas CHAMSUDDIN*, and Curtis LEWIS. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

125 Venous anomalies complicating inferior venacaval filter placement for recurrent pulmonary embolism. BEST, Irwin M., Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

126§ Venous anomalies complicating inferior venacaval filter placement for recurrent pulmonary embolism. BEST, Irwin M., Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.

127 Anomalous origin of left testicular artery from left accessory renal artery. FARHAN, Thaer M., Lecturer of Human Anatomy, Department of Human Anatomy, Al Nahrain University, Baghdad, Iraq.

128 The Conjoined Tendon-Does It Exist? FARHAN, Thaer M., Lecturer of Human Anatomy, Department of Human Anatomy, Al Nahrain University, Baghdad, Iraq.

129 The pattern of the thoracic splanchnic nerves as they pass through the diaphragm. GEST, Thomas R., and Sabine HILDEBRANDT, Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI.

130 Clinical anatomy of the lusorian artery in adult, and fetuses. GIELECKI, Jerzy, and Anna ZURADA. Departament of Anatomy, Medical University of Silesia, Poland.

131 Experimental colitis: A chronic model. JURJUS, Abdo R.*, PhD, American University of Beirut; Mahmoud A. KAMAR, Beirut Arab University; Inaya M. ABDALLAH HAJJ HUSSEIN, PhD, American University of Beirut; and Mostafa H. MOSTAFA, PhD, Beirut Arab University.

132¶ Digital-image analysis of the subclavian artery in human fetuses. KOWALÓWKA*, Adam, Jerzy, GIELECKI, and Anna, ZURADA. Departament of Anatomy, Medical University of Silesia, Poland (sponsored by J Gielecki).

133¶ Two unilateral variations in pelvic attachments of the quadratus lumborum muscle and their relevance to scoliosis. LaSALA, Gregory*, Quentin A. FOGG and Lancelot G. NASH. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA.

134¶ Comparison between two methods of percutaneous vertebral pedicle screw placement on accuracy and time using human cadavers. LUFLER[1], Rebecca, S, Tony TANNOURY*[2], Jared TOMAN[2], Joshua J. STEFANIK[1], Chad W. FARRIS[1], and Todd M. HOAGLAND[1]. Department of Anatomy and Neurobiology[1], Boston University School of Medicine and Department of Orthopaedic Surgery[2], Boston Medical Center, Boston, MA.

135¶ Coronary sinus anomalies. MARGARIDA, Francisco*, Faculdade de Medicina de Lisboa.

136 Analysis of the morphological types of intraparenchymal spatial distribution of caudate lobe arteries. Study on corrosion casts. MATUSZ[1] Petru L., Eniko-Christine HORDOVAN[1]*, Agneta Maria PUSZTAI[1]*, Klara BRINZANIUC[2]*, Cosmin NICOLESCU[2]. [1]Department of Anatomy, University of Medicine and Pharmacy "Victor Babes" Timisoara, ROMANIA, [2]Department of Anatomy, University of Medicine and Pharmacy Targu-Mures, ROMANIA.

137 Can CT Enterography replace the fluoroscopic small bowel series? MORRISON, Stuart , Sunny PITT*, Robert WYLLIE*, Janet REID*. Pediatric Radiology and Gastroenterology, Children's Hospital, Cleveland Clinic, Cleveland, OH.

138 Anthropometric study of the inguinal region and its relevance in inguinal hernia. PAI Mangala M*, Varsha NAYAK*, Latha V. PRABHU*. Department of Anatomy, Kasturba Medical College, Mangalore, KA, India.

139 MRIs, CTs, and advanced anatomic images of female cadaver pelvis. PARK* Jin Seo, Min Suk CHUNG*, Jun Won LEE*, Dong Sun SHIN*, and Yong-Wook JUNG*. Department of Anatomy, Dongguk University College of

Medicine, Republic of Korea, and Department of Anatomy, Ajou University School of Medicine, Republic of Korea (sponsored by Chang-Seok Oh).

140 Topographical study of brachiocephalic trunk in Caspian miniature horse. PARYANI*, Mohammad R. and Hassan Gilanpour* (sponsored by Quentin A. Fogg). Department of Basic Sciences, Faculty of Veterinary Medicine, Islamic Azad University, Karaj branch, Iran. Department of basic sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran.

141¶ Buhler's anastomotic artery: long forgotten in the annals of anatomy. PERRY, L. Amanda[1], Pranjal PATEL[1], Sonali PATEL[1], M. Josh PHILLIPS[1], James M. WILLIAMS[2], and Vassyl A. LONCHYNA[2]. Rush Medical College[1], Department of Anatomy and Cell Biology[2], Rush University Medical Center, Chicago, IL, USA.

142 Is traction a reasonable mechanism of injury explaining an isolated ruptured lumbar disc? PORTA[1], David J., Andrew R. KEMPER[2]*, Charles BARRETT, JR.[1]* and Stefan M. DUMA[2]*. [1]Department of Biology, Bellarmine University, Louisville, KY. [2]Virginia Tech – Wake Forrest Center for Injury Biomechanics, Blacksburg, VA.

143 Histological study of the cervix in Caspian Miniature Horse. REZAIAN, Maryam, Mohammad E. AKBARI*. Division of Histology, Department of Basic Sciences, Faculty of Veterinary Medicine, Tehran University, Tehran, Iran.

144 Caudal regression and sirenomelia: the detailed dissection of a "Mermaid Baby". RODRIGUEZ, Jolie R.* and Jeffrey SOSNOWSKI. Department of Pathology, University of South Alabama, Mobile, AL.

145 Gross anatomy of ostrich's heart. TADJALLI Mina* , Reza GHAZI* and Paria PARTO*. (Sponsored by Gregory Smith). Department of Anatomy, School of Veterinary Medicine, Shiraz University, Shiraz, Iran.

146 An additional approach in preserving the medial and lateral pectoral nerves in modified radical mastectomy.

TAN, Yun*; Waheed M. RANA*; Jeff WATSON*; Margaret H. COOPER; John R. MARTIN, III; Yunxi TAN*. Center for Anatomical Science and Education, Department of Surgery, Saint Louis University School of Medicine.

147 Branches of the Posterior Ramus of the Spinal Nerve. TOSHIYUKI, Saito, M.D., Ph.D., Hanno STEINKE, Ph.D., Tomoe IWABUCHI D.D.S., Toshiyasu KITAYAMA, D.D.S., Yoshiyuki OI, M.D., Ph.D., Takayoshi MIYAKI VMD., Ph.D., Masahiro ITO M.D.,Ph.D. Anesthesia, Nihon University, Dental School, Chiyada-ku, and Anatomy, Tokyo Medical University, Shinjuku-ku, Tokyo, Japan.

148 Study of the effects of flexion on the position of the conus medullaris. TUBBS, R. Shane, David Bauer*, Mohammadali M. SHOJA*, Marios LOUKAS, and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI.

149¶ Experimental and clinical imaging of a retroesophageal right subclavian artery. VOGT*, Keith M., Courtney Y. KAUH*, David M. HOLDER*, and Robert M. DEPHILIP. College of Medicine, Division of Anatomy, The Ohio State University, Columbus, OH.

150 Anatomical Study of latissimus dorsi myocutaneous flap vascular distribution. WATANABE*, Koichi, Tsuyoshi SAGA*, Noriyuki KOGA*, Kensuke KIYOKAWA*, and Koh-ichi YAMAKI*. Department of Anatomy and Department of Plastic and Reconstructive Surgery and Maxillofacial Surgery, Kurume University School of Medicine, Kurume, Japan (sponsored by M. Miura).

151 Ectodermal dysplasia in twin gestation, a case report and review ofthe literature. WHITHAUS*, Kenneth C., Elizabeth A. MANCI*, and Jeffery S. SOSNOWSKI. University of South Alabama, Department of Pathology, Mobile, AL.

Anatomical Services

152 A final farewell. ELIOT, David J., and Bruce SILVERMAN*, Basic Science Department Touro University California, Vallejo, CA.

153 A graveside memorial service and internment honoring donors to the anatomical gift program.MARTINO, Leon J. and Julie A CHANG*. Anatomical Gift Program, Albany Medical College, Albany, NY.

154 Evolution of a database system for an anatomical donations program. MUELLER, Dean A., Carolyn WHITE*, Mary BERNIER*, Shiow-Hwa GAU*, and Thomas R. GEST, Division of Anatomical Sciences, Anatomical Donations Program, and Medical School Information Systems, University of Michigan Medical School, Ann Arbor, MI.

155 Humanism and professionalism integrated into gross anatomy. O'DONOGHUE, Daniel, L., Jerry B. VANNATTA*, Robert M. HAMM* and Sheila CROW*, College of Medicine, University of Oklahoma, Oklahoma City, OK.

156 The Convocation of Thanks: A Meaningful Memorial Service for Donor Families and Students. PEDERSEN, Ruth L, Terry D REGNIER, Dean R FISHER AND Karen M MILLS, Department of Anatomy, Mayo Clinic, Rochester, MN.

157 SpecimenTrak: an RFID system for tagging and tracking anatomical specimens. PRABHU, Shiv*[1], Charlie QIU*[1], Chi-Cheng CHU*[1], SCHMITT Brandi[2], Rajit GADH*[1]. [1] Wireless Internet for the Mobile Enterprise Consortium (WINMEC), UCLA, Los Angeles, CA. [2] Univ. of California, Office of the President, Oakland, CA.

158¶ Development of a CT autopsy imaging service to augment the State Medical Examiner's investigations of traumatic death: logistic issues, techniques, findings, and future potential. SHAH Priti A.[1]*, Barry D DALY[1]*, Clinton W SLIKER[1]*; Nancy KNIGHT[1]*, Kenneth B. HISLEY[2]; [1]Department of Diagnostic Radiology,

University of Maryland School of Medicine; [2]Department of Anatomy, Des Moines University.

159 Reflection on the 2007 UC Davis Body Donor Memorial Service. WACKER, Charlotte and Zhanetta HARRISON*. School of Medicine, University of California, Davis, 4800 Broadway, Suite 100, Sacramento, CA.

Abstracts

AN*, Xiao-Chun, Je-Hoon LEE* and Seung-Ho HAN, Department of Anatomy, Catholic Institute for Applied Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Korea. Anatomic study of the localization of motor points and the intramuscular nerve supply to the hamstring muscles.

Fifty lower limbs from twenty seven fresh cadavers were dissected to elucidate the anatomical location of the motor point and intramuscular nerve distribution of hamstring muscles. The point where the nerve branch first pierced the muscle belly was defined as the motor point (MP). The intramuscular branches located most proximally and distally were defined as proximal limit (PL) and distal limit (DL) respectively. The MP, PL and DL were measured along a reference line from the superior medial aspect of the ischial tuberosity to the most proximal aspect of the medial femoral condyle. The MP, PL and DL of long head were located at 41.9%, 39.6% and 72.9% of the reference line while for short head at 57.3%, 58.9%, 80.2% and for semimembranosus muscle at 62.8%, 65.9%, 89.1% of the reference line. The semitendinosus muscle could be divided into two parts according to the intramuscular distribution and for the upper part the data were 20.5%, 18.6% and 36.8% while for the lower part were 60.0%, 56.6% and 79.1% of the reference line. The results of this research were capable of providing useful guidelines for good practice of selective chemodenervation of hamstring spasticity.

ANANTHARAYA Vinodini N*, Anu V RANADE*, Raghuveer C. VASUDEVAN*, Rekha D. KINI*, and Nayanatara A KUMAR*. Kasturba Medical College, Mangalore, KA, India. Spermatogenic disturbance induced by testicular torsion and detorsion is significantly prevented by treatment with antioxidant vitamin C in the rat.

The effect of a testicular torsion leading to the possible loss of a gonad within few hours is well known. Delay in operative intervention remains the dominant factor governing testicular survival. Previous studies have shown that use of antioxidants in the prevention of testicular reperfusion injury following detorsion is conflicting. This study was conducted to know the role of Vitamin C on testicular torsion and detorsion in rats. Male Wistar albino rats were divided as Group I - Group IV. The animals of

Group IV were orally pretreated with Vitamin C for 30 days (40mg/kgbw). The testis was manually rotated 720° clockwise and counter rotated to induce ischemia and reperfusion. The testis was fixed in Bouin's fluid and processed for histopathological examination. There was a significant decrease seen in the standard tubular diameter and the epithelial height in untreated group compared to Normal and Sham controls. However, the animals of Vitamin C treated group, showed a recovery in their standard tubular diameter and epithelial height when compared to their untreated control groups. Therefore this study shows that antioxidant vitamin C can prevent testicular damage as it can block the release of oxygen free radicals.

ANDREWS*, Kelly, Brion BENNINGER and Karen RICHARDS, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Periodontal Surgery, Oregon Health and Science University, Portland, OR. Clinical measurements of the hard palate and implications for subepithelial connective tissue grafts with suggestions for palatal nomenclature.

The objectives of this study were to identify a reliable measuring technique regarding a palatal graft, observing patterns of the neurovascular bundle and identifying morphology of the hard palate. Subepithelial connective tissue grafts (SCTG) are performed at an increasing rate to improve aesthetics and oral health. Palatal graft techniques commenced in 1963 and today the SCGT is the most widely accepted technique. The greater palatine nerve and artery (GPN/GPA) are critical neurovascular structures to identify. Their pattern and palate morphology are not well defined. We dissected 34 palates from embalmed human cadavers, implementing a new measuring technique to locate the GPA-GPN bundle, observing patterns and palatal morphology. Electronic digital calipers were used for data collection. Anatomy texts and atlases were analyzed. Results revealed a reliable measuring technique, a common pattern of the bundle and osseous palatal landmarks, which are poorly defined in contemporary texts. Dissections also demonstrated a medial and lateral groove along with a crest in the palatine process of the maxillary bone. The GPA traversed the lateral groove and the GPN traversed the medial groove consistently. The crest was located anteroposteriorly between the grooves.

This work suggests a measurement technique, a consistent neurovascular pattern and reconsidering palatal nomenclature.

APAYDIN, Nihal*[1], Marios LOUKAS[2], Richard S. TUBBS[3], Ali F. ESMER*[1], Murat BOZKURT*[4], [1]Department of Anatomy, Ankara University School of Medicine, Ankara, Turkey, [2]Department of Anatomical Sciences, St. George's University, Grenada, West Indies, [3]Section of Pediatric Neurosurgery, University of Alabama at Birmingham, Birmingham, AL, [4]Third Clinic of Orthopaedics and Traumatology, S.B. Diskapi Yildirim Beyazid Research and Education Hospital, Ankara, Turkey. The course of the inferior gluteal nerve and surgical landmarks for its localization during posterior approaches to the hip.

The position of the inferior gluteal nerve (IGN) makes it vulnerable to iatrogenic injury during posterior and posterolateral approaches to the hip. Although the posterior approach has been reported to be the most frequently used technique, it is most likely to be associated with damage to the IGN. As there is scant information in the literature regarding the course and the anatomic relationships of the IGN, we aimed to investigate the anatomic course of the IGN and to define anatomical landmarks that can be used by surgeons during posterior approaches to the hip. Thirty-two gluteal regions from adult fixed cadavers were used for this study. A triangular-shaped anatomic area that contains the IGN was defined. This geometric area was formed by connecting the following points: posterior superior iliac spine (PSIS) (apex), ischial tuberosity (IT) and greater trochanter (GT). The closest mean distance between the IGN and the PSIS, IT and the GT was 3.2 cm, 5.4 cm and 4.8 cm, respectively. In all specimens, the nerve entered the deep surface of the gluteus maximus approximately 4.8 cm from the apex of the GT and approached the GT as close as 0.8 cm on average. Based on our study, dividing the gluteus maximus with standard techniques may damage the IGN. Posterior minimally invasive approaches to the hip should take into account the point of entry of the IGN into the gluteus maximus. Localization of the IGN by using the anatomic triangle defined in this study may decrease surgical morbidity.

BAJIC, Nicholas A.*, Fiona STEWART, and John P HARRIS*. Department of Medicine, Graduate Medical Program, University of Sydney, NSW, Australia. The asymmetry of the carotid bifurcation: a cadaver study.

It is generally agreed the carotid bifurcation occurs approximately cervical vertebra (CV) level 3-4, from the upper border of the thyroid cartilage to the greater horn of the hyoid bone, with no significant difference bilaterally. By dissecting twenty five Caucasian cadavers (mean 84.5 years), the aims were; (1) Determine if there is significant difference in vertical height between left and right carotid bifurcation, (2) Identify any significant difference in the vertical height of the carotid bifurcation between males and females. Bilaterally, measurements were taken from the anterior tubercle of CV6 transverse process to the carotid bifurcation. The carotid bifurcation occurred higher twice as frequently on the left, with a mean difference of 4 mm (95% CI ±3.4mm). In females the mean carotid bifurcation occurred 5 mm (95% CI = ± -3.5) higher on the left. In males the mean difference in carotid bifurcation vertical height was 4 mm higher on the left (95% CI = ± 6.3). This study confirmed the existence of considerable variation in common carotid bifurcation in its cadaver population, with the left occurring higher than the right. In this study, the comparison of male and female carotid arterial anatomical variation was not significant.

BELBECK, Larry W.*, Bruce C. WAINMAN*, Alexander K. BALL* and Stephanie L. CAMPBELL*. McMaster University, Department of Pathology and Molecular Medicine, Hamilton, ON Canada (sponsored by Michael J Wiley). Design and Implementation of a Problem Based Dissection Course.

A problem-based dissection course was initiated to teach undergraduate Anatomical Pathology. The goals were to encourage active interaction with human pathological specimens, to encourage interactive learning and produce learning materials for other educational efforts. The course was based on a McMaster's course model that has previously resulted in a high level of clinical reasoning, retention of information and engagement of the students. The premise is that the more ways that student interacts with material, the greater amount of material they remember. At the same time students develop critical thinking and problem solving skills as well as physical skills in prosection. A high level of academic achievement was the primary outcome of the course, but additionally, a number of specimens representing disease processes or surgical treatments useful for teaching in other

courses were produced, along with digital images, presentations and multiple choice questions to be used in teaching modules. This poster presentation will showcase some of the material produced by students.

BENNINGER, Brion, and Ilkyu LEE*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Anastomosis, an important clinical term with multiple non-standardized definitions and no formal classification.

This study investigates the definition of 'anastomosis.' Anastomosis is a frequently used and important clinical term with multiple meanings and no standardized definition or classification. Anastomosis differs in meaning depending on whether the context is structural (anatomical), physiological, or surgical, and leads to confusion. Few textbooks offer a complete or working definition of 'anastomosis' even though the term is mentioned and used ubiquitously. We reviewed the most commonly used texts: anatomical, physiological, and surgical along with common web-based resources and medical dictionaries to examine the use of 'anastomosis' and to determine the completeness of the definition. Our findings revealed that the most common definition, when presented, was "a communication of one open lumen to another." Although three separate general definitions were found, of the surprisingly limited number of texts giving any definition, most only provided a limited definition of anastamosis. Our suggested definition is: 'The communication of a luminal vessel with another region of itself, or branch of itself, or with another luminal vessel from a separate origin.' Due to its clinical importance in the healthcare arena, the results of our study suggest the term anastomosis should be defined comprehensively and classified.

BENNINGER, Brion, and Jon McNEIL*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR. Can neurotracers be used successfully on embalmed human cadaver nervous tissue?

The purpose of this study is to demonstrate that retrograde neurotracers can be used successfully on embalmed human cadavers. Neurotracer studies have been performed

successfully on nervous tissue in laboratory rodents (Rattus norvegicus); however, there have been no neurotrace studies using retrograde lipophilic dyes on embalmed human cadaver nervous tissue. We dissected, harvested, and labeled 7 spinal cord-brainstem units and preserved cervical nerves and accessory nerves bilaterally. We kept the cervical spinal nerves and the accessory nerves intact as close to their target organs as possible. We then applied lipophilic retrograde neurotracers (DiI and DiO) from Invitrogen (Molecular Probes) to the cervical spinal nerves and the accessory nerves. All specimens were then incubated for 6 months at 37.5°C. Post-incubation, we used O.C.T. embedding media to prepare the spinal cord-brainstem units for observation. Using a cryostat to section the spinal cord-brainstem units, we prepared slides and examined them under an inverted light microscope using filters. Our results revealed that the retrograde lipophilic DiI and DiO had diffused into the spinal cord-brainstem units. This is the first study to demonstrate that lipophilic retrograde neurotracers can be used on embalmed human cadaver nervous tissue for future research.

BENNINGER, Brion. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR. The pectoralis minor and scapula reveal the “coracopectoralis” or Benninger’s Maneuver and Sign, a shoulder girdle diagnostic examination tool.

The purpose of this study is to introduce a clinical maneuver and sign by palpating the coracoid process (CP), proximal pectoralis minor musculotendinous unit (PMMU) and pectoralis fascia (PF)-“coracopectoralis”or Benninger’s maneuver to aid the diagnosis of muscle imbalance and scapular dyskinesis (SD). Muscles that create movement of the scapula, referred to as scapulothoracic rhythm, scapular tilting and scapulohumeral movement, allow us to move our upper limb in an impressive number of positions. Pectoralis minor is enveloped by PF and attaches from the anterior thoracic wall to the coracoid process of the scapula, and can act as a warning system when scapulothoracic/scapulohumeral rhythm is kinetically compromised. Muscle imbalance from repetitive activity in the workplace or sport causes the scapula to move ineffectively. This can put undue strain onto the PF and PMMU attachment to

the anteromedial coracoid process. Chronic repetitive strain to the PF and PMMU revealed pain on palpation to one or more of the following structures, the coracoid process, PMMU and PF--a positive “coracopectoralis”or Benninger’s sign. We dissected 40 cadavers analyzing PMMU at the coracoid process. Clinical examination was performed on 40 volunteers (20 healthy and 20 with chronic shoulder pain) by palpating the CP, PMMU and PF. Results from cadavers revealed a consistent PMMU within 2cm of the coracoid process. Clinical examinations demonstrated painless palpation of the CP, PMMU and PF in healthy shoulders and pain to those with scapular dyskinesis. When assessing shoulder complex injuries,“coracopectoralis” tenderness or‘Benninger’s sign’can aid in the diagnosis of scapular dyskinesis.

BENNINGER, Brion, and Agnieszka, BALKOWIEC. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Identification of Brain-Derived Neurotrophic Factor (BDNF) in the adult human trigeminal ganglion and its colocalization with Calcitonin Gene-Related Peptide (CGRP).

The primary goal of our current study was to determine whether BDNF is expressed in human trigeminal ganglion neurons. Although the role of BDNF in trigeminal nociceptive transmission has been examined in other species, its role in human trigeminal pathways remains unknown. Previous studies have demonstrated that CGRP is involved in transmission of trigeminal pain, such as migraine headaches. We used 30 trigeminal ganglia from embalmed human cadavers (ages 58 to 89) and post-fixed with 2% paraformaldehyde in 0.1 M phosphate buffer for at least 24 hours. The ganglia were sectioned on a cryostat at 10 um thickness. BDNF and CGRP were detected with immunohistochemistry using chicken anti-human BDNF (Promega) and rabbit anti-CGRP (EMD Biosciences) primary antibodies, followed by mouse anti-chicken-Cy3 (Jackson Immunoresearch) and goat anti-rabbit-Alexa 488 (Invitrogen), respectively. Our results demonstrate that BDNF is abundantly expressed in human trigeminal ganglion neurons, many of which also contain CGRP. In conclusion, this is the first demonstration of BDNF expression in human trigeminal ganglion tissue. This data strongly suggests that

BDNF plays a role in trigeminal pain pathways in humans. BDNF colocalization with CGRP is consistent with the role of both peptides in trigeminal pain associated with common clinical conditions.

BENNINGER Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, Oregon Health and Science University, Portland, OR. Increased grade emphasis (60%) should be placed on lab performance in a clinical anatomy course.
The purpose of this study was to evaluate and highlight the grading imbalance between lab and lecture components of a heath care clinical anatomy course and encourage the reevaluation of grading procedures. In anatomy courses at healthcare institutions, there is often a disproportionate amount of grading emphasis given to examinations based on lecture or didactic teaching despite the fact that students spend equal or more time in laboratory tactile learning. All institutions surveyed allocated either equal or more of the overall grade percentage to lecture performance. Students entering our professional institution reported having memorized lists of anatomical structures during their undergraduate courses. They had learned by rote memorization and thus were ill prepared for the more conceptual coursework of postgraduate courses. Students reported they learned more general concepts and felt their recall was better when the course emphasized and rewarded lab performance. Our data collected during 4 years suggested that it would be beneficial to the students' long-term retention of anatomical knowledge, if institutions encouraged their time in lab by giving the lab component of the overall grade at least 60% weight.

BENNINGER, Brion, and Gary WIND. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR. Latissimus dorsi – evidence that the shoulder joint complex is connected to the knee joint complex.
The objective of this study was to investigate the concept that a connection exists between the shoulder and knee joints. The latissimus dorsi is described as a wide reaching triangular muscle connecting between the pelvis and shoulder joint complex. The origin is described at the posterior border of the iliac crest, posterior layer of the thoracodorsal fascia, sacral,

lumber and lower 6 thoracic vertebrae, lower 3 ribs, scapula and finally reaches its insertion into the intertubercular sulcus of the humerus. Clinically, shoulder specialists will examine the posture of the pelvis and the patient's balance on one leg to determine possible pathologies of the shoulder complex. Dissection of the latissimus dorsi musculotendonous unit (LDMU) was performed on 40 human embalmed cadavers to identify a connection between the shoulder and the knee. Anatomy texts and atlases were reviewed to assess the attachments of the LDMU. Dissection results revealed a connection could be considered via the iliotibial band. The outer border of the iliac crest is where the latissimus dorsi is intimate with the iliotibial band, which attaches distally at the knee(tibia). No texts discussed or illustrated this possible connection. These findings support the concept that the shoulder and knee may be connected.

BENNINGER, Brion. Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health and Science University, Portland, OR.
Rotator cuff muscles or a 'compressor muscle unit'- the CMU.
The objective of this study was to compare the function and nomenclature of the collective muscle group, named the rotator cuff, and suggest new terminology based on function. The shoulder joint complex consists of 5 articulations, working in orchestration under neuromuscular influence to withstand heavy loads and coordinate fine motor skills for efficient upper limb function. The glenohumeral joint within the shoulder joint complex is the most frequently dislocated joint in the body. Maintaining functional congruity of the glenohumeral articulation is paramount for the ability to withstand heavy workloads and perform precision movements of the upper limb. The term 'rotator cuff' includes the supraspinatus, infraspinatus and teres minor (SIT) muscles. This is an interesting term, since some believe the supraspinatus muscle is not a rotator of the humerus and there is no cuff inferiorly. Shoulder dissections were performed on 80 human cadavers where rotator cuff morphology was observed. Anatomical texts, atlases, and journals were reviewed for their discussion and illustration of the rotator cuff group. This study suggests the primary function of the rotator cuff is indeed a 'compressor muscle unit'-CMU, which is also represented morphologically. This study suggests consideration

of the ‘compressor muscle unit’-CMU to replace rotator cuff terminology.

BENNINGER Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, OHSU, Portland, OR. Using radiology to demonstrate normal and pathological structures improved student comprehension in a clinical anatomy course.
The objective of this study was to assess whether the use of both normal imaging and pathological radiology of the same structures improved student comprehension. While teaching contemporary human anatomy with cadavers, labs often use radiographic imaging to augment the “normal” anatomy being taught. Often, the philosophy is to have imaging encourage the understanding of the cadaver anatomy or simply to expose students to “normal” anatomy imaging. Our human anatomy lab employs the philosophy that the cadavers augment the learning of normal and abnormal radiological anatomy. The aim is to have our students/trainees become comfortable with navigating the anatomical structures portrayed on both normal imaging and pathology demonstrated by radiology in the mediums of roentgenograms, computerized tomography, magnetic resonance, and ultrasonography. The combination of normal and abnormal anatomical radiology taught simultaneously resulted in more efficient learning in today’s shorter accelerated anatomy courses. This study appears to refute the adage one must learn normal anatomy first, then take a separate pathology course. We found the integration of normal imaging with abnormal radiology and the use of cadavers to catalyze the understanding of relationships and orientation was preferred by our student/trainees.

BENNINGER, Brion, Laura R. WHEELER*, and Gary WIND. Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health & Science University, Portland, OR. The ‘deep pes anserine complex’ of the medial knee: an original concept.
The purpose of this study was to analyze the distal insertion of 3 structures: medial retinaculum, medial collateral ligament (MCL), and semimembranosus to see if they exist as an integrated structural unit. Current literature does not illustrate these 3 structures as a distal unit of the medial knee. Individually, each structure is clinically important in knee stability and pathology.

The recognized pes anserine complex is a 'superficial' distal unit consisting of sartorius, gracilis and semitendonosus along the medial knee. We believe that a distal deep unit of 3 structures also exists. We dissected 80 knees and reviewed illustrations from current texts: clinical anatomy, surgical, and anatomical atlases. Findings from cadaver dissections demonstrated that the medial retinacular fibers, MCL, and the semimembranosus formed a structure distally--suggesting a 'deep pes anserine complex'. Review of texts found these three structures were not shown or described as a distal unit. The distal medial knee structural unit proposed as the 'deep pes anserine complex', is formed from the medial retinacular fibers, medial collateral ligament (MCL) and the semimembranosus. These structures are important in knee stability and awareness of this unit may contribute to better understanding of total knee morphology.

BENNINGER, Brion, Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, OR. The Splenomesenteric vein: formally recognizing a section of the portal venous drainage system.

The objective of this study was to identify and examine a common vein in the portal system which is not consistently named, and when named, assessing whether fundamental concepts were applied in the process of naming. Essentially, the portal venous system drains 3 regions of the gastrointestinal system into 3 major veins (Superior MesentericSMV, SplenicSV, and Inferior MesentericIMV) ultimately forming the portal vein PV. The SMV is formed from midgut veins generally representing the right side of the abdomen. The IMV is formed from hindgut veins generally representing the left side of the lower abdomen and pelvis, classically draining into the SV. The SV is formed from the foregut veins and generally accepts the IMV. The SV then joins the superior mesenteric vein to become the portal vein. 40 cadavers were dissected to observe the frequency of this morphology. Current anatomy and atlas texts were reviewed to identify the morphology and nomenclature. Observations from this study identified a vein being formed from the convergence of the splenic and inferior mesenteric veins we named "splenomesenteric vein", which joins the superior mesenteric to form the PV. These findings suggest reevaluating the morphology and nomenclature of this structure.

BENNINGER, Brion, Laura R. WHEELER*. and Gary WIND. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Portland, OR. The tentorium cerebelli: morphologically an acute peak contrary to representation.

The objective of this study was to reevaluate the morphology of the tentorium cerebelli. The morphology of the tentorium cerebelli is depicted as a structure that essentially blankets over the cerebellum with a central obtuse angle becoming the falx cerebrii. When a craniotomy is performed and the brain and brainstem are removed, the tentorium cerebelli displays an acute slope rising centrally and visibly more elevated than typical illustrations. We dissected 80 cadavers during 2006 and 2007. A measuring technique was employed to determine the angle and height of the tentorium cerebelli. This technique was used to make comparison and determine any patterns observed among the cadavers. All had a slope and angle much more prominent than portrayed in anatomical literature. We reviewed the most commonly used anatomy, neuroanatomy and atlas texts to evaluate and read about the morphology of the tentorium cerebelli. Our results revealed that anatomical and neuroanatomy texts and atlases display the tentorium cerebelli with a rather flat base and a vertical central portion that becomes the falx cerebri. Findings from dissections, measurements and photographs suggest that the tentorium cerebelli has been less than ideally represented in anatomical illustrations.

BENNINGER, Brion, Francis SALINAS, Trevor PITSCH, and Jean-Louis HORN. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Anesthesiology and Perioperative Medicine Oregon Health and Science University, Portland, OR. Department of Anesthesiology, Virginia Masson, Seattte, WA. Ultrasound-Guided Posterior Approach for the Saphenous Nerve Block and Anatomical Description.

Ultrasound imaging and successful blockade of the saphenous nerve is challenging. The objective of this study was to evaluate the feasibility of performing a saphenous nerve block from a posterior approach with ultrasound using its anatomic relationship to the genicular artery, sartorius muscle and the adductor hiatus as defined by cadaveric measurements. We dissected and measured 11 embalmed cadaver knees,

identifying the saphenous nerve and its relationship to surface anatomy landmarks. 10 consecutive patients undergoing lower extremity surgery with combined popliteal sciatic and saphenous nerve blocks were reviewed. The saphenous nerve courses with the saphenous branch of the descending genicular artery. It exits the adductor canal and travels closely with the genicular artery 2.7 cm [2.1-3.4] proximal and 6.6 cm [5.0-9.0] posterior to the proximal and medial patellar border respectively. The distal portion of the adductor (Hunter) canal was at 10.5 cm proximal to the proximal patellar border. A series of 10 patients underwent successful saphenous nerve block from this approach. This study suggests that the posterior approach for saphenous nerve blockade using ultrasound and its anatomic relationships is a feasible alternative to previously described anterior approaches to saphenous nerve blockade.

BENNINGER Brion. Department of Oral Maxillofacial Surgery, Department of Integrated Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Exploring a clinical anatomy course for translational teaching and research. This study is to explore the use of translational teaching and encouragement of research in the clinical anatomy course at the onset of a dental physician's career. Classically, healthcare professional institutions have had separate pre-clinical individual basic science and clinical courses as part of their overall curriculum. The theory was that they would flow sequentially, building upon themselves. The end result was not as desired because courses were not integrated within the preclinical and clinical curricula. In the School of Dentistry, pre-clinical basic science and clinical curricula have been vertically integrated. Dental trainees are put into translational teaching settings in their first course, clinical anatomy. Translational teaching takes place during each clinical anatomy lab session with human cadaver dissection(basic science). Normal and common pathological radiology is taught with cadavers in small groups during dissection (bedside teaching, diagnostic clinical skills). Surface anatomy, examination and procedural techniques are taught during each lab session (clinical skills). Following completion of the translational clinical anatomy course, students identified the benefits through surveys and evaluations. Comments included more confidence with superiors and patients on the clinic floor. More students became involved with research than previously.

This study suggests that translational teaching/research is a successful early teaching concept.

BEST, Irwin M. and Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.
Anatomic relationships for safe trans-jugular tunneled venous catheter placement.

Small bore central venous access for long term intravenous therapy has become commonplace in clinical practice. We demonstrate a safe ultrasound guided technique for tunneled central venous catheter insertion at the patient's bedside. The neck and chest are prepped and draped in the standard fashion for central venous access. Then the jugular veins are located just above the clavicles with a 5-10 megahertz B-mode ultrasound probe in transverse profile. The skin at the lateral edge of the probe is infiltrated with local anesthesia and a 21 gauge micro puncture needle is passed into the internal jugular vein under ultrasound guidance. After spontaneous blood return a 0.018 Cope mandrill wire is passed via needle and then angled towards the xiphoid process. A 1.0 mm incision is made directly through the skin at the needle entry site. A 21 gauge needle is curved into a 30 to 60 degree arc and passed into the 1.0 mm incision directly beside the IJ access needle. The local anesthetic syringe is attached and the subcutaneous tract is infiltrated over the clavicle and onto the lateral chest wall. The outline of the advancing needle must always be in sight. As the 21 gauge needle reaches the end of its 7 cm course over the chest, the point is advanced through the skin and a 018 cope wire is passed through this needle into the hub of the syringe. As the needle is withdrawn from the subcutaneous space the wire is advanced into the tract. A retrograde tunnel is created and the line is passed through the tract to the jugular access site. The dilator and peel away sheathe are passed over the wire and the catheter is cut to 20 -23 cm for the right and 25 – 27 cm for the left jugular system before it is passed centrally and secured to theskin. Placement at the top of the right atrium is confirmed immediately by chest roentgenogram. Discussion and use of this anatomically sound approach to central venous tunneled access will facilitate its widespread clinical adoption. Moreover, its use will preserve precious arm veins in patients at risk for dialysis and reduce the frequency of catheter related infection in patients undergoing long term intravenous therapy.

BEST Irwin M., Abbas CHAMSUDDIN*, Brandon KANG*, Louis G. MARTIN*, Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA. Case study of an infrequent cause of right lower lobe consolidation.

We present the case of a 20-year-old man who presented with recurrent pneumonia and right lower lobe consolidation on chest film. Computed tomography with contrast enhancement demonstrated an extensive right lower lobe intrapulmonary sequestration with consolidation and aberrant systemic supply to the right lower lobe. Preoperative thoracic and abdominal angiogram revealed a single supra-celiac thoracic arterial supply. In conclusion, pulmonary sequestration is an infrequent congenital thoracic developmental abnormality that accounts for 0.1 to 6 % of all thoracic congenital abnormalities. Pulmonary sequestration is a cystic mass of primitive non-functional lung tissue arising from an accessory bud of the primitive foregut. It migrates caudally with the normally developing lung and is often supplied by a systemic blood supply from below the diaphragm. Multiple arterial sources might be present from the subclavian artery to the abdominal aortal. Left intrapulmonary sequestration is more prevalent than on the right. Surgical excision remains the treatment of choice. A thorough evaluation of the blood supply preoperatively might help to simply the surgical approach.

BEST, Irwin M. and Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA. Hemoperitoneum and prolonged hematuria after retrograde treatment of a proximal ureto-pelvic junction stenosis.

A 58 year old man was transferred to Emory Healthcare for treatment of prolonged and intermittent hematuria two months after a left retrograde transurethral cystoscopy and laser treatment of a proximal ureteropelvic obstruction and placement of a double-J ureteral stent. He experienced significant hematuria on the first postoperative day. A contrast enhanced CT scan of the abdomen and pelvis was obtained. This showed massive hemoperitoneum, and hematuria without a point source for the bleeding. He experienced several episodes of hematuria and two additional CT scans of the abdomen were obtained before his transfer for recurrent hematuria. An additional CT was obtained on admission, without identification of the point of bleeding in the GU tract or abdominal cavity. At Emory Healthcare he was taken to the operating room for a retrograde uretero-cystoscopy. Fresh blood and clots were encountered in

the bladder and ureter but not the point of bleeding. He was referred for emergent angiography to localize and embolize the point of bleeding. A left renal angiogram was performed. No bleeding was observed from the left renal artery or its branches. The catheter was then exchanged for a pigtail catheter and aortography was performed. The source of hematuria and hemoperitoneum were readily identified and treated by interventional techniques. Within six hours his urine was totally clear. The unique relationship between the ureter, peritoneum and the genitourinary vasculature helps us to understand this clinical presentation and to consider more dynamic imaging modalities earlier in the evaluation process.

BEST, Irwin M. and Louis G. MARTIN*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA. Hypoxemia and filling defect on pulmonary angiogram several days after a long road trip.

A 67 year old man presented to the hospital with an acute onset of shortness of breath after a long interstate ride. Chest Computed tomography demonstrated a saddle embolus and patient was referred for pulmonary artery angiogram and thrombolytic therapy. Left and right pulmonary artery angiograms were performed. A large filling defect was noted in the pulmonary outflow tract extending into both left and right mail pulmonary arteries. However, significant sparing of the pulmonary branches was noted. Lytic therapy was withheld pending further evaluation. An 80 cm 7 French sheath was passed from the right femoral vein to the pulmonary artery and a piece of the filling defect was retrieved with an endocardial biopsy forceps and submitted to clinical pathology. Histology revealed a sarcomatous tissue. Lytic therapy was not administered and patient was referred for oncologic management. Advanced catheter skills and a familiarity with imaging might prove to be highly desirable skills in the evaluation and management of patients with difficult clinical problems.

BEST, Irwin M., Brandon KANG*, Abbas CHAMSUDDIN*, and Curtis LEWIS. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA. Percutaneous recovery of an embolized patent foramen ovale closure device.

A 42-year-old-man with a documented history of multiple strokes and a patent foramen ovale was referred to the vascular and interventional suite after the Amplatzer device used in closure of

his patent foramen ovale became dislodged from the right atrial septum. It was located at the aortic bifurcation during fluoroscopy of the abdomen. Because of the pliable nature of the Amplatzer device, a Bard Recovery filter cone was chosen as the capture device. Percutaneous access was obtained to the right common femoral artery and a five French diagnostic catheter was placed above the Amplatzer device. An arteriogram was performed demonstrating patency or the distal aorta and iliac arteries bilaterally. A 10 French dilator and introducer sheath were passed over a stiff wire. The filter retrieval cone was then passed to the aortic bifurcation and advanced up the infrarenal aorta to avoid grasping the aortic flow divider. The filter cone was closed around the inferior edge of the Amplatzer device. The Filter Cone and Amplatzer device were enclosed in the 10 F sheathe. The Filter cone along with the ensnared Amplatzer device were withdrawn through the sheath and removed. Completion arteriogram was unremarkable. The femoral sheath was removed and Hemostasis was obtained at the right groin with manual compression. The patient was maintained on intravenous heparin and coumadin pending definitive repair. Patent foramen ovale is estimated to be present in 25% of the adult population. However, most are asymptomatic. Transvenous Amplatzer device closure has greatly simplified the management of patients with symptomatic patent foramen ovale. However, new treatments bring new challenges that require experience and a little imagination to solve. The Recovery cone is designed for inferior vena cava filter removal. This has been the first known use of the filter Recovery Cone for an embolized Amplatzer patent foramen ovale closure device.

BEST, Irwin M., Brandon KANG*. Emory University School of Medicine, Division of Interventional Radiology, Atlanta, GA.
Venous anomalies complicating inferior venacaval filter placement for recurrent pulmonary embolism.

We present the case of an 83 year-old-man who presented with recurrent pulmonary embolism while on coumadin therapy with an International Normalize Ratio of 2.4. His risk factors for deep venous thrombosis were advanced age, inactivity, and metastatic prostate cancer. Informed consent was obtained and he was brought to the angiography suite for a vena cava filter. Both femoral triangles were prepped and the right femoral vein was accessed using ultrasound guidance and micro-puncture

technique. A five French pigtail catheter was placed at the 5th lumbar vertebra and a venogram was obtained in the AP projection. The left iliac vein was not seen and the inferior vena cava appeared to be small. The pigtail catheter was advanced to the 3rd lumbar level and the contrast injection repeated. Contrast did not reflux into the left iliac vein. The left femoral vein was accessed with a short five French sheath and contrast was simultaneously injected via the left and right femoral catheters as illustrated. Duplication of the IVC was confirmed. Both right and left renal veins joined the respective duplicated inferior vena cavae. An IVC filter was passed above the suprarenal cavae and deployed below the right hepatic vein. Follow-up imaging showed good axial alignment and continued patency of the cava. Duplication of the inferior vena cava appears to be not only associated with a higher rate of deep venous thrombosis, but also might significant complicate inferior vena cava filter placement or result in failure of effective prophylaxis if the duplication is not uncovered at the time of treatment.

BIBLEKAJ* Robert R.[1], Andreas H. WEIGLEIN[1] and Lumnjie KQIKU*[2], [1]Institute of Anatomy, and [2]Dept. of Conservative Dentistry, Dental Clinic, Medical University Graz, Austria.
Bleeding sources during sinus floor elevation surgery.
INTRODUCTION: The reduced maxillary vascularization in the elderly may cause problems during alveolar ridge augmentation by the so called sinus floor elevation technique (SFES). Thus, one must strictly avoid additional damage to the maxillary blood supply. MATERIAL & METHODS: We studied the blood supply of the maxilla in 28 specimens (18 edentulous, 10 dentate) with arterial injection. RESULTS & DISCUSSION: The lateral wall of the maxillary sinus – is crossed by two anastomoses between the posterior superior alveolar artery (PSAA) and the infraorbital artery (IOA) The PSAA divides into a gingival (epiperiosteal) and dental (endosteal) branch. The gingival branch anastomoses with the terminal extraosseus branch of the IOA. The mean distance from the alveolar margin varied from tooth to tooth (10,1 -18.9 mm) respectively from region to region in the edentulous. The dental branch of the PSAA anastomoses with the endosteal branch of the IOA. The mean distance from alveolar margin was slightly higher than in the extraosseus anastomosis. The deepest point of the gingival anastomosis was 2.9 mm at level 7; and that of the endosteal anastomosis 4.6 mm at level 7. Based on these results, these arteries can be preserved in order not to diminish

the anyway reduced vascularization in patients receiving dental implants and bleeding during SFES can be avoided.

BLITZ*, Neal M. and David J. ELIOT, Department of Orthopedics and Foot & Ankle Surgery, Kaiser North Bay Consortium Residency Program, Kaiser Permanente Medical Centers, Santa Rosa, CA and Department of Anatomy, Touro University California, Vallejo, CA. Anatomical aspects of the gastrocnemius aponeurosis and its muscular bound portion – a cadaveric study.
Gastrocnemius recession surgery is performed to weaken the gastrocnemius muscle's plantarflexory action on the foot. Recent literature demonstrates that surgeons are targeting the anterior muscular-bound aponeurosis as an anatomical location for this lengthening. The area that is available to divide the aponeurosis ("transection zone") is inferior to the region where the aponeurosis is formed by the separate tendons of the medial and lateral heads of gastrocnemius and superior to the non-muscular-bound aponeurosis. The dimensions of the transection zone have not been studied previously. The mean proximal-to-distal length of the transection zone was 50 mm (range 7 mm – 100 mm). Its mean width was 88 mm (48 mm – 119 mm). The mean lengths of the medial and lateral heads that were inferior to the transection zone were 40 mm and 22 mm respectively. The zone is often long enough for surgeons to make the transection within the zone; a more distal incision will free a greater amount of muscle from its plantarflexory action. An oblique incision that is more distal medially may be appropriate if the transection zone is short, if the transection is far distal in the transection zone, and/or the medial head extends far distal to the lateral head.

BRUECKNER, Jennifer K., Douglas GOULD, Geoffrey GUTTMANN, Brian R MACPHERSON, Bruce MALEY, Don M. GASH*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY and The Ohio State University College of Medicine, Columbus, OH. Recruiting the next generation of educators through creation of a graduate certificate in anatomical sciences instruction.
The paucity of faculty qualified to teach anatomy in health professional programs is well documented in the recent literature. The University of Kentucky Educational Research Group developed an incentive in the form of a Graduate Certificate in Anatomical Sciences Instruction to provide a coherent, integrated approach to helping graduate students,

postdoctoral scholars, residents, faculty and staff to develop the skills needed in order to effectively teach anatomy. This 12 credit hour Certificate, including a required 3 credit hour supervised practicum experience, provides basic competency in graduate-level anatomical sciences instruction and provides participants with documentation of their abilities. The Certificate is accessible to participants from a wide range of disciplines and backgrounds and provides practical, hands on anatomy coursework and instructional mentoring. The Certificate is intended to improve the job placement for our graduates, to provide recognition for graduate student professional development in teaching-related efforts, as well as additional resources and avenues for teaching assistant development.

BUNTON, Timothy J*, Craig W GOODMURPHY, and Stephanie FREUND*. Department of Pathology and Anatomy, Eastern Virginia Medical School, Norfolk, VA. The incidence and relationship between the presence of palmaris longus and fibularis tertius.

Palmaris longus and fibularis tertius are two muscles within the human body that enjoy variable expression in the population. Palmaris longus is thought to be devolving and fibularis tertius evolving. Although the prevalence of these muscles has been studied individually, it has yet to be determined whether their presence or absence are linked. In the course of our study we dissected 49 human cadavers and searched for a correlation between the absences of palmaris longus and fibularis tertius. The palmaris longus muscle was found to be missing in 18% of the total arms studied. Fibularis tertius was missing in 18% of the total legs studied. These results are similar to previous studies by other investigators. Of the 49 bodies, 18 were missing one or both of the muscles of interest and were used to look for correlations between the absences of the two muscles. Of the bodies missing palmaris longus or fibularis tertius either bilaterally or unilaterally, 20% were also missing the other muscle. These are similar to incidences found in our general study population (18%/18%), and no statistically significant correlation was found ($p=0.74$), indicating no relationship between the presence or absence of these muscles.

BUNTON, Timothy J*, Craig W GOODMURPHY, and Stephanie FREUND*. Department of Pathology and Anatomy, Eastern Virginia Medical School, Norfolk, VA. The incidence and

relationship between the presence of palmaris longus and fibularis tertius.

Palmaris longus and fibularis tertius are two muscles within the human body that enjoy variable expression in the population. Palmaris longus is thought to be devolving and fibularis tertius evolving. Although the prevalence of these muscles has been studied individually, it has yet to be determined whether their presence or absence are linked. In the course of our study we dissected 45 human cadavers and searched for a correlation between the absences of palmaris longus and fibularis tertius. The palmaris longus muscle was found to be missing in 16% of the total arms studied. Fibularis tertius was missing in 18% of the total legs studied. These results are similar to previous studies by other investigators. Of the 45 bodies, 16 were missing one or both of the muscles of interest and were used to look for correlations between the absences of the two muscles. Of the bodies missing palmaris longus or fibularis tertius either bilaterally or unilaterally, 22% were also missing the other muscle. Although these are higher incidences of absence than in our general study population (16%/18%), the correlation is statistically insignificant (p=1), indicating no relationship between the presence or absence of these muscles.

CANTELMI, David, Tom A. SCHWEIZER*, Anne M. AGUR, and Michael D. CUSIMANO*. Division of Neurosurgery, Department of Surgery, St. Michael's Hospital, University of Toronto, Toronto, Ontario, Canada. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada. The contribution of the cerebellum in the neurocognitive sequelae of posterior fossa tumor treatment.

Introduction: Neurocognitive impairments often occur following treatment of posterior fossa tumors. These impairments have been attributed to supratentorial damage resulting from radiotherapy, despite the fact that non-irradiated patients also present with similar impairments. Other research has suggested that the cerebellum may play a role in cognition. The purpose of this study was to conduct a literature review of the cognitive role of the cerebellum, and link these findings to neurocognitive deficits of posterior fossa tumor patients. Methods: A comprehensive literature review was conducted using Medline, PsychInfo, and Web of Science. All relevant studies from 1979 to December 2007 were included. Results: The cognitive functions impaired in patients with posterior fossa

tumors are consistent with those that have been related to the cerebellum. Treatments that reduce radiation dose to supratentorial brain areas have only resulted in small improvements in neurocognitive functions, because these treatments do not reduce damage to the cerebellum. Conclusion: Neurocognitive sequelae in posterior fossa tumor patients are determined by a combination of factors including extent of cerebellar damage and the use of radiotherapy. Future research needs to account for all of these factors to ensure improved outcome for posterior fossa tumor patients.

CHUNG[1], In-Hyuk, Kyu-Seok LEE[2], Chang-Seok OH[3], and Seung Min KIM[4]. [1]Department of Anatomy, Yonsei University College of Medicine, [2]Department of Anatomy, Kwandong University College of Medicine, [3]Department of Anatomy, Samsung Biomedical Research Institute, Sungkyunkwan University School of Medicine, [4]Department of Neurology, Yonsei University College of Medicine. Intramuscular distribution of the median and ulnar nerves of the flexor digitorum profundus muscle.

The flexor digitorum profundus (FDP) is innervated by median and ulnar nerves, and a finger can be dually innervated by both nerves. In the paralysis of the median or ulnar nerve, the symptoms of the FDP are correlated with the patterns of the nerve innervation of this muscle. Hence, this study was conducted to clarify the anatomic variations of the nerve innervation of FDP. The FDP was removed from 80 adult cadavers along with the innervating nerves, and dissected under a surgical microscope. The patterns of the nerve innervation were classified into six types. In the most common type (46.3%), the median nerve innervated the 2nd-4th fingers, and the ulnar nerve innervated the 3rd-5th fingers. The results of this study showed that the FDP of the 2nd finger was innervated only by the median nerve in all cases except one, the FDP of the 5th finger was innervated only by the ulnar nerve in 68.8%, and the FDP of the 3rd finger was innervated only by the median nerve in 15.0%. There was not a case in which the median and ulnar nerves innervated the lateral and medial halves of the FDPs of the 2nd – 5th fingers, respectively, without overlapping. (Sponsored by Grant No. E00002 from Korea Research Foundation)

CHUNG* Min Suk, Dong Sun SHIN*, Jun Won LEE*, and Jin Seo PARK* (sponsored by Chang-Seok Oh). Department of Anatomy, Ajou University School of Medicine, Republic of Korea, and Department of Anatomy, Dongguk University College of Medicine, Republic of Korea. Surface models of the gastrointestinal tract and neighboring structures made from the Visible Korean Human.

Surface models of the gastrointestinal (GI) tract and neighboring abdominal structures can be opened and rotated in a real time, which is helpful to understand anatomy of digestive system. However, we could not find objective surface models made from the serially sectioned images. In this research to make the surface models, whole length of the GI tract was outlined in the serially sectioned images of the Visible Korean Human; the outlining was supported by the enhanced technique of filtering and interpolation. Subsequently, highly curved GI tract was divided into several parts, and each part was surface reconstructed and united with one another to acquire a surface model of GI tract. Likewise, about 100 surface models of other neighboring structures were prepared. The surface models are expected to encourage other investigators to develop medical training systems such as virtual abdominal operation. Additionally, the improved technique of outlining and surface reconstruction is expected to inspire other investigators to easily make their own surface models from other serial images.

CLEARY, Leonard J., Edie SHULMAN* and Joanne OAKES*. Integration of Gross Anatomy and Introduction to Clinical Medicine, Depts. of Neurobiology and Anatomy, Internal Medicine and Emergency Medicine, The University of Texas Medical School Houston, Houston, TX. Integration of gross anatomy and introduction to clinical medicine.

In the fall of 2005, the Introduction to Clinical Medicine (ICM) course was reorganized to coordinate physical exam sessions with the Gross Anatomy (GA) course. For example, when students were dissecting the thorax, they practiced obtaining vital signs and performing the cardiopulmonary exam on standardized patients. Student response was mixed, however, because the schedule required that they be pulled out of Anatomy lab for the ICM sessions. In the fall of 2006, scheduling conflicts were remedied by adopting a rotational dissection system for the Anatomy lab. Eight students were assigned to each tank, but only four dissected in a scheduled lab session. As

a result, the number of standardized patient exercises was increased from three to five. Some additional modifications were implemented in the fall of 2007. An important outcome is that the ICM course now has a greater presence in the curriculum, and students appear to be more enthusiastic about the course than in the past. Students favor the revised GA schedule because it provides more time for study while still providing the benefits of the dissection experience. At the same time, student performance in GA has improved.

CLEMENT Hans[1]*, Stephan GRECHENIG[1]*, Wolfgang PICHLER[1]*, Norbert P. TESCH[2]*, Andreas H. WEIGLEIN[2]. [1]Department of Traumatology and [2]Institute of Anatomy, Medical University Graz, Austria. Frequency of third extensor compartment drill bit perforation in case of volar plating of radius fractures.

The objective of this study was to explore how frequently the third extensor compartment was penetrated by drilling distal screw holes when doing volar plating of distal radius fractures. Four different plates used for volar plating of radius fractures were tested on altogether one hundred and sixty cadaver forearms. All distal holes were drilled and after the drilling, the exit holes were analyzed on the dorsal radius. The overall penetration risk of the third extensor compartment regarding all four implants was 43 percent. Differences could be observed: 3.5 LCP 4-hole locking T-plate: 20 percent, 3.5-LCP 3-hole locking plate: 42.5 percent, 2.4 volar LCP standard plate and the 2.4 volar LCP buttress plate: 55 percent. In conclusion. the surgeon should be aware of a considerable risk of penetrating the third extensor compartment during volar plating of radius fractures. The extensor pollicis longus tendon may be harmed by drilling or by a prominent screw. This may increase the possibility of a tendon rupture. Injuries to the extensor pollicis longus tendon may be avoided by not perforating the dorsal corticalis, and downsizing the screws.

COLLINS, James D., Ernestina H. SAXTON*, Samuel S. AHN*, Hugh GELABERT*, and Alfred CARNES*. Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA, Los Angeles, CA. Thymus gland enhances costoclavicular compression of the vascular supply to the brachial plexus in patients with thoracic outlet syndrome (TOS): MRI/MRA AND MRV.

The bilobed thymus gland, part of the immune system, develops bilaterally from the third and sometimes from the fourth brachial oropharyngeal pouch. The gland has no afferent lymphatics and functions as an organ of surveillance and defense persisting until puberty when it involutes and contain large fat cells. Bilateral MRI of the of the brachial plexus in patients with thoracic outlet syndrome displays the thymus as an intermediate to gray proton density within the anterior mediastinum posterior to the manubrium extending superiorly into the anterior neck. Unsuspected residual gray proton dense thymus tissue marginates the soft tissues between the common carotid sheaths. Two selected patients were imaged on the 1.5 Tesla (GE Signa LX) with abduction external rotation, 4.0mm thickness and 512 x 256 matrix size: a 17 yr-old female with residual thymus tissue and a 13 yr-old male with an enlarged thymus, which extended superiorly into the neck and posterior to the manubrium, crimping the great vessels and displacing the aorta. In both patients the thymus enhanced costoclavicular compression of the draining veins within the neck, triggering complaints of difficulty breathing and sleeping; visual spots on raising arms overhead; hip pain, and tingling and numbness of fingers and toes.

CORK, R. John, and Raymond F. GASSER. Department of Cell Biology & Anatomy, LSU Health Sciences Center, LA. The Virtual Human Embryo: a progress report.

The Virtual Human Embryo (VHE) project is making representative examples of sectioned human embryos at each of the 23 Carnegie stages available to researchers, educators and students. We use the best specimens from the historic Carnegie Collection and provide labeled images of their serial sections on disks and on the web (http://virtualhumanembryo.lsuhsc.edu). The section images are presented at multiple magnifications with measuring bars. In addition to the image databases we also provide digital 3D reconstructions of the embryos and animations of the embryos' morphology. The VHE project has two parts; the DREM (Digitally Reproduced Embryonic Morphology) component, funded by the National Institute of Child Health and Development, produces the databases of labeled, aligned serial sections together with the software to display them, and HEIRLOOM (Human Embryo Imaging and Reconstruction, Library of Online Media) which is responsible for the online versions of the databases, 3D-reconstructions of the systems

and animations and is funded by the National Library of Medicine. Since 2002 we have produced databases for 21 embryos at stages 1 -16 and stage 23. We plan to complete the remaining six stages in the next few years. (Supported by grants HD37811 from NICHD and LM 007591 from NLM)

CROSSINGHAM, Jodi L., Jodie JENKINSON, Nicholas WOOLRIDGE, Steven GALLINGER, Carol-Anne MOULTON, and Gordon TAIT. Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto, Toronto, ON and Department of Surgery, Division of General Surgery, Toronto General Hospital, Toronto, ON. Interpreting three-dimensional structures from two-dimensional images: a web-based interactive 3D model of the liver to enhance surgical residents spatial understanding of structural inter-relationships.
Learning intrahepatic anatomy and developing an understanding of the relationships that exist between the key structures is a difficult process that is required of surgical residents. They need to mentally reconstruct 3D images from available CT scans and this may not be an effective way of understanding the liver. A web-based interactive 3D model of the liver was created to facilitate understanding of the complex spatial anatomy of the liver and to help visualize this anatomy in 3D when viewing CT scans. By importing CT scans into Osirix, 3D surface renderings of the liver were obtained. Using these images as reference, anatomical structures were modeled in Cinema4D. This included the liver surface and the intrahepatic structures; portal veins, hepatic veins, hepatic arteries and the biliary system. Users can view common liver anatomy and common variations online in interactive 3D rotational model to observe the complex interactions of the vascular and biliary systems. Thismodel will be useful for surgical trainees learn the difficult and complicated intrahepatic anatomy and will optimize learning opportunities for all trainees requiring knowledge of liver structures.

DESY, Nicholas M., Kimberly K. AMRAMI*, Gauri LUTHRA*, Meredith L. ANDERSON*, Robert J. SPINNER. Departments of Neurosurgery, Radiology, Orthopedics and Anatomy, Mayo Clinic, Rochester, MN. The clock face guide to fibular intraneural ganglion cysts: critical “times” and sites for accurate diagnosis.
The consistent anatomy of the common fibular nerve (CFN) and its branches can be exploited to identify constant MRI patterns in fibular intraneural ganglion cysts. MRIs of patients with fibular

intraneural and extraneural ganglion cysts were compared to those with normal knees (n = 25 in each group). Using conventional axial images (all interpreted as left-sided), the position of the CFN and intraneural or extraneural cyst was determined relative to standard bony landmarks with a symbolic clock face. In all patients the CFN could be seen between 4 and 5 o'clock at the mid-portion of the fibular head. In patients with intraneural cysts, a single axial image at this level could reliably demonstrate cyst within both the CFN (4 - 5 o'clock) and the articular branch-superior tibiofibular joint connection (11 - 12 o'clock); cyst within the transverse limb of the articular branch was seen at the fibular neck (12 - 2 o'clock). Extraneural cysts arose from more superior joint connections; their epicenters varied around the clock face without a consistent pattern. There was no significant difference between the visual and template assessment of clock face positions. This technique can provide rapid and reproducible information for diagnosis, pathogenesis and treatment planning.

DETTON*, Alan J. and Robert M. DEPHILIP. Division of Anatomy, College of Medicine, The Ohio State University, Columbus, OH. Simultaneous presentation of anatomy and radiology using interactive object movies.

One of the challenges for the novice learner in identifying structures in conventional radiographs is the overlap of anatomical features in standard projections. The purpose of this project is to create interactive learning tools allowing side-by-side comparison of photographs of anatomical specimens and corresponding radiographs. The lumbar spine and the shoulder joint were selected to demonstrate the technique, as both have overlapping structures often making interpretation difficult. The interactive learning tool consists of two sets of sequential images saved as QuickTime VR object movies using commercially available software. The sequential images were obtained by placing an anatomical specimen on a moveable turntable and then capturing images at fixed intervals of rotation using first, a digital camera, and second, a portable fluoroscope. The object movies were linked to allow simultaneous control of movement by the user as part of a lecture presentation or as a stand-alone study aid. This approach can be extended to soft-tissue structures whose radiographic anatomy is enhanced with contrast medium. These interactive learning tools should

facilitate student understanding of complex radiographic anatomy.

EDWARDS*, Isaac, Brion BENNINGER, Yi-Li LIN* and Marisa REICHMUTH*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Pediatric Dentistry, Oregon Health and Science University, Portland, OR. Five Most Common Genetic Diseases Affecting the Maxilla and Mandible in the United States.

The objective of this study was to identify and define the five most common genetic diseases that cause defects in the mandibular and maxillary arches in the United States. A common result of genetic diseases that involve the head and neck is mandible and maxilla anomalies. When oral morphology and health is compromised, general health is affected. Oral healthcare advancements highlight the importance of treating maxilla and mandibular genetic defects in their early stages. Identifying the most common genetic diseases affecting the mandible and maxilla and understanding the clinical anatomy of each can serve as an aid for oral clinicians in recommending preventative treatment measures. We analyzed clinical anatomy and specialty texts and journal articles to determine the 5 most common genetic diseases affecting oral health. Results revealed that there was no list that clearly identified the most common genetic diseases. We identified and listed the five most common genetic diseases based on prevalence that cause mandibular and maxillary defects: Downs Syndrome, *Cleft lip/palate, Ectodermal Dysplasia, Edwards Syndrome, Marfan's Syndrome, and Dentinogeneses Imperfecta. This study suggests that these diseases (based on prevalence) should be included in texts because of their clinical relevance to oral health and dentition.

ELIOT, David J., and Bruce SILVERMAN*, Basic Science Department Touro University California, Vallejo, CA. A final farewell.

Cadaver based anatomy often engenders fear and emotional anxiety for medical students. Each medical school deals with these issues in unique ways. At Touro University California we have evolved a process that began with a simple "moment of silence" on the first and last days of dissection. The students' Integrative Medicine club has added a gathering of first and

second year students before the first dissection. The university's Orthodox Rabbi and a local Zen Buddhist minister join the students for this event. Poetry reading and informal sharing of experiences about death and dying are followed by the laying of a flower on each cadaver. The "moment of silence" and final thank you on the last laboratory day completes the experience for most students. At Touro we have the unique experience, for those who wish, to have one more chance to say goodbye. The cremains of cadavers the students dissected are scattered at sea beyond the Golden Gate Bridge. Students have the privilege to not only go out on the boat but also to scatter the cremains of their cadaver. This process helps provide a "closure" for the students and faculty who attend.

FARHAN, Thaer M., Lecturer of Human Anatomy, Department of Human Anatomy, Al Nahrain University, Baghdad, Iraq. Anomalous origin of left testicular artery from left accessory renal artery.

During dissection of a 50 year old male cadaver as preparation for medical student practical session in abdomen, left accessory renal artery was encountered and the left testicular artery was originated from its middle part instead of the usual origin from abdominal aorta. The left accessory renal artery was originated 5 mm from the main left renal artery and passes toward the lower pole of the kidney, in the middle distance in its way, the left testicular artery passes downward. Variation in the renal and gonadal vasculature has been known since early days of human autopsy. It has been reported that accessory renal artery founds in 26% of individual. The anomalous origin of testicular artery from accessory renal vessel has important clinical implications, since any surgical intervention with the kidney, during transplantation for example, may lead erroneously to injury of the anomalous testicular artery leading to atrophy of the male gonad.

FARHAN, Thaer M., Lecturer of Human Anatomy, Department of Human Anatomy, Al Nahrain University, Baghdad, Iraq. The Conjoined Tendon-Does It Exist?

Background: The conjoined tendon is formed by the fusion between the lower margins of the transverse abdominis and the internal oblique muscles. This turns downwards between the transversalis fascia and the inguinal canal. The conjoined tendon is attached to the pubic crest. Thus, the conjoined tendon forms the strong posterior wall for the medial part of the inguinal canal.

The details of the normal anatomy of the conjoined tendon, as described in the textbooks, were infrequently found. Aim: To verify the controversy about the presence of conjoined tendon Patients and Methods: This study was performed on 17 embalmed cadavers in the laboratory and 27 surgical cases at the hospital. An anatomical observation was carried out on the anatomy of the inguinal region, particularly the posterior wall, and on the operative cases. Results: No conjoined tendon "conjoined aponeurosis"was observed in 42/44 (95.5%) and only in 2/44 (4.5%) of the cases where conjoined aponeurosis was noticed. Discussion: There was a controversy between the classical description of the posterior inguinal wall and what have been stated in this study due to technical difficulties of dissection or the presence of many structures in the inguinal region like rectus tendon, lateral extension of rectus sheath and ligament of Henle. Conclusion: The fusion between both internal oblique and transversus abdominis aponeuroses to form the classical conjoined tendon is a rare rather than what has been previously established.

FLEMING, James* and Jennifer BRUECKNER. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY. Philosophical viewpoint of the notion of cadaver as the student's first patient.

During their introduction to the gross anatomy laboratory experience, many professors encourage their students to consider the cadaver as their first patient. Some authors support the notion that the dissection experience naturally causes students to distance themselves emotionally from their patients; this abstract philosophically challenges that premise. The lack of similarity between cadaver and patient means that a student learns nothing about how to respect or disrespect a patient through dissection. A patient has a moral status not shared by the cadaver, while the student and patient share a moral status with the cadaver's donor. The cadaver is a gift of the donor to the student. Thus, a student will become desensitized from dissection, but cannot become detached from the cadaver. Desensitization is a good thing in dissection because it a recognition of inconsistent reasoning. From our argument, a student who is desensitized to a patient on the wards could not have adopted this perspective from her dissection experience. Empathy for a patient is the appropriate

manifestation of the same concern that leads students to be initially upset with the dissection experience.

FOGG, Quentin A. and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; Modbury Public Hospital, Adelaide, Australia; Queens Hospital, Burton, UK. Anatomical interactions within the wrist related to carpal movement patterns and surgical adaptation.

The structural and mechanical complexities of the wrist make investigation, understanding and treatment of this area particularly difficult. Despite intense scrutiny, the wrist is still poorly understood. Limitations of numerous studies reflect upon imprecise anatomical understanding. This study addressed the major anatomical concerns of wrist researchers. The study utilised data gathered from numerous sources, and combined these data with new quantitative data on the principle carpal bones and their ligamentous supports. The results suggest that the various typing methods for multiple modes of carpal function are compatible and anatomically linked. The primary source of clinically-relevant typing is radiologic description of the lunate. This was related to separate categorisation of scaphoid morphology, radial ligament patterns, triquetrohamate joint structure and various biomechanical models from independent sources. A series of functional wrist models are therefore proposed. These models are also applied directly to surgical maintenance of wrist function. This may applied to surgical procedures developed with sensitivity and adaptability towards anatomical typing of an individual wrist. The anatomical findings of this study are therefore applicable to the earliest stages of clinical interpretation and progress through to the completion of surgical management.

FOGG, Quentin A., Benjamin R. HESS*, and Neil ASHWOOD*.University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK. Distal biceps brachii tendon anatomy revisited from a surgical perspective.

The distal biceps brachii tendon is commonly suspect to traumatic injury. This study aimed to describe the morphology of the distal biceps brachii tendon in relation to the commonly used endobutton repair of tendon rupture. The results suggested that the distal tendon is a series of distinct bands of variable number. These bands are obscured surgically by the tendon sheath.

Upon opening this sheath, blunt dissection of the tendon released fibrous connections between the tendon bands. Adjacent bands were variably connected via small oblique bands. The tissue spaces and oblique connections were confirmed histologically. The separations between bands were continuous onto the radius. They were therefore considered as separate force-conducting units. This notion is of high relevance to endobutton repairs, as the suture anchors are typically only passed through the margins of the tendon. Where few connections exist between tendinous bands, this represents a potential weakness, as central bands are therefore free to be pulled proximally. This is of primary concern in the early rehabilitative stages of postoperative care. It may be suggested that sutures that cross the width of the tendon will eliminate the give of central bands, improving postoperative results, reducing revision numbers, and potentially reducing rehabilitation time.

FOGG, Quentin A., A. Jay FREEMAN and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK.
Radiographic circularity of the capitellum and its surgical implications.

The capitellum is infrequently fractured, yet repair of these injuries is complicated and sparingly reported. Reconstructive radiology and post-operative functional scores suggest a relationship between sphericity of the capitellum and smooth, stable function. Whilst function is able to be restored post-operatively, the degree of functionality decreases with increasingly complex fractures. This study aims to investigate the relationship between radiographic capitellar shape (2D circularity), and range of motion. A cohort of 25 patients with no skeletal trauma consented to inclusion in the study. Circularity of the capitellum was measured on digital AP and lateral radiographs using Image J. Manual and automatic calculations were used to confirm accuracy. Decreased circularity was associated with slightly increased range of flexion and pronation, whilst the range of supination decreased noticeably. These data suggest that capitellar shape does have a close association with elbow function, and that restoration of a suitably spherical capitellum should be a clear goal of reconstructive surgery. These data suggest that post-operative functional scores may improve with more purposeful restoration of the shape of the capitellum. Further investigation with increased sample size,

patient sub-grouping and digital modelling of the skeletal elements may increase understanding of this relationship.

GEST, Thomas R., and Kevin O'BRYAN, Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI. A web-based cadaver medical histories database used for collection of anatomical variation data.
For the past six years, we have used a web-based database to display anonymized medical histories of the donors used in the dissection labs of the medical gross anatomy course. Last year, we modified this database to enable the harvesting of data on common anatomical variations within our donor population. For each laboratory exercise, students are presented with a short checklist of common anatomical variations specific to the region dissected. Students can record any variation found in their dissection by either selecting the checkbox for a common variation or entering a textual description of a unique variation in the "Dissection Notes" portion of the database. In addition to collecting useful data on anatomical variation, the recording of variations by students should help to encourage their skills of observation and recording and their recognition of the variability of human form.

GEST, Thomas R., and Sabine HILDEBRANDT, Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI. The pattern of the thoracic splanchnic nerves as they pass through the diaphragm.
The manner in which the thoracic splanchnic nerves pierce the diaphragmatic crura to enter the abdomen was investigated in a series of dissections. Many commonly used illustrations depict the passage of the thoracic splanchnic nerves through the diaphragm as three nerves penetrating the crura in three separate locations along a rough superoinferior line. Dissections of 24 donors revealed that the most common pattern of diaphragmatic passage of these three nerves is through a single location in each crus. From this crural passageway, the three nerves then diverge to reach their targets, with the greater thoracic splanchnic nerve bending anteriorly at nearly ninety degrees to enter the posterolateral edge of the celiac ganglion.

GIELECKI, Jerzy, and Anna ZURADA. Departament of Anatomy, Medical University of Silesia, Poland. Clinical anatomy of the lusorian artery in adult, and fetuses.

An aberrrant right subclavian artery is known as the lusorian artery (LA). This is an congenital anomaly with an incidence of 0.5-2% of the general population. This variation is an abnormal aortic arch that cause an unusual anatomical structure (Lat. arteria lusoria means playful or impolite artery). Therefore, it should be analyzed to understand for anatomical, diagnostic and therapeutic problems. Previous studies had been predominantly focused on adult patients. However, the congenital nature of this anatomical anomaly requires not only adults are subject to be examine, but also fetuses. In this studies 3 fetal and 5 adults were examined according to their anatomical and morphmetrical relations to the LA. Diameter, length, and volume of LA was calculated by Digital-image analysis system DIAS-08. There has not been found an abnormal fetal vessel development of LA when it was compare with adult vessel. In all cases that was analyzed, LA encircles the mediastinal portion of the trachea and esophagus. Usually patients with this type of disorder develops symptom such as left supraclavicular pulsations, right upper extremity claudication, and dysphagia. This studies would help to understand the treatment method that involves in surgical intervention of this disorder.

GIELECKI, Jerzy, and Anna ZURADA. Departament of Anatomy, Medical University of Silesia, Poland. Interactive 3D PDF human anatomy medical software for education.

All anatomical PDF were created as 2D atlas in the past, however, we are proposing the new 3D files to help student understand anatomy in a better way. We have meticulously created interactive 3D geometries from actual bones and we are in the last stages of achieving complete high precision of these spatial description of all vertebrae. This interactive 3D system differs from all other 3Ds that have been used in the past is that the vertebrae pictures set can be used by anybody who owns a computer and free Adobe Acrobat Version 7+. Also, this program combined fully interactive 3D anatomical model with a helpful text description of that particular structure. Moreover, the use of this program can save money, time, and protect forests. The resulting of interactive 3D PDF can be used to render as many anatomical objects of any parts, viewed from outside and in, and used for researches, and professors - however the main target is to educate medical students. 3D PDF is easier to understand anatomy and the functions of human body by having it on your

computer, being able to rotate it, make models transparent, zoom in and out, and change background.

GOGALNICEANU Petrut*, Jason PALMAN*, Hardi MADANI*, Yezen SHEENA* and Wendy BIRCH, *London Surgical Anatomy Group*, London, UK. Undergraduate anatomy teaching – a consumer-led market?

Background: UK undergraduate medical education has experienced a reduction in anatomy teaching. This was justified by student dissatisfaction with modern curricular load and dislike for teaching methods such as dissection. Consequently, the time and resources dedicated to anatomy teaching have been reduced and dissection / prosection are no longer practiced in some schools. Aim: To survey students' satisfaction with their anatomy curriculum and various teaching methods. Methods: 174 medical students from a London medical school were randomly surveyed (March 2007) using a standardised questionnaire. Results: 100% of students thought anatomy is important to medical training. 98% disapproved of removing dissection from the curriculum and 79% felt more curricular time should be devoted to anatomy teaching. Dissection was believed to be the most useful method of learning anatomy (mean rank 1.5 of 6; SD 1.027). 40% thought the amount of anatomical knowledge taught was insufficient. 91% wanted to continue being taught clinical anatomy by newly qualified doctors. Conclusion: The survey suggests that medical students highly value anatomy teaching. Current curricula are failing to reflect this by providing the necessary teaching time and resources needed. Dissection remains a useful and popular method of teaching anatomy, despite recent academic isolation. These findings should inform those involved in curricular design and reform.

GOULD, Douglas J., Sean M. HAEZEBROUCK*, Barney P. FLEMING* and Jo FLEMING* The Ohio State University College of Medicine, Columbus, OH. Neural Groove, Columbus, OH and ORCCA Technology, Seattle, WA. Anatomy of the CNS – a phase 2 demonstration: the sensory system.

This project involves the development of a program to provide interactive instruction regarding the central nervous system (CNS) using a programmed learning format, which uses interactive multimedia to cover the structural and functional interrelationships of the CNS emphasizing nervous system

interconnectivity. Users can follow set lesson plans as if an instructor was leading them through a particular topic area by following a programmed linearly-arranged set of modules. After each block of material, users are prompted to answer questions on content they have just worked through, much as an instructor might reinforce concepts prior to moving on the to the next topic. The program provides extensive self-testing for the competencies to be acquired through interaction with the software. Phase I student and faculty surveys were used to assess all aspects of the demonstration module in 2004. Survey feedback has caused a rethinking of presentation methods, content and some navigational aspects of the original program. The final result of the project will be an intuitively navigated, self-contained, easily distributable program that can be used as a premiere ancillary or as a substitute for ever-decreasing faculty interaction in the neuroscience laboratory or lecture hall. (Supported by N.I.H. grant #2 R44 NS040588-02).

GOULD, Douglas J., Anthony HARTSFELD*, James BALLARD*, James NORTON*, Laurie DAVIS*, Lesley GILMER* and Jennifer BRUECKNER. The Ohio State University College of Medicine, Columbus, OH. and the University of Kentucky College of Medicine, Lexington, KY. The effectiveness of the anatomy component of a summer program for disadvantaged kids desiring a career in the health professions.

The goal of the current project is to evaluate the efficacy of anatomical instruction for the Health Career Opportunity Program (HCOP) at the University of Kentucky. HCOP incorporated development of activities to build diversity in health professions, addresses identified risk factors for school failure, exploring ways to narrow achievement gaps and assure students in the program remain in the educational pipeline. Students in the program may come from ethnically, geographically, and/or economically underserved backgrounds. In 2006-2007, 40 high school students from Eastern Kentucky counties participated in the program. They were exposed to a broad array of individuals and programs at the University of Kentucky, including: medicine, dentistry and allied health. The Department of Anatomy and Neurobiology was invited to give a series of survey-level anatomy modules over a four week period, which were to include cardiovascular, lymphatic, nervous and respiratory systems. The sessions included lectures and involved the use of human anatomical specimens. Post-program assessment revealed a

one and a half times increase in average performance on the post-test. A longitudinal investigation of the programs effectiveness is ongoing.

GRANGER, Noelle A. The University of North Carolina, School of Medicine, Department of Cell and Developmental Biology, Chapel Hill, NC. Leonardo da Vinci, anatomist.
Leonardo da Vinci is one of the most famous Renaissance artists - known for his exquisite paintings of women, the enigmatic *Last Supper*, and his engineering marvels. He was also one of the foremost anatomists of his time, creating sketches of bones, muscles and organ systems that were often the first ever made. This presentation will set him in context, in terms of the study of anatomy before and during the Renaissance, in comparison to other artists of the time, and most especially in regard to his anatomical discoveries and unique methods of artistic presentation.

GREENE, Sarah J., and Todd M. HOAGLAND. Department of Anatomy and Neurobiology, Boston University School of Medicine, MA. Teaching the neurological exam strengthens medical student knowledge of the cranial nerves.
The integration of clinical correlations into Medical Gross Anatomy provides students the opportunity to actively apply their knowledge. Clinical correlations are routinely incorporated our Gross Anatomy course. In Fall 2007, optional small groups sessions covering the cranial nerve (CN) portion of the neurological exam were incorporated into this course. A maximum of 12 students attended each two-hour session. A demonstration of the CN exam was followed by a brief CN review as a segue into methods for testing each nerve. Opportunities for students to test one another were provided and overseen by the instructor. A series of clinical correlations utilizing images, movies, and interactive animations were then presented, and students were challenged with localizing lesions most likely to result in specific clinical symptoms. Surveys were distributed to students who attended (n=26) after the conclusion of the course. Responses indicate sessions improved understanding of CN anatomy, function, and methods for localizing lesions. Preliminary analyses found these students performed significantly better than those who did not attend on one clinical exam question querying symptoms associated with a CN XII lesion ($p=0.01$). In the upcoming year, CN sessions will be

repeated with pre/post-tests to assess learning taking place during these sessions.

GUTTMANN, Geoffrey D., and Brian R. MACPHERSON, University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY. The assessment of study skills in gross anatomy for physician's assistant and physical therapy students.
The new generation of students entering university and health care professional schools has brought about terms such as iGeneration, which refers to their skills with the internet. However we as academics may be missing a key question, which is "What are the study skills of our students?" This paper discusses the study skill set of physician's assistant and physical therapy students at the University of Kentucky College of Health Sciences, where they take a dissection-based gross anatomy course. A survey was conducted during the last weeks of their course. The survey was based upon Approaches and Study Skills Inventory for Students (ASSIST), which was developed by NJ Entwistle in 2006. The authors modified the survey to reflect North American terminology. These students are required as part of the admission process to have volunteer or work experience related to their prospective professions and present first aid and CPR certifications prior to consideration for admission. We plan to present data showing the study skill set of physician's assistant and physical therapy students and how the study skill set may vary from other programs given the admissions prerequisites.

GUTTMANN, Geoffrey D., and Jennifer K. BRUECKNER, University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY. The assessment of study skills in the anatomical sciences for dental students.
Much has been written about the new generation of students entering university and health care professional schools. They have been called the iGeneration in reference to their skills with the internet. However we as academics may be missing a key question, which is, "What are the study skills of our students?" This paper discusses the study skill set of dental students in their 1st and 2nd years at the University of Kentucky College of Dentistry, where until recently they took two separate courses for gross anatomy and embryology. During the last weeks of their course, a survey was given to 1st year dental students taking a

combined course on gross anatomy and embryology and 2nd year students taking embryology. The survey was based upon Approaches and Study Skills Inventory for Students (ASSIST), which was developed by NJ Entwistle in 2006. The authors modified the survey to reflect North American terminology. We plan to present data showing the study skill set of 1st and 2nd year dental students, whether they change as they progress through their studies, and the possible causes for these changes.

HANSON*, Elizabeth, Nichole BOETTCHER*, Katharine BYRON*, Jeremiah EISENSCHENK*, and Arlen SEVERSON. University of Minnesota Medical School, Duluth, MN. Learning the ins and outs of the peripheral nervous system.
Although the lecture approach to educating students provides a means of disseminating subject material, it is a passive learning approach not particularly effective in engaging learners in critically comprehending information. In our Applied Anatomy course for first-year medical students, two student-centered peer learning sessions regarding the peripheral nervous system were conducted. Prior to each session, students were given a reading assignment, lecture handout, learning objectives, and a narrated PowerPoint. During the scheduled class period a question/answer period was followed by the students taking identical individual and then group multiple-choice tests. During the group test each student discussed and defended their individual answers. Students were not permitted to change their answers on their individual test during the group test. Each group collectively chose and recorded their answers for the test. Then, using a scratch-off answer sheet, the selected letter answer box was scratched off to determine whether the correct answer, indicated by an asterisk, had been selected. A student survey regarding the effectiveness of peer learning indicated that 54% of the students preferred active, student-centered involvement, 35 % preferred the traditional lecture, and the remainder had no preference. The survey supports supplementing lecture-based courses with peer-centered educational opportunities. (Sponsored by a Herz Faculty Teaching Development Award, Minnesota Medical Foundation).

HE, Xiaohua and Hansuc JUNG*. Palmer College of Chiropractic Florida FL and HanSeo University, South Korea. Sensory Nerve

Endings in Guinea Pig Knee Articular Tissues – A Morphological Investigation.

The purpose of this study was to investigate the different types of nerve endings in articular tissues of the knee joint of guinea pig. Histological study has shown that the articular tissues, such as the articular capsule, ligaments and articular fat pad were richly innervated. By using whole mount gold chloride preparations, various kinds of nerves and terminals or endings were identified in these tissues. On the basis of their morphology, the nerve endings in the articular tissues were classified into four types (type I to IV), considered to be mechano- and pain receptors. The distribution of the different nerve endings showed a characteristic pattern in different articular tissues. The type I (Pacinian) and II endings resembled Ruffini corpuscles and were located mainly in the joint capsule. The type III or so-called Golgi corpuscle was confined to the ligaments of the knee joint. The type IV or free nerve endings composed of fine unmyelinated fibers were located mainly in the synovium of the joint capsule, ligaments and fat pad. The structural characteristics and distribution patterns of the different types of nerve endings suggest that the roles of the different nerve endings vary in different parts of the articular tissues.

HUNT, Allison G.* and Jeffrey SOSNOWSKI. Department of Pathology, University of South Alabama, Mobile, AL. Clinical anatomy of an autopsy.

There are two basic settings in which an autopsy is performed. An autopsy in the hospital, also known as a house case, is the gold standard for a final diagnosis of disease. Clinicians and family members often want to know why their patient or loved one died and what diseases, fatal and non-fatal, they may have had. In a medicolegal setting, the purpose of the autopsy is to determine the cause and manner of death. These autopsies are performed by a forensic pathologist. This platform will discuss the relevant clinical anatomy and significant clinical findings of the cardiovascular system only. A few cases will be chosen which highlight the anatomy of the cardiovascular system and the significant clinical implications that follow when certain diseases are present. At autopsy, some of the most important aspects of the cardiac exam are weight, thickness of the walls, and atherosclerotic narrowing of the coronary arteries. Various examples will be presented including the common myocardial infarction and the rare acute angle of origin of a coronary artery.

Other causes of sudden death including: pulmonary embolism, aortic dissection and aortic transection will be briefly discussed along with the relevant anatomy and significant clinical findings.

HUR[1]* Mi-Sun, Sung-Yoon WON[1]*, Jae-Gi LEE[1]*, Kwan-Hyun YOON[1]*, Kyung-Seok HU[1]*, Christian FONTAINE[2], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea [2]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France. Topography of the depressor anguli oris with a relation to the mental foramen and intramuscular nerve innervation pattern.

The aim of this study was to demonstrate the topographic anatomy of the DAO with a relation to the mental foramen and to clarify the intramuscular nerve innervation pattern, thereby providing critical information for the safe and effective site at which to inject botulinum toxin type A (BTX-A). Thirty-four dissections and ten whole mount nerve stain (Sihler's stain) from Korean and French adult cadavers were performed. From the dissected specimens (34 cases) the mental foramen was located in the middle third from the cheilion to the mandibular border in 28 cases (90.3%), and it was mostly confined within the DAO muscle coverage in 21 cases (67.7%). The buccal branch of the facial nerve entered through the middle third of the lateral border of DAO and then distributed. Concomitantly, the marginal mandibular branch of the facial nerve entered through the lower third of the lateral border of DAO in 60.7%. From ten whole mount nerve stained specimens, the facial nerve branches were abundantly innervated in the medial portion of the lower third within the DAO. These results represent the criteria for the most effective site for injecting BTX-A when treating the labiomandibular fold. (Sponsored by Grant No. R01-2007-000-11219-0 from the Korea Science and Engineering Foundation (KOSEF)).

HUTCHINS, Bob. Department of Biomedical Sciences, TX A&M Univ. Sys. HSC, Baylor College of Dentistry, Dallas, TX. A digital temporal bone program designed as an interactive teaching module.

The human temporal bone is a complex structure that is typically very challenging for the novice to conceptualize. Following a lecture, students are often asked to learn the various bony features, nerves, and functional compartments of the temporal bone on their own with only the aid of their atlas and a bone model. This approach leaves the students with no easy method for landmark identification or for self-testing. In our institution, this resulted in a considerable amount of faculty laboratory time devoted to personal or small group tutoring. As an alternative, a digital temporal bone module was developed to allow the students to study the required features on their own time. This interactive module has been in place for the past two years and functionally, the students would still prefer a personal tutoring session, but now they have the ability to study on their own and at their own pace. Informal evaluations have indicated that the students prefer the interactive module to the text atlas. Supported by the Texas A&M Univ. Sys. HSC, Baylor College of Dentistry, Department of Biomedical Sciences.

JACKSON, R. Brent*, John E. ASCHENBRENNER*, Rustin E. REEVES, and Harold J. SHEEDLO. Department of Cell Biology and Genetics, University of North Texas Health Science Center, TX. Variation in contribution of ulnar artery to the deep palmar arterial arch.

The deep palmar arterial arch is formed by the anastomosis of the ulnar and radial arteries along the bases of the metacarpal bones, and provides deep palmar circulation. In contrast to the superficial palmar arch (SPA), the deep palmar arch (DPA) is usually complete, with the radial artery supplying most of the blood. In a routine cadaveric dissection, we noted the ulnar contribution to the DPA originating from the ulnar palmar digital artery (UPDA) of the small finger. Original studies on the arterial circulation of the hand describe the ulnar contribution from a proximal deep branch, a distal deep branch, or proximal and distal deep branch of the ulnar artery, but never from the digital artery of the small finger. Recent studies have shown the ulnar contribution can be from the UPDA of the small finger, but that in most prior research, the UPDA has been grouped as a distal deep branch of the ulnar artery. In our dissection, the branch to the DPA was 9mm distal to the SPA. Knowledge of possible variations and their incidence are important to understand for surgical procedures of the palm. This inconsistency should be

further clarified, with future studies describing this arterial pattern.

JAYARAM, Prathap, L. MOUNT and Alan HRYCSHYN, Department of Anatomy, American University of Antigua College of Medicine, St. John, Antigua and Barbuda. A variation in origin of the left vertebral artery and its impact on cerebral hemodynamics- clinical significance and embryological basis- a case study.

This study found that in one cadaver, the left vertebral artery originated from the arch of the aorta and entered the transverse foramen of the 4th cervical vertebra. The right vertebral artery was found to originate from the right subclavian artery. We have examined how the vertebral artery variation on the left side, compared to the course of the vertebral artery on the right alters cerebral hemodynamics which may favor cerebral disorders. It was also found that the thyrocervical trunk and its branches on both the sides had no variations in their branching pattern. The diameter of the left vertebral artery was smaller than the right.

JEVOOR, Praful S., and Sharad M. ANTIN*. Departments of Anatomy and Orthopaedics, Jawaharlal Nehru Medical College, Belgaum, INDIA. Multiple and congenital limb deformities- a case study.

A male infant aged five months presented with history of multiple skeletal deformities in both upper and lower limbs. On examination, ulnar deviation of both hands with polydactyly and bilateral club feet with polydactyly of right foot were observed. Plain radiography of upper limb demonstrated bilateral club hand with no radioulnar or radiohumeral joint deformities. Lower limbs showed bilateral club feet with increased talocalcaneal angle. The said anomalies were associated with bilateral inguinal hernia, micropenis, enophthalmos, bicuspid aortic valve and low posterior hairline with low set ears. Limb malformations occur in approximately 6 per 10,000 live births. The factors involved in malformation of the limbs are dominant and recessive genes, chromosomal abnormalities and drugs. The extremities are most susceptible to teratogens during 4th to 7th weeks of intrauterine life. Overall, genesis of congenital limb anomalies are related to apical ectodermal ridge of limb bud with it's mesodermal layer and amount of circulating morphogens. Treatment for club feet and ulnar deviation of hands is more of conservative nature than surgical. Besides the etiological features responsible for the

defects, relevant points of clinical significance are highlighted in the study.

JOHNSON, Nathan F., April D. RICHARDSON, and Jennifer K. BRUECKNER. Department of Anatomy and Neurobiology, University of Kentucky, KY. Online learning: bringing the teacher to the student using Camtasia Studio software.

In response to the increasing demand for independent study, many academic institutions are providing students with an opportunity to enroll in a variety of medical education courses online. This type of learning is unique in that students are more autonomous and are able to self-pace their own learning process according to personal time restrictions. However, many students feel that one disadvantage relative to online learning is the minimal guidance associated with posted lecture notes, which are mostly comprised of text. In a recent poll of student opinion, undergraduates enrolled in principles of anatomy and physiology at the University of Kentucky expressed a desire for spoken text corresponding to posted powerpoint presentations. The goal of this study is to evaluate student preference and ease of learning, relative to anatomical principles, by providing students with verbally narrated powerpoint presentations. Through the use of Camstasia Studio software, we have successfully incorporated verbally guided powerpoint presentations in a series of lectures covering the male and female reproductive systems. A thorough review of the results will be discussed upon completion of student surveys.

JUDSON, John P., Joachim PERERA*, Nilesh K MITRA*, Daw Khin WIN* and Nagarajah LEE**. Departments of Human Biology* & Community Medicine**, International Medical University, Kuala Lumpur, MALAYSIA. Assessment of Surface Anatomy in Objective Structured Clinical Examinations.

The objective structured clinical examination (OSCE) is a good avenue for integration of basic science knowledge with clinical sciences. At the International Medical University (IMU) Malaysia, among the 89 OSCE questions of Semester 3 & 5 that were analysed, 70 (78.6%) were found to assess surface anatomy (SA) skills, with the degree of representation ranging from 88-25% in different system courses. The weightage of the SA component varied between 2.5 and 0.5 (average - 1.6) on a marking scale of zero to 10. In five OSCE questions of different systems, more than 80% students scored the maximum

allocated scores on the surface anatomy component. The average mark scored by students in OSCE stations with a SA component was 7.32 compared to the average score of 6.64 obtained at OSCE stations that had no SA components, implying that students perform better at the OSCE stations which had SA components. These results indicate the effectiveness of the OSCE in testing skills in surface anatomy and the students' acceptance of the same. Anatomists collaborating with clinicians could explore other ways of further improving the testing of SA at the OCSE for better achievement of curricular outcomes.

JURJUS, Abdo R.*[1], Mahmoud A. KAMAR[2], Inaya M. ABDALLAH HAJJ HUSSEIN[1], and Mostafa H. MOSTAFA[2], [1]American University of Beirut, [2]Beirut Arab University. Experimental colitis: A chronic model.

Introduction: High levels of prostaglandins produced in IBD correlate very well with marked upregulation of COX-2 expression in colonic tissue, which is associated with cell resistance to apoptosis. Objective: This work investigates COX-2 and apoptosis in the colonic mucosa of a model of chronic ulcerative colitis developed by iodoacetamide (IA) and Enteropathogenic E. coli (EPEC). Methods: Male Sprague-Dawley rats were divided into four groups inoculated intrarectally on a regular basis with 4 different combinations: (a) 1% methylcellulose (MC), (b) 100 μl of 6% IA in 1% MC, (c) 200 μl containing 4 x 108 CFU of EPEC, (d) combined treatment of (IA) followed by bacteria (B) after 2 days. Colitis was evaluated by different criteria including mRNA expression of COX-2, BAX, and Bcl2. Results: The (IA+B) group exhibited the highest expression in COX-2 compared to the other 3 group ($P<0.01$) and was maintained to various extents till end of experiment. The ratio of BAX/Bcl2 in the (IA+B) group was the lowest among all groups (50% less) ($P<0.001$). The granulomatous mucosa in the (IA+B) group was not apparently subject to apoptosis but rather to necrosis. Conclusion: The presence of a significant increase in COX-2 expression in the (IA+B) group supports the proposed model. This cell resistance to apoptosis in the (IA+B) group is probably associated with COX-2 over expression.

KILARKAJE, Narayana., Susan VARGHESE,* Saju S. JACOB.* Department of Anatomy, Faculty of Medicine, HSC, Kuwait University, Safat, Kuwait. Testicular effects of two cycles of

cisplatin chemotherapy and concomitant administration of L-Ascorbic acid in a mouse model.
Cisplatin is a widely used antineoplastic drug in the treatment of various solid tumors. The purpose of this study was to investigate the testicular toxicity of cisplatin at human therapeutic dose-levels, and any protective effect of concomitant administration of L-Ascorbic acid (10 mg/kg). Adult male BALB/C mice (12-week-old) were treated (i. p.) with two cycles of cisplatin with a recovery period of 17 days between two cycles, as follows: Group I- water (N=10); Group II-1 mg/kg (N=6); Group III-2.5 mg/kg (N=6); Group IV-1 mg/kg + L-Ascorbic acid (N=6); Group V-2.5 mg/kg + L-Ascorbic acid (N=8); and Group VI- L-Ascorbic acid (N=6). All animals were sacrificed on third day after the last treatment. The sperm samples were obtained from the caudae epididymides and the sperm count, motility and sperm abnormalities were estimated as per the standard protocols. The testis was processed for light microscopic analysis. The data were analyzed by Kruskall-Wallis test and Mann-Whitney 'U' test with the level of significance set at $P<0.05$. The testis weight was decreased in a dose-dependent pattern, but L-Ascorbic acid was able to nullify the toxicity significantly only at 2.5 mg/kg dose-level, although not to the control level. The sperm count and sperm motility were decreased, whereas the sperm abnormalities were increased in both treated groups ($P<0.05$) and L-Ascorbic acid was able to restore the sperm count ($P<0.05$), and sperm abnormality at higher dose-level, but not the sperm motility. Cisplatin treatment resulted in tubular degeneration in terms of vacuoles, epithelial sloughing, germ cell degeneration and tubular atrophy. L-Ascorbic acid, although showed some protective effects, could not restore the testicular structure to the control level. In conclusion, at human therapeutic dose-levels, cisplatin induces testicular damage and spermato-toxicity. L-Ascorbic acid only partially nullifies the gonadotoxicity of cisplatin (Sponsored by Kuwait University).

KIM, Jeong-Nam*, Soon-Heum KIM*, Ki-Seok KOH*, Wu-Chul SONG*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea. Female-to-male proportions of the head and face in Koreans. It is well known that the head and face are smaller in females than in males. The present study evaluated the female-to-male proportions of the head and face so as to clarify the sex-

related differences. Totals of 1939 females and 1398 males were divided into three age groups: young, middle-aged, and elderly. The dimensions were classified into three categories: cephalic, frontal facial, and lateral facial. The female-to-male proportions were compared in the three age groups using the following formula: female measurement value × 100 / (mean of male measurement value). The female-to-male proportions of the cephalic dimension increased with age, with the female cephalic dimensions overall being about 96% of the male cephalic dimensions. The female-to-male proportions of the frontal facial dimension were constant across the age groups, with the female frontal facial dimensions overall being 95% of the male frontal facial dimensions. Overall the female lateral facial dimensions were about 97% of the male lateral facial dimensions. The present study will suggest a new approach to elucidate those sex-related dimensional differences that are characteristic of females and males.

KIM, Soo Y., Robert R. BLEAKNEY*, Tim RINDLISBACHER*, Erin L. BOYNTON*, Denyse RICHARDSON*, and Anne M. AGUR. Division of Anatomy, Department of Surgery, Departments of Medicine and Medical Imaging, University of Toronto, Cleveland Clinic Canada, Sports Medicine Institute, Toronto, Canada. In vivo ultrasonographic investigation of the musculotendinous architecture of supraspinatus in subjects with rotator cuff tears: a pilot study.

Introduction: In vivo ultrasound (US) of supraspinatus (SP) muscle with tendon tears can be used to assess musculotendinous changes. Previous US studies have been qualitative, focusing on fatty-muscle atrophy; quantitative measurements of architectural parameters have not been investigated. Purpose: To quantify the in vivo musculotendinous architecture of SP in relaxed and contracted states in subjects with a 1-2 cm full-thickness anterior tendon tear using US. Methods: SP was scanned in three subjects (1M/2F), mean age 57±7 years. The shoulder was scanned in neutral and 60° abduction. Fiber bundle length (FBL) and pennation angle (PA) were computed for each architecturally distinct region of SP. Data was compared with age/gender matched subjects without pathology. Results: In pathological subjects, fiber bundles of the anterior region of SP shortened 14.7% on contraction into 60° abduction, whereas in controls fiber bundles shortened 31%. Percentages of fiber bundle shortening of the posterior region

were similar between the pathological subjects and controls. In pathological subjects, mean PA of the anterior region increased 23.4%, whereas in controls mean PA increased 67.8%. Conclusion: The large differences in dynamic changes of architectural parameters in pathological subjects when compared to normal controls suggest that evaluation of both muscle and tendon changes may be important when planning treatment.

KOWALÓWKA*, Adam, Jerzy, GIELECKI, and Anna, ZURADA. Departament of Anatomy, Medical University of Silesia, Poland (sponsored by J Gielecki). Digital-image analysis of the subclavian artery in human fetuses.

The left and right subclavian artery (SA) have their different origin. The left SA usually branches stright from the aortic arch and the right from the brachiocepchalic trunk. The purpose of the study was morphological and morphometric analysis of the SA during fetal period of development. The study were performed on 70 spontaneously aborted fetuses in the age between 4th and 7th months of gestation. The arteries of fetuses were injected with a mixture of latex and detergent. After fixed in 4% formalin, the SAs have been dissected. The digital-image analysis system DIAS-08 were used for the measurement of the diameter, length and volume. The statistically significant differences were to be found between the right and left SA in the length and volume. The mean left SA length was 6.51 mm for 4th month group, 8.96mm for 5th, 10.87mm for 6th and 13.45mm for 7th month group age. Accordingly, the mean length for the right SA was as follow 5.82mm (4th), 7.34mm (5th), 8.83mm (6th) and 12.74mm (7th). The precise morphometric knowledge of the SA may be helpful for the analysis of development of the fetuses and their clinical significance may be discussed in the follow studies.

KRISHNAN, Subramaniam, and Munisamy MAHALINGAM. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. Morphometric studies on the hypoglossal canal.

The hypoglossal canal transmits the hypoglossal nerve, an emissary venous plexus and a dural artery. The nerve can be compressed in the canal due to skull base tumors, schwannomas or ganglion cysts resulting in speech disturbances. In the present investigation, the morphological characteristics and dimensions were evaluated in macerated Asian skulls (n=62). Measurements (in millimeters) were done

using calipers and a micrometer screw gauge for evaluating diameters (vertical and horizontal) and a fine wire for measuring canal length. The right internal canal diameter was 5.29± 0.75 [range: 3.37- 7.41] whereas the external diameter was 5.45± 0.61 [range: 3.26 – 7.60]. On the left side, the internal diameter measured 5.65± 0.53 [range: 3.45- 6.40] whereas the external diameter was 6.11 ± 0.32 [range: 3.19 – 7.33]. There was no significant difference between both sides (p≥0.05). A double canal was seen in 36% and a triple canal was seen in a single skull. The shape of the internal opening was either circular or oval (74%), teardrop (16%) or dumbbell (10%). The canal length measured 8.33± 1.88 [range: 6.42 – 11.26]. The characteristics of the canal direction were variable and could not be quantified. These results form a useful database for the differential diagnosis of speech disturbances.

KRISHNAN, Subramaniam. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. The neuroanatomy curriculum: Current trends and future implications in medical education.

The neuroanatomy curriculum has come under increasing scrutiny because of vast changes in the educational landscape due to cotemporary teaching-learning innovations. The purpose of this study was to evaluate variations in the neuroanatomy course in an attempt to establish a core curriculum for general reference. Twenty-two neuroanatomical curricula from geographically diverse schools and representing different educational formats (traditional, systems-based, problem based or a combination mix) were evaluated blindly to avoid bias. The parameters studied included range of topics, contact hours (lectures, tutorials and laboratory sessions), hands-on demonstrations, clinical correlations, written assignments and assessment modes. The results showed wide variations. The hours ranged from 3-33 (lectures), 0-15 (tutorials), and 6-33 (laboratory sessions). In addition, it was noted that standardized assessment procedures were not adopted for almost a third of the curricula studied where the methods were arbitrary. It was further evident that there were substantial gaps in the knowledge base in some curricula. Also, in several cases, the syllabus did not come with well-defined and measurable learning objectives. A core neuroanatomy curriculum has now become a necessity incorporating a combination of didactic teaching methods and

including a substantial portion of student-directed learning activities to prepare them for the clinical years ahead.

KRYSKI*[1], Diana G., Michael J. WILEY[2], Jodie JENKINSON*[3], Nicholas WOOLRIDGE*[3], Michael CORRIN*[3]. [1]Graduate student Msc.BMC Program, Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto; [2]Department of Surgery, Division of Anatomy, University of Toronto; and [3]Biomedical Communications, Institute of Communication and Culture, University of Toronto Mississauga.
Enhancing medical students' clinical reasoning ability through visualization of spatially complex gross anatomy with a computer-based, three-dimensional model of the pterygopalatine fossa.

A web-based interactive 3D model of the pterygopalatine fossa (PPF) and related neurovascular structures was developed and evaluated against a comparable 2D model for its effectiveness at enhancing undergraduate anatomy and medical students' spatial and clinical understanding of the PPF. This understanding is crucial to physicians' diagnosis and treatment of disease conditions involving the PPF, such as the perineural spread of tumor. The boundaries of the PPF were isolated within a 3D model of the skull, and neurovascular structures were modeled in Cinema 4D, including the trigeminal ganglion, maxillary division and branches, pterygopalatine ganglion, and maxillary artery and branches. Users can control both the rotational view and opacity of the model layers, toggle between visible nerves, arteries, or both, view structure labels and descriptions as well as nerve pathways on mouse rollover. An identical 2D version of the module was developed (rotation disabled). Volunteer participants in medicine and anatomy were divided into '2D' (control) and '3D' (experimental) groups, completed a knowledge pretest, were exposed to their assigned module, and completed a post-test. The average ∂ between pre- and post-test for each group was compared (funded in part by the Vesalian Scholar Award from the Vesalius Trust for Visual Communication).

LEYNES*, Peter, Marc DRYER*, Nicholas WOOLRIDGE*, David PEARSALL, and Anne AGUR. Biomedical Communications, Institute of Communication and Culture, University of Toronto at Mississauga, ON, Institute of Medical Science, Division of Anatomy, University of Toronto, ON, Department of Kinesiology and Physical Education, McGill University, Montreal, QC. High-

calibre skating: comparing skating techniques between low- and high-calibre hockey skaters with anatomically accurate three-dimensional animation.

There is currently a lack of adequate visualizations for sports kinematics that clearly display the fine detail of motion and relate it to the actions of specific anatomical components. The human body moves in three dimensions and its movements are not easily conveyed in two-dimensional, static images. The main goal of this project is to create a three-dimensional animation that demonstrates to hockey players and coaches the main kinematic differences between novice and advanced hockey skaters. The animation focuses on stride width, stride length, degrees of hip and knee flexion and knee abduction. By revealing the actions of specific muscles and joints in achieving these poses, the animation helps athletes to mentally visualize the anatomy involved and to fine-tune their skating technique. Secondarily, this project attempts to develop a streamlined work flow for producing anatomically accurate three-dimensional visualizations. The animation is guided by motion capture data of low- and high-caliber skating strides and 3D muscle simulation. Autodesk Maya(TM) was used to model, render, and animate the visualization. Editing and compositing was done in Adobe After Effects(TM). Hockey players and coaches will evaluate the effectiveness of the final animation. This resource is not available for purchase from national publishers/resellers.

LaSALA, Gregory*, Quentin A. FOGG and Lancelot G. NASH. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA. Two unilateral variations in pelvic attachments of the quadratus lumborum muscle and their relevance to scoliosis.

Variations of the quadratus lumborum muscle are not commonly reported. In this study, two variations are described. In each case the proximal attachment was consistent with common descriptions. In the first case the lateral margin of the muscle was attached into the iliac crest, but the medial half of the muscle was only attached to the iliac crest via its posterior fibres (approximately the posterior third). The anterior fibres were passed anterior to the iliac crest, anterior to the iliacus muscle and attached to the pubis. In the second case the medial half of the muscle was divided into a superior and an inferior segment. These two segments were joined through a mass of fibrous tissue 15mm above the iliac crest. The distal segment was

continued distally to the pubis. In both cases this muscular anomaly was unilateral. Further examination revealed that in both cases the vertebral column had moderate curvature with the convexity of the lumbar curvature towards the side with additional muscle. These cases may therefore represent an anatomical mechanism for the development of scoliosis. This is worth taking into consideration in clinical cases.

LEE*, Byung-il, and Brion BENNINGER, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Morphology and nomenclature of the distal attachment of the temporalis tendon.

The objective of this study was to examine the morphology of the anterior distal temporalis tendon (ADTT) attachment and describe its osseous nomenclature. The temporalis muscle is arguably one of two most important muscles of mastication. Contemporary anatomy texts and atlases regarding the ADTT attachment demonstrate a coronoid process attachment and/or an extension inferiorly along the anterior border of the ramus where its representation is often unclear and inconsistent. The osseous nomenclature of retromolar triangle where the ADTT attaches is even less clear in most texts and atlases. Including variations, it is observed that the inferior insertion continues downward onto the retromolar triangle, posterior to the mandibular third molar. We dissected 30 embalmed human cadavers to examine the morphology of the ADTT. We analyzed commonly used anatomical texts and atlases. Our dissection results revealed that the ADTT consistently attached onto the retromolar trinagle. Only 5 of 23 texts described or illustrated a retromolar triangle area (though not labeled) for ADTT insertion. This study suggests the ADTT attachment could be further depicted, and the nomenclature of retromolar triangle and fossa be included. This work suggests further investigation into the clinical relevance of the retromolar triangle and fossa.

LEE*, Ilkyu, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Clinical anatomy of proximal tibial autogenous bone graft harvest for Head and Neck Procedures.

The objective of this study was to analyze the clinical anatomy of a proximal tibial bone harvest graft to provide anatomical

evidence of a safe procedure. The iliac crest is the standard site for harvesting bone; however, this procedure often requires another specialist (Orthopedic surgeon) and a general anesthetic. The proximal tibial area has gained popularity for harvesting autogenous bone. Clinical literature analyzing the various regions for harvesting bone reports that using the proximal tibia led to shorter hospital stays, lower morbidity rates, and a shorter learning curve for one surgeon. We dissected 30 lower limbs (15rt and 15lt)from embalmed cadavers to determine the anatomy of a proximal tibial bone harvest. We reviewed clinical papers on proximal tibial harvesting to assess the anatomy illustrated and to understand the efficacy of this procedure. We conducted a continuing dental education seminar emphasizing this procedure. Successful technique requires knowledge of surface anatomy, skin incision location, and cognizance of cutaneous neurovascular structures. Local anesthetic can be used. Our results revealed that harvesting bone from the proximal tibia is less technically difficult and anatomically safer than other donor sites and could be explored as a safe viable option for oral surgical specialists.

LEE, Jeong-Yong*, Soon-Heum KIM*, Ki-Seok KOH*, Wu-Chul SONG*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea. Anatomical study of the superficial layer of the temporalis muscle. The temporalis muscle is masticatory muscle for mouth closing which arises from the whole temporal fossa and deep temporal fascia, and attached to the coronoid process of mandible. The temporalis muscle is important not only for functional aspect, but also for surgical approach during facial reconstructive surgery or neurosurgery. The insertion part of the temporalis muscle was described as tendon showed just beneath the deep temporal fascia in all pictures of anatomy textbooks and atlases. The purpose of present study was to define the superficial layer of the temporalis muscle which has not been discussed. Twenty sides of the temporal region were dissected. After removal of the deep temporal fascia, the superficial layer of the temporalis muscle was exposed. The fibers of the superficial layer were mixed with fat tissue. The tendinous part was attached to the supero-lateral region of the coronoid process joining with insertion part of the deep layer of masseter muscle. The well-known original tendon of the temporalis muscle described in the pictures of the textbooks and

atlases was exposed after the removal of the superficial layer. Therefore, the superficial layer of the temporalis muscle must be described in the anatomy textbook and atlas.

LEE, Sat-Byol*, Jeong-Yong LEE*, Wu-Chul SONG*, Ki-Seok KOH*, Soon-Heum KIM*. Department of Anatomy, Department of Plastic and Reconstructive Surgery, School of Medicine, Konkuk University, Seoul, Korea. Analysis of lower face in Korean - An anthropometric study.

In human, distinctive change of lower face and lip was showed as human gets older. However, there was no reliable data of lower face of Korean. The purpose of this study is anthropometric analysis of mouth and lower face for aesthetic and reconstructive surgery. The standardized photographs of 2,018 healthy volunteers were investigated. The data were analyzed and compared n three age groups. All results were larger in male than female and the differences were decreased with age. Most lengths were decreased with age, but length of mouth corner and width of lower face were increased with age. The height of lip is less than 10mm and the lower lip is higher than upper lip. The tangential length of nose-mentum is 60% of lower facial width and the width of mouth is 60% of tangential length of nose-mentum. Most Koreans showed relatively prominent lower face because of mandibular development. The soft-tissue droop of lower face was one of the significant changes of aging. The results elucidated the senile change of the face of Koreans and demonstrated that Korean has relatively more protruded and wide lower face than Caucasian.

LEE, U-Young[1]*, Mi-Sun LEE[1]*, Jae-Hoon LEE[1]*, Yong-Seok NAM[2]*, Seung-Ho HAN[1]. [1]Catholic Institute for Applied Anatomy and Department of Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea, [2]Department of Plastic Surgery Research Professor and BK21 project, College of Medicine, Inha University, Incheon, Republic of Korea. Relative direction and position of recurrent laryngeal nerve for anatomical configuration.

The present study aims to describe the course of the recurrent laryngeal nerve (RLN) using the tracheoesophageal groove (TEG) at the cricothyroid joint as a base line, and the configuration of RLN and inferior thyroid artery (ITA) for careful dissection in thyroid surgery. Sixty four cadavers were investigated. The angle of RLN from TEG was measured at the

cricothyroid joint. The relative position of RLN to ITA was classified. The location of the contacting point of RLN with ITA was measured and converted as an index. The RLN of left side is likely to be found posterior to ITA and course mainly from 0° up to 30° based on TEG near cricothyroid joint while the nerve of right side is likely to be found anterior to ITA in right side and course mainly from 15° up to 30° based on TEG. The contacting point of RLN with ITA locate from the tip of cricoid cartilage at about three tenth of the distance from the tip of cricoid cartilage to sternal notch without reference to individual body size. These findings suggest the area for careful dissection near cricothyroid joint, the configuration of RLN for identifying the nerve.

LEYNES*, Peter, Marc DRYER*, Nicholas WOOLRIDGE*, David PEARSALL, and Anne AGUR. Biomedical Communications, Institute of Communication and Culture, University of Toronto at Mississauga, ON, Institute of Medical Science, Division of Anatomy, University of Toronto, ON, Department of Kinesiology and Physical Education, McGill University, Montreal, QC. High-calibre skating: comparing skating techniques between low- and high-calibre hockey skaters with anatomically accurate three-dimensional animation.

There is currently a lack of adequate visualizations for sports kinematics that clearly display the fine detail of motion and relate it to the actions of specific anatomical components. The human body moves in three dimensions and its movements are not easily conveyed in two-dimensional, static images. The main goal of this project is to create a three-dimensional animation that demonstrates to hockey players and coaches the main kinematic differences between novice and advanced hockey skaters. The animation focuses on stride width, stride length, degrees of hip and knee flexion and knee abduction. By revealing the actions of specific muscles and joints in achieving these poses, the animation helps athletes to mentally visualize the anatomy involved and to fine-tune their skating technique. Secondarily, this project attempts to develop a streamlined work flow for producing anatomically accurate three-dimensional visualizations. The animation is guided by motion capture data of low- and high-caliber skating strides and 3D muscle simulation. Autodesk Maya(TM) was used to model, render, and animate the visualization. Editing and compositing was done in Adobe After Effects(TM). Hockey players and coaches will evaluate the

effectiveness of the final animation. This resource is not available for purchase from national publishers/resellers.

LORIAN*, Adi, Ilan KOREN*, Mimi EINREICH* and Tamar SCHIRMAN*, Research division of Brainsgate Inc. Surgical access to the sphenopalatine ganglion via the oral cavity for placement of a stimulating electrode in treatment of ischemic stroke patients.
The sphenopalatine fossa has a protected position and a complex neurovascular anatomy. The narrow inverted pyramidal shape space is located between the posterior wall of the maxillary antrum and lateral and medial pterygoid plates. The sphenopalatine ganglion, harbored in the fossa, is the source of parasympathetic innervation to the lacrimal, pharyngeal, nasal and palatinal glands as well as to the anterior cerebral circulation (via the Medial Cerebral Artery), thus regulating cerebral blood flow in the anterior part of the brain. Our goal was to determine the position of the vital structures of the sphenopalatine fossa and to develop a safe, precise and minimal invasive procedure that allows insertion of an electrode to stimulate the ganglion. We used in this study 66 dry skulls in order to prepare anatomical landmarks for the oral cavity approach and 200 fresh frozen specimens to determine the anatomical relations of the vital structure in the sphenopalatine fossa. The study lead to the development of an innovative surgical technique using custom made surgical instruments that allows insertion of an electrode in the vicinity of the sphenopalatine ganglion.

LOUKAS, Marios and R. Shane Tubbs. Department of Anatomical Sciences St. George's University, Grenada, West Indies. Department of Cell Biology, UAB, AL. Cardiac anatomy and embryology: correcting anatomical errors.
As with many anatomical structures, the heart continues to have inaccurate descriptions of its anatomy in standard anatomical textbooks. Cardiac structures have consistently and inappropriately been considered in the setting of the heart positioned on its apex, with the atria superior to the ventricles. Another example is that standard anatomy and embryology books fail to recognize that the only true interatrial septum is the fossa ovale and that the rims of the fossa ovale represent atrial infolding filled with extracardiac adipose tissue i.e. there is no septum secundum. Similarly, anatomy books include erroneous

notions such as the “Torrent-Guasp” theory regarding myocardial bands, a concept which has no foundation in anatomic fact. Another structure that is erroneously included in anatomy textbooks as part of the fibrous skeleton of the heart is the tendon of the infundibulum. In addition, the tubercle of Lower is still described as a structure of the right atrium, which according to our knowledge is not present in human hearts. Lastly, the importance of the collateral blood supply to the heart and its development from preexisting non functional capillaries (arteriogenesis) is neglected in the majority of anatomy textbooks. We review such misconceptions and provide an evidence-based approach at correcting such incorrect literature.

LUFLER[1], Rebecca, S, Tony TANNOURY*[2], Jared TOMAN[2], Joshua J. STEFANIK[1], Chad W. FARRIS[1], and Todd M. HOAGLAND[1]. Department of Anatomy and Neurobiology[1], Boston University School of Medicine and Department of Orthopaedic Surgery[2], Boston Medical Center, Boston, MA.
Comparison between two methods of percutaneous vertebral pedicle screw placement on accuracy and time using human cadavers.
This study compares two methods of posterior percutaneous pedicle screw placement used in treating spine trauma. Accuracy and surgical time were the metrics used to compare the two techniques. Pedicle screws were placed in 4 embalmed cadavers by three orthopedic spine surgeons with varying years of experience using the common Jamshiti or novel Hybrid technique. The surgeons inserted 119 pedicle screws into both sides of vertebral segments T4-S1 guided by C-arm fluoroscopy. Accuracy of pedicle screw placement was measured as incidence of critical (≥ 2 millimeters) and noncritical (< 2 millimeters) breaches of cortical bone on Computed Tomography (CT) scans and visually after laminectomy. Total procedure time was significantly shorter in the Hybrid technique group, 4 minutes per screw, compared with the Jamshiti group, 6 minutes per screw, (p=0.0058). Visually, the breach incidence was not significantly different between the groups with 1 critical breach (6 total) in the Jamshiti group and 2 critical breaches (7 total) in the Hybrid group. Preliminary CT data indicates that evaluation by CT is as effective as visual inspection. The Hybrid technique therefore significantly reduces surgical time without reducing accuracy. Future investigation will evaluate radiation exposure and the learning curve associated with these techniques.

MacPHERSON, Brian R., Zachary B. FULKERSON*, Gregory L. REPASS*, and Pamela COFFEY*. Anatomy and Neurobiology, University of Kentucky College of Medicine. Lexington, KY.
Digital Histology 1.0 – A Newly Incorporated Digital Product For Medical Histology.

This study reports on the transition of the first year medical histology course from traditional microscope-based to a digital product enabling freer access to the materials and facilitating different, individual, learning styles. Controversy exists around the nature of digital histology labs – microscope-like or image intensive. Over the past 10 years, the oral histology component of the dental histology course has been put into a digital format and has gone through two modifications. Over the past 18 months the web/CD hybrid template used in the dental course has been modified using student comments solicited from course evaluations and student liaison focus groups. The new HTML-based template is ess complex, more intuitive and contains only those components end users found beneficial, including those requested as new features. Based on these comments, Digital Histology 1.0 was released for use in the medical histology course in fall 2007. The new program contains 22 lab sessions that cover all aspects of histology tested on Part 1 of the medical boards. A scrollable text box, larger initial images, and the ability to navigate within the enlarged image/testing screen are among the most notable features. A drop-down "jump to" menu allows more flexible navigation within lab sessions. A user-composable test engine is being developed as the last feature to be incorporated. The success of this non-microscope-like curricular enhancement, over the short and long term is examined through data obtained in student evaluations and annual grade patterns on the practical exam portion of both courses.

MAERTINS, Benjamin A.*, Ryan P. WIPPLER, Thomas H. QUINN, and James P. PHALEN*, Department of Anatomy, Creighton University School of Medicine, Department of Radiology, Creighton University Medical Center, Omaha, NE.
Killian-Jamieson diverticulum: case report and review.

The purpose of this project is to review a case report of the seldom encountered Killian-Jamieson diverticulum, identify the anatomical site and discuss the clinical/surgical implications in relationship to other hypopharyngeal diverticula such as Zenker's and Laimer's diverticula. The history, physical exam and

radiographic studies are consistent with a 2cm lateral hypopharyngeal herniation known as a Killian-Jamieson diverticulum. This lateral out-pouching protrudes through a weakened muscular hiatus located in the anterolateral hypopharyngeal wall inferior to the cricopharyngeus muscle and lateral to the insertion of the longitudinal muscle of the esophagus, a location known as the Killian-Jamieson area. A dissection of this location demonstrates the intimate relationship of the inferior laryngeal nerve as it travels into the larynx. The close proximity of the inferior laryngeal nerve produces clinical manifestations and surgical management implications which differentiate Killian-Jamieson diverticula from Zenker's and Laimer's diverticula.

MARGARIDA, Francisco, Faculdade de Medicina de Lisboa.
Coronary sinus anomalies.

Introduction: The coronary sinus is considered the major system of cardiac venous drainage. The anomalies of the coronary sinus are generally underdiagnosed conditions as they are usually assymptomatic. In procedures involving interventional cardiology and cardiac surgery the knowledge of morphological variants of the coronary sinus may be determinant in avoiding medical and surgical complications. Methods: On a base of a literature review subjects concerning: embryology, anatomy and classification of coronary sinus anomalies are presented with a brief mention of its clinical and therapeutical implications. Results: By the 10th week of embryonic development as a result of the involution of the left vitelin and left common cardinal veins, the coronary sinus and oblique vein start to develop from the left horn. Among the most frequent coronary sinus anomalies are the dilatation of the coronary sinus, absence of the coronary sinus, atresia of the right atrium ostium of the coronary sinus and hipoplasia of the coronary sinus. The persistence of left superior vena cava (0,3-0,5% of general population) and cardiac lateralization variants are some of the congenital cardiovascular malformations frequently associated with coronary sinus anomalies. Although clinically silent in the vast majority of cases the presence of coronary sinus anomalies can assume important intra and perioperative implications in interventional cardiology and cardiac surgery namely in what concerns anatomical exposition of cardiac structures, myocardium protective techniques (cardioplegia), vascular ligation and anastomosis performed (venous shunts) and also in other surgical decisions.

Conclusion: The presence of an alternative venous drainage system to the coronary sinus (from the epicardial veins directly to the cardiac chambers) is the reason why even situations of agenesia of the coronary sinus can occur frequently without significant symptomatology. New imagiologic techniques with the possibility of 3D visualization can have an important future impact in the diagnosis of these conditions having in mind the exposure of important anatomical details in the context of interventional cardiology and cardiac surgery.

MARSKE, Cynthia*, Robert ANDERSON*, Bruce SILVERMAN*, and David J. ELIOT, Touro University California, College of Osteopathic Medicine. Central-line placement "clinic," a cadaver-based learning exercise.

First and second year medical students rightly yearn to acquire clinically relevant skills through hands-on experiences. Conducting these experiences in the anatomy laboratory helps to integrate anatomy instruction into the medical curriculum. Students in the Touro University Emergency Medicine and Surgery clubs have twice organized demonstration events in which a central line was placed into a great vein of a cadaver. The first event demonstrated the feasibility of the concept with a previously dissected cadaver. The next year's cadaver was prepared specially: it was embalmed through the left common carotid artery, leaving the right internal jugular vein (the most common site of central line placement in clinical practice) undisturbed; its dissection highlighted the vasculature. As many as twenty students can view the central line placement as a demonstration that takes approximately 90 minutes; fewer students can actually participate. Clinician faculty who are willing to work with cadavers are required. This exercise may nonetheless be developed as a regular part of our two-year integrated curriculum because it allows students to learn about clinical anatomy of the vascular system; to witness proper gowning and sterile procedures; and to reinforce their understanding of the purposes, limitations and risks of access to various veins.

MARTINO, Leon J. and Julie A CHANG*. Anatomical Gift Program, Albany Medical College, Albany, NY. A graveside memorial service and internment honoring donors to the anatomical gift program.

Many people view the donation of their body to medical education and science as a way of continuing to serve humanity even after their death. The Anatomical Gift Program of Albany Medical College receives over 250 anatomical donations a year. The Program supports anatomical education within the Albany Medical College and suppliements regional programs with cadaveric material. Two options are available regarding the final disposition of the remains of donors. At the donor's or families request, remains may be returned to the family for disposition. Alternatively, donors or families may choose to have the Albany Medical College inter the remains in plots at Albany Rural Cemetery and Saint Agnes Catholic Cemetery. A Graveside Memorial Service and Internment is held each fall honoring all donors utilized during the past year. Family and friends of all donors, regardless of which option was chosen, are invited to attend the Memorial Service and Internment. Over 300 family members and friends attend the service each year. Medical students are actively involved with the service. Following introductory remarks on the Anatomical Gift Program, family members and friends are comforted by a homily presented by the college ministry. Two medical students, selected by their class, speak to the families honoring the donors and their contribution to education and science. In memorium, each donor's name is called individually, while a procession of students place a flower in honor of each donor on the casket. Family and friends may present flowers and personal momentos at the grave during the reading of the donor names. The service is concluded with a prayer and benediction. Following the service, students and families have an opportunity to meet. Images and examples of student appreciation, as well as examples of news articles covering the service will be presented.

MATUSZ Petru L., Agneta Maria PUSZTAI*, Mihaela MASTACANEANU*, Bogdan HOGEA*, Eniko-Christine HORDOVAN*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. Calf angiozome of posterior tibial artery.

An angiozome is a volume of deep and superficial anatomical structures vascularized by the same source artery. The extension of the calf angiozome (CA) of posterior tibial artery (PTA) was studied on 60 dissection specimens and 10 lower limb amputees, using macro- and mezoscopic dissection. The arterial trunks were injected with colors and with plastic, to

facilitate the dissection of the arterial trunk and to underline the extent of the CA. The muscular territory of the PTA CA is represented superficially by the inferior-medial portion of gastrocnemius muscle (medial half) and the inferior-medial portion of soleus muscle, and deeply by the muscle body of flexor digitorum longus (except a small portion next to the inferior 1/3 of the lateral margin), the inferior 2/3 of the medial half of tibialis posterior muscle, the inferior 1/3 of the medial half of flexor halucis longus muscle body. The cutaneous territory of PTA CA is represented by a part of the skin from the anterior - medial aspect of the calf and by the posterior aspect of the calf (inferior to the projection of the gastrocnemius inferior margins). These aspects should be considered when performing muscular and muscle-fascio-cutaneous flaps to repair calf soft tissue defects.

MATUSZ[1] Petru L., Eniko-Christine HORDOVAN[1]*, Agneta Maria PUSZTAI[1]*, Klara BRINZANIUC[2]*, Cosmin NICOLESCU[2]. [1]Department of Anatomy, University of Medicine and Pharmacy "Victor Babes" Timisoara, ROMANIA, [2]Department of Anatomy, University of Medicine and Pharmacy Targu-Mures, ROMANIA.

Analysis of the morphological types of intraparenchymal spatial distribution of caudate lobe arteries. Study on corrosion casts.

According to Terminologia Anatomica (1998), the caudate lobe (CL) is vascularized by 2 arteries of the caudate lobe (CLA): the right artery – originating from the right branch (RBr) of the proper hepatic artery (PHA), and the left branch, originating from the left branch (LBr) of the PHA. The morphologic variability of the CLA was analyzed on 100 hepatic corrosion casts. The vasculo-ductal systems of the hepatic casts were injected with plastic, followed by parenchyma corrosion with hydrochloric acid. We analyzed at first the modalities of PHA branching, noticing 3 morphological types (MT): T I – modal type, in 90% cases; T II – continuation of the RBr only with the posterior branch, in 3% cases; T III – with the origin of the medial branch from the RBr, in 7% cases. The number of CLA varied between 1 and 4: one artery in 31%, 2 arteries in 62%, 3 arteries in 5%, and 4 arteries in 2%. The presence of a single CLA was encountered only in the modal type of branching of PHA, and the presence of 4 CLA only in type III of branching of PHA. These aspects are important when planning regulated liver resections.(Supported by CNMP 4.1-092/2007).

McCAIN*, Danial, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Why oral clinicians (dentists) should administer botulinum toxin.

The purpose of this study was to investigate why oral clinicians (dentists) should administer botulinum toxin (Botox). The pathology of clenching and impacts related to excessive force by muscles of mastication are significant issues facing oral clinicians. Currently, a variety of techniques are used for the treatment of these pathologies; however, many are expensive and invasive for the patient and may be ineffective. In fact, the patient may suffer irreversible damage. Botox inhibits acetylcholine release, blocking or reducing the contraction of muscles which can have a positive impact for patients with increased muscle activity to the temporomandibular joint (TMJ). Botox was found to be effective in treating muscle spasm, TMJ pathologies, sialorrhea, trismus, tolerance of intra-oral prostheses and other dental conditions. Dentists can be trained at administering Botox because of their extensive head and neck anatomical training and skill of injection administration, offering patients an alternative treatment. Currently, the American Dental Association has not taken a position on the administration of Botox by dentists; however, several state dental boards have developed, or are in the process of developing a policy for its use. We propose that dentists should be allowed to inject Botox because their anatomy courses and clinical curriculum prepare them appropriately.

McDONALD, Stuart W.*[1], and Jennifer MILLER*[2], [1]Laboratory of Human Anatomy and [2]Glasgow University Archaeological Research Division (GUARD), University of Glasgow, Glasgow, Scotland, UK. Animal bones referred for forensic anthropological identification in the West of Scotland.

The authors would like to share experiences with members of AACA engaged in forensic anthropology. Over a 2-year period we have had 8 consultations over the species identity of animal bones. We hope AACA members will enjoy learning what they were and we would like to hear which species present in similar circumstances in Canada and the USA. In 6 of our 8 enquiries the bones were found during building work. In one instance, a suspected human forearm and hand was found by a dog-walker. Another was a bone that fell down the chimney of a student flat

during high winds. We will not spoil the puzzle element of the presentation by recording what they were in this abstract! The bones found during building construction all contained bones of domestic animals and most were meat waste. The most interesting was a mixed assemblage of human and animal bones from an ancient cave on a raised beach that was opened by an excavator extending a garden. Interestingly, 5 of the calls have come from Argyll, a large and somewhat remote rural district on the West Coast, and only 3 have come from the city of Glasgow and its vicinity.

MCEVOY, Elizabeth M.*, Robert T. PADWICK*, S. James COEY*, Daniel E. FIELDING*, Peter J. GOLD*, Laura E.A. HARRISON*, P. Narasimha MURTHY*, Chia Tsyh TAN*, Stephen BRYDGES*, Peter ABRAHAMS. Institute of Clinical Education, Warwick Medical School, UK. Coachpod – students of the 21st century – anatomy on the move.

At our medical school there are currently no facilities for dissection, and the students have to travel an hour to the nearest department at Leicester University for cadaveric dissection. We have developed, piloted and evaluated the “Coachpod”, a series of video podcasts designed to prepare the students for each weekly dissection session. Basic anatomy and dissection techniques are described with accompanying educational guidance. Students download the podcasts and watch them weekly. Evaluation was performed using satisfaction questionnaires. For the first session 106 questionnaires were returned from a cohort of 200 students. 105/106 students who returned the evaluation forms viewed the coachpod. Most students watched the Coachpod on their laptops (51%), followed by a mobile device (32%) – ipod, itouch etc. Several of the students watched it more than once. Comments on the evaluation forms indicated that the students enjoyed the Coachpod and found it helpful in preparation for the dissection. Suggestions for improvement were mostly on technical matters. We believe the Coachpod is potentially a valuable preparation tool for dissection sessions. We will continue to evaluate “Coachpod” and provide a comprehensive picture of student satisfaction at the TechFair. (Sponsored by a grant from the University of Warwick Education Innovation Fund).

McHERRON*[1] Tony I., Brandon J YUAN*[1], Steven S HAMILTON*[1], Nathan HELLYER*[2], David KRAUSE*[2], John

HOLLMAN*[2], James YOUDAS*[2], Wojciech PAWLINA[1] and Nirusha LACHMAN[1]. [1]Department of Anatomy, Mayo Medical School, Rochester, MN, [2]Department of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, MN. Interprofessional peer teaching of the musculoskeletal system in a combined medical and physical therapy gross anatomy class.

Integrating learning across disciplines through collaboration has become an important component of fostering early interprofessional interactions in medical school. The current curricular approach supports continued development of interdisciplinary educational strategies that can create opportunity for students to develop skills enabling them to function effectively within an interdisciplinary team. Within the context of peer teaching, we explored the impact of 1-st year physical therapy (PT) students sharing their knowledge of the musculoskeletal system with medical (MD) students during a combined gross anatomy class. A pre- and post- experience survey was administered to 42 MD and 28 PT students that evaluated their perception of peer teaching, attitudes towards interprofessional education, and cooperation among heath care professionals. Students agreed that the team interaction provided opportunities for better understanding of subject material. Positive comments were received from MD students relating to PT students knowledge of the musculoskeletal system. This learning experience in anatomy lead to continued informal interaction between members of both classes. Ninety two percent of students agreed that shared learning with other health care students would increase their ability to understand clinical problems and become a more responsible and effective member of a health care team.

McNEIL* Chris and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. Identifying the most common acutely injured tooth by assessment of etiological literature from sports-related trauma to primary and permanent dentition.

The objective of this study was to identify the most common acutely injured tooth and suggest prevalence and incidence by evaluating literature on the etiology of sports-related traumatic dental injuries (TDI). Participation in sports increases the risk of TDI, the majority of which occur during childhood and adolescence. Studies reveal no consistent differences between

the sexes during primary dentition; however, males experience more TDI to permanent dentition. During primary dentition, luxations were the common pathology. The most frequent type of injury to the permanent dentition was an enamel fracture to a single maxillary central incisor. Mandatory use of facemasks and mouthguards during contact sports has reduced TDI compared to basketball, baseball, soccer and other so-called non-contact sports where such use is limited. Studies utilizing similar protocols show deviations between countries and within countries, pointing to the role of cultural and socio-economic factors in the etiology of TDI. To understand the complexities of TDI, more studies that include incidence calculated from exposure time and unified recording standards are needed from representative populations. Despite multiple variables, the most commonly injured tooth to both primary and permanent dentition is the maxillary central incisor. This supports further investigation into protection of anterior dentition.

MILLER, Dan*, Brion BENNINGER, and Anand MAHARATHI*. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Department of Periodontal Surgery, Oregon Health and Science University, Portland, OR. Dental implant placement investigation: is the anterior loop of the mental nerve clinically relevant.

The purpose of this investigation was to identify the presence of the anterior loop in human cadavers. Dental implant placement has become the standard of care for the replacement of missing or severely compromised teeth. Treatment planning of such cases has become increasingly complex in the interforaminal region of the mandible because of the potential proximity to the alleged anterior loop of the mental nerve. Investigation into diagnosing the anterior loop by imaging has provided inconclusive results due to the potential of radiographic artifacts that mimic a loop, which does not exist anatomically. Bilateral dissections were performed on 15 Caucasian cadavers identifying 30 mental nerves: 26 lacked mental nerve rami anterior to mental foramina, 4 mental nerve rami measured less than 1 mm anterior to foramina. This investigation supports the absence of clinically significant anterior rami of mental nerves and contradicts some of the historic literature of the anterior loop structure. If significant anterior rami are found, it may be an anomaly. Further studies in different ethnic populations could be undertaken to comprehensively support this study. This study

suggests a re-evaluation of discussion and illustrations to reflect current data about the anterior loop of the mental nerve.

MISHALL*, Priti L. and Lakshmi RAJGOPAL. Department of Anatomy, Seth G.S Medical College and K.E.M Hospital, Mumbai, India (Sponsored by Greg Smith). A morphometric study of articular surfaces of the glenohumeral joint in cadavers.
Fracture-dislocation of humeral head, head splitting and other age-related arthritic changes may require partial or total shoulder arthroplasty. There is dearth of anatomical data to support the need for a wide variety of sizes and shapes of humeral and glenoid prosthetic components. Present work was undertaken to study the morphometry of articular surface of the head of humerus and of glenoid fossa of scapula in Indian population. 60 shoulder joints of 30 cadavers were dissected. It was found that average horizontal and vertical diameters of head of humerus were 41.1mm (range 36mm-50mm) and 43.9mm (range 36mm-50mm) respectively. The average circumference of head of humerus was 140.2mm (range 115mm-164mm). The average height and maximum width of glenoid fossa were 27.5mm (range 14mm-38mm) and 19.4mm (range 12mm-36mm). The average width of glenoid labrum was 4.2mm (range 2mm-5mm). The average thickness of glenoid labrum at 12 o'clock and 6 o'clock position were 4.5mm (range 2.5mm-6.4mm) and 6mm (range 4.2mm-7.1mm) respectively. A comparison of right and left sides of each of the above parameters concluded that articular surface of head of humerus on right side was more than left side. The current study shows, indigenous prostheses smaller in size are required for Indian subjects.

MOCHIZUKI*, Tomoyuki[1], Kumiko YAMAGUCHI[2]*, Keiichi AKITA[2]*. [1]Department of Orthopedic surgery, Tokyo Medical and Dental University, JAPAN, [2]Unit of Clinical Anatomy, Tokyo Medical and Dental University, JAPAN (sponsored by Tatsuo Sato). Origin of the supraspinatus and infraspinatus.
With the development of arthroscopic surgery, detailed anatomy of the shoulder joint and surrounding structures are required. In this study, we focused on the origin of the supraspinatus and infraspinatus muscles to understand the action of these muscles. Seven specimens of 4 cadavers were used in this study. After decalcification, humeral attachment region was embedded in paraffin. Serial sections are examined histologically. From these serial sections, we performed computer assisted three-

dimensional reconstruction to analyze the relationship among humerus and tendon of supraspinatus, infraspinatus, and long head of biceps. Attachment of the supraspinatus was restricted to the anterior medial part of the greater tuberosity. On the other hand, tendon of the infraspinatus attached to the remaining large part of the greater tuberosity. The insertion of the infraspinatus extended to the upper surface of the greater tuberosity. It is believed that upper surface of the greater tuberosity is inserted by tendon of the supraspinatus muscle, and the supraspinatus muscle plays the most important role for abduction. However, from these observations, infraspinatus muscle has more important role for abduction than supraspinatus muscle.

MOORE*, Mallory C. and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR. A cultural anthropological study: how human cadavers become healthcare students' first patients.

This study concentrates on how a human cadaver becomes the students' first patient. In a cultural anthropological study, the behavior of Medical, Dental, Physician Assistant and Radiation Therapy students was analyzed as they worked with human cadavers in a Clinical Human Anatomy course. Many studies have investigated the merits of human cadaver dissection versus computer-generated anatomy regarding cost effectiveness and the value of the students' experiences. This study concentrates on how a human cadaver becomes the students' first patient. Methods to acquire data were by participant-observation and interviews spanning two years, encompassing more than 300 hours of lab time and representing 235 students. Results revealed that students experienced a three-stage process when exposed to a human cadaver: 1) dehumanization, 2) reanimation, and 3) humanization as first patient. Students initially consider the cadaver an inanimate object; it ultimately becomes the students' first patient with whom they have strong attachments. This study suggests that dissecting human cadavers has educational and tactile benefits and may play an important role in the early development of future healthcare providers' relationships with their patients. This study also suggests that anatomy programs with human cadavers should hold a funeral service for the cadavers to give students closure.

MORRISON Stuart C, and Jennifer M McBRIDE. Department of Radiology, and Cleveland Clinic Lerner College of Medicine, Cleveland Clinic, Cleveland, OH. CT enterography: An imaging window of the bowel.

Multidetector CT has revolutionized imaging of the abdomen by not only decreasing scanning time but also increasing spatial and contrast resolution together with isotropic voxel acquisition. This has allowed reformatting in any plane, specifically, the axial and coronal planes for the abdomen. Traditionally enteric contrast for visualization of the bowel in Radiology has been positive consisting of either barium or iodinated water soluble contrast. CT Enterography utilizes a neutral enteric contrast agent named Volumen [E-Z-EM Westbury, New York]. This material produces luminal distension throughout the entire small bowel allowing the lumen, mucosa and bowel wall to be imaged. These technological advances have permitted exquisite imaging of the abdomen including the bowel. Anatomical information of the entire gastrointestinal system including the vasculature, vasa recti, mesentery, lymph nodes and bowel wall is routinely visible. Global views of the entire abdominal viscera and knowledge of this anatomy can provide a deeper understanding of radiographic signs described in bowel pathology and normal bowel anatomy.

MORRISON, Stuart, Sunny PITT*, Robert WYLLIE*, and Janet REID*. Pediatric Radiology and Gastroenterology, Children's Hospital, Cleveland Clinic, Cleveland, OH. Can CT Enterography replace the fluoroscopic small bowel series?

Increased spatial and contrast resolution together with isotropic voxel acquisition from multidetector CT has revolutionized imaging of the abdomen. This has increased the speed of CT scanning by improving both the spatial and temporal resolution. Traditionally enteric contrast has been positive consisting of either dilute barium or iodinated water soluble contrast. CT Enterography utilizes a neutral enteric contrast agent named Volumen [E-Z-EM Westbury, New York]. This material produces luminal distension throughout the entire small bowel allowing the lumen, mucosa and bowel wall to be routinely imaged. The surrounding mesentery including lymph nodes and the vasa recti are also visible. Reformatting in both the axial and coronal planes is performed. Radiation dose is kept as low as reasonably possible to produce a diagnostic scan. Anatomical information of the entire gastrointestinal system including the vasculature,

lymph nodes and bowel wall is obtained. This information, together with the global view of the entire abdomen and pelvis, we believe provides an imaging technique that can replace traditional fluoroscopy. Examples illustrating normal small bowel anatomy and disease of the small bowel including Crohn disease will be presented.

MUELLER, Dean A., Carolyn WHITE*, Mary BERNIER*, Shiow-Hwa GAU*, and Thomas R. GEST, Division of Anatomical Sciences, Anatomical Donations Program, and Medical School Information Systems, University of Michigan Medical School, Ann Arbor, MI. Evolution of a database system for an anatomical donations program.

Anatomical donations programs must accurately maintain a huge amount of data on donors and the users of anatomical materials. Over the past decade, we have evolved our methods of maintaining these records to take advantage of the most recent technologies. Six years ago, we moved our FileMaker database to an Oracle database that is web-accessible and secure. This database is used in all aspects of operations, including generation of various form letters, billing, and specimen allocation and tracking. An alert system generates email notifications whenever anatomical materials approach a specified length of use. Our morgue and donations facilities are equipped with wireless ethernet, and we have implemented a system of laptop computers and an industrial barcode printer to help our program in specimen tracking. Barcodes are generated for every anatomical specimen so that accurate tracking can be rapidly achieved with the minimum possibility of data entry errors. Barcodes are printed on metal tags capable of withstanding the harshest physical and chemical environments, including acetone and silicone used in plastination.

NAYERI, Zainab*, A. Vaughn JACKSON*, Quentin A. FOGG and Lancelot G. NASH. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA. Complex anatomy of the extensor carpi radialis tendons in the hand.

The extensor carpi radialis muscles are commonly described as being attached to the second and third metacarpals. Precise knowledge of their attachment and surrounding structures is important to reconstruction of traumatic hand injuries, and for accurate portal placement for wrist arthroscopy. This study aims

to investigate the accuracy of the common descriptions. Cadaveric limbs were dissected (n = 20). In all cases the extensor carpi radialis longus (ECRL) muscle was attached to the second metacarpal. In only two cases was the extensor carpi radialis brevis (ECRB) muscle attached to the third metacarpal alone. In the remaining cases (n = 18) the tendon straddled the joint between the second and third metacarpals, supported by a fibrous plate which was invaginated into the joint space. The distal attachment of the ECRL (n = 14) and ERCB (n = 18) tendons merged with the first or second dorsal interosseous muscles. Branches of the radial artery were passed radial to the ERCB tendon (n = 7), deep to the ERCB tendon (n = 5) or both (n = 8). These data suggest that the distal attachments of these tendons are much more complex than previously described, and warrant further investigation.

NORTON, Neil S., Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE. An anomalous split of the lingual nerve within the infratemporal fossa.

The lingual nerve arises from the mandibular division of the trigeminal nerve in the infratemporal fossa. Deep within the infratemporal fossa, the chorda tympani nerve will join the posterior part of the lingual nerve. The lingual nerve passes between the medial pterygoid and the ramus of the mandible to enter the oral cavity bounded by the superior constrictor, medial pterygoid, and mandible. The lingual nerve supplies the mucous membrane of the anterior 2/3 of the tongue, floor of the oral cavity, and gingiva on the lingual aspect of mandibular teeth. In dentistry, the lingual nerve is normally anesthetized during an inferior alveolar nerve (IAN) injection because it lies immediately anterior to the IAN at the normal injection site. We report an anomalous situation, occurring bilaterally, that was observed during routine dissection. In this cadaver, the lingual nerve split into two separate nerve trunks in the infratemporal fossa. One branch followed the normal path of the lingual nerve, whereas the other branch passed deep in the infratemporal fossa. These two branches joined together immediately after entering the oral cavity. This anomalous nerve is unique. In this case, IAN anesthesia would not produce adequate anesthesia along the lingual gingiva and associated structures.

O'BRIEN*, Stacey, A.[1], Michael H. CARSTENS*[2], John R. MARTIN, III[1]. [1]Center for Anatomical Science and Education, [1,2]Department of Surgery, Saint Louis University School of Medicine, Saint Louis, MO. Maternal carbon monoxide exposure and its effects on fetal cleft lip and palate development.

Important orofacial developmental stages are neural crest cell (NCC) migration, differentiation then elevation and fusion of the orofacial processes. Hypoxic conditions during the elevation and fusion stages have been shown to increase orofacial anomalies (OFA). The aims of this study were to use levels of carbon monoxide (CO) related to OSHA's standards to indicate a dose-dependent fetal sensitivity in the orofacial region to CO induced hypoxia during NCC migration and palatine shelf elevation and to generate sectional analysis of the palate to gain insight relating CO exposure to distortions in palate formation. Pregnant CD-1 and A/J mice were exposed to CO at 50ppm or 100ppm in balanced air, or room air during NCC migration (7.75-8.75dpc) or palatine shelf elevation (11.75-12.75dpc). At 17dpc, dams were sacrificed, pups removed and grossly inspected for an OFA. Once fixed, the fetal heads were serially sectioned at 30µm and stained. The palate was examined for the presence of an OFA and reconstructed digitally at 90µm intervals. A dose-dependent increase in OFA's in CD-1 and A/J mice resulted from exposure to elevated levels of CO during both developmental periods with the NCC period displaying a greater percentage of anomalies at both CO levels.

O'DONOGHUE, Daniel, L., Jerry B. VANNATTA*, Robert M. HAMM* and Sheila CROW*, College of Medicine, University of Oklahoma, Oklahoma City, OK.

Humanism and professionalism integrated into gross anatomy.

Anatomy can be used to reinforce humanistic approaches to medicine and access professionalism in students. This presentation will describe the process by which our students interact with the families of our cadaver specimen. Next, students are rated by non-anatomy faculty, self and peers for professionalism. For the last 7 years, during orientation to medical school, students are randomized to dissection groups. The college of medicine invites the families of the specimen/donors to a luncheon. Students learn from the families about the donor as a person but do not dwell on medical issues. After anatomy, donor families attend a remembrance service. Students' creative works supplement presentations by the

dissection groups to the families. Toward the end of the year, students are rated on honor/integrity, responsibility/accountability, leadership, altruism, care/compassion, scholarship and lastly respect. For the past three years, ratings have been consistent and peers rate students higher then they rate themselves. Faculty members give lower ratings, in comparison. Our students' experiences are an opportunity to acquire ideals we hope to instill and reinforce peer-evaluation.

OH[1], Chang-Seok, Hyung-Sun WON[2], Kyu-Seok LEE[3], and In-Hyuk CHUNG[2]. [1]Department of Anatomy, Samsung Biomedical Research Institute, Sungkyunkwan University School of Medicine, [2]Department of Anatomy and Brain Korea21 Project for Medical Sciences, Yonsei University College of Medicine, [3]Department of Anatomy, Kwandong University College of Medicine. The origin of the radial nerve branch innervating the brachialis muscle.

The brachialis muscle is dually innervated by musculocutaneous nerve running via the anterior division of the brachial plexus, and radial nerve running via the posterior division of the plexus. This study was performed to clarify the route of the radial nerve branch innervating the brachialis in the brachial plexus, and to investigate its origin at the root of cervical nerves. Eighteen samples including the brachialis and the brachial plexus were kept in the solution of 0.1M Guanidine-HCl to soften the connective tissue surrounding the nerve bundles. The radial nerve branch innervating the brachialis was traced up to the cervical nerve roots under a surgical microscope. All the radial nerve branches innervating the muscle, ran via the posterior cord, the posterior division and the superior trunk in the brachial plexus, suggesting that the brachialis might have dual embryonic origins; the superficial part innervated by the musculocutaneous nerve arises from the ventral muscular primordium, and the deep part innervated by the radial nerve arises from the dorsal primordium. The radial nerve branches arose from C5 in 6 cases, C6 in 8 cases, C5 and C6 in 3 cases, C6 and C7 in 1 case. (Sponsored by Grant No. E00002 from Korea Research Foundation)

OLINGER*, Anthony, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science

University, Western States Chiropractic College, Portland, OR. Correlation between the branching pattern of the subscapular and posterior humeral circumflex artery and their spatial relationship to the posterior cord of the brachial plexus.

This study quantifies the frequency of variant branching of the distal two-thirds of the axillary artery, how those vessels are distributed and their special relationship with the posterior cord of the brachial plexus. Anatomical variations in the branching pattern of the axillary artery are common and typically include the subscapular, lateral thoracic and the posterior humeral circumflex arteries. Previous investigations of single specimen dissections demonstrate numerous variations to axillary artery branching but the frequency of these occurrences are unclear. The axilla of 166 cadavers were dissected to allow examination of the vasculature. Data were collected regarding the branching pattern of the subscapular, the lateral thoracic, and posterior humeral circumflex arteries, as well as those branches' spatial relationship to the two terminal branches of the posterior cord. Numerous variations were observed involving the lateral thoracic, subscapular, circumflex scapular, thoracodorsal and posterior humeral circumflex arteries. Alternate distributions and specific patterns in the positions of the posterior cord were also observed. These findings are relevant to both anatomical and clinical fields as it provides evidence as to the frequency of variant axillary artery branching as well as the potential for neurovascular elements to exist in a location other than their classical anatomical description.

OLINGER*, Anthony[1], and Brion BENNINGER. Department of Surgery, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Oregon Health and Science University, Western States Chiropractic College[1] Portland, OR. Unique course of the infrequent extensor carpi radialis accessorius muscle observed bilaterally.

The purpose of this study is to report the finding of the infrequent extensor carpi radialis accessorius muscle observed bilaterally in a 90-year-old male cadaver. An accessory extensor carpi radialis muscle was observed bilaterally in a 90 year-old male cadaver. The muscle originates from the lateral humeral epicondyle as a separate muscle between the extensor carpi radialis longus and brevis muscles and fits the description of the rare extensor carpi radialis accessorius. As the accessory muscle courses distally, it turns laterally to travel with the

outcropping muscles of the thumb. Just proximal to its insertion, its tendon splits and inserts onto the first metacarpal and abductor pollicis brevis muscle bilaterally. Despite traveling deep to antebrachial fascia along its entire course, the tendon does not pass under the focal thickening of that fascia that is the extensor retinaculum, nor through any sort of muscular tunnel on the lateral aspect of the wrist. Numerous descriptions of the morphology and course of the extensor carpi radialis accessorius exist; however, no descriptions of a bilateral version of the muscle following this course was found, thus making it a novel form of the muscle.

OLSON, Todd R.[1], Peter DAMA[2], Andrew LATTIMORE[3], Norman GOLDBERG[4], Sherry A. DOWNIE[1]. [1]Department of Anatomy and Structural Biology, [2]Graphic Arts Center, Albert Einstein College of Medicine, Bronx, NY; [3]Atelier Studio, Cornwall, NY; [4]Department of Communications, Yeshiva University, New York, NY. "Da Vinci Nights" in the dissection studio: a source of artistic and humanistic inspiration from the Renaissance to today.

The desire to understand and know the internal structure of the human body in order to more realistically represent it in paintings and sculptures was one of the driving motivations that stimulated both Leonardo da Vinci and Michelangelo Buonarroti to engage in the clandestine study of anatomy through dissection. The historically important 16th Century work of Andreas Vesalius is memorable as much for its artistry as for its detailed exposition of the body's structure. Through succeeding centuries, human anatomy remained an essential discipline in the apprenticeship and formal education of both artists and physicians. Lamentably, the 20th Century's progressive embrace of science by medical educators did not also encompass the previously appreciated inspirational power inherent in the exploration of the human body by dissection. Today, medical education struggles to break away from its pedagogic focus on the inculcation of scientific knowledge and to re-emphasize humanistic attitudes and behavior in the training of physicians. "Da Vinci Nights" in the dissection laboratory were created to promote this contemporary experiential renaissance. The inaugural "Da Vinci Night" at Einstein was held at the end of the anatomy course when one of the dissection laboratories was transformed into an artist's studio. MS-1 and MS-2 students were invited to participate in a drawing lesson supervised by a classically trained New York painter (AL). The inaugural dissection studio, supported by the

College's Graphic Arts Center (PD), was attended by 16 students. Thirty-one people were turned away! The drawings and testimonials from those attending and the photographs taken during the event (NG) attest to the power and positive reaction of everyone, including anatomy faculty, who participated. Next year, we are planning three "Da Vinci Nights": the first on the heart after it has been removed from the chest, another on the skull during the head and neck unit, and again one on the forearm and hand at the end of the course.

OLSON, Todd R.[1], Charles E. SCHWARTZ[2], Alice FORNARI[2], Elizabeth LEE-REY[2], Sherry A. DOWNIE[1]. [1]Department of Anatomy and Structural Biology, [2]Department of Family and Social Medicine, Albert Einstein College of Medicine, Bronx, NY.
The Generalist Physician Anatomy Faculty (GPAF) Program: anatomy and dissection as a patient-centered clinical learning experience.

Dissection creates an extraordinary opportunity for students to discern the individuality and physical history of a cadaver and to discover pathologies, evidence of surgeries, implants and alterations, variations and vestiges. General internists and family practitioners are uniquely qualified to mentor students throughout this discovery process because of their broad and holistic approach to patient care. The GPAF Program assigns a generalist physician to interact with each student team and explore the medical, behavioral, psychosocial and cultural context of dissection findings from a patient-centered perspective. The program begins in the laboratory when the GPAF mentor and students meet each other and the cadaver for the first time. The generalist reviews surface anatomy, pointing out its relevance to the physical exam and clinical practice, and encourages students to reflect on this experience. Subsequently, the students write a Surface Anatomy Report that includes clinical speculations about the origin of their physical findings and how these conditions may have affected the living individual. The GPAF mentor provides feedback on this report. The GPAF-Student interaction continues in each regional dissection unit via online postings and blogs on the ARI website. At the conclusion of the course, student teams write a “summative report” integrating their regional findings and hypotheses into a comprehensive evidenced-based speculation about how disease, trauma and surgical intervention could have affected their cadaver's health and functional abilities during life. The

generalists complete their contribution by reading and grading these patient-centered summary narratives. The GPAF Program creates a novel and innovative educational environment for practicing clinicians, not typically involved in anatomy courses, to expose students to the emotional and intellectual complexities associated with developing professionalism and learning how to treat and care for patients. The GPAFs play a central role at a formative time in helping students to appreciate the importance of integrating a patient-centered perspective with the acquisition of essential biomedical knowledge (anatomy) and technical skills.

PAI, Mangala M*, Varsha NAYAK*, and Latha V. PRABHU*, Department of Anatomy, Kasturba Medical College, Mangalore, KA, India. Anthropometric study of the inguinal region and its relevance in inguinal hernia.

Abdominal wall is the site of opposing physical forces that may eventually result in the appearance of the hernias. The external abdominal hernias are the most common forms, the inguinal hernia being the commonly encountered type [75% of the abdominal hernia]. Many factors are responsible for the formation of the inguinal hernia but, what makes a few people more susceptible to this situation is still clearly not proved. Few of the previous studies have concluded that the low lying pubic tubercle is associated with the development of the inguinal hernia. This study was designed to investigate the distance between the anterior superior iliac spines and the perpendicular distance of the pubic tubercle from the interspinal line in 78 males with inguinal hernia and the same was compared with the control group comprising of 75 adult healthy males. This study revealed that both the parameters in the study group were significantly greater than that in the control group. The distance from mid inguinal point to the superficial inguinal ring was also measured in both the study and control groups and the results show that the distance is shorter in the individuals with the inguinal hernia.

PAI*, Shakunthala R., Huban THOMAS*, Mamatha SRINIVASAN* and Anuj JAIN*. Relation of Sciatic Nerve to Piriformis Muscle in South Indian Human Cadavers.

Purpose: In majority of cases the sciatic nerve lies ventral to the piriformis muscle and it emerges from the inferior border to continue distally. However, it may divide into its two parts within

the pelvis and its relationship to piriformis muscle then becomes variable. Materials and methods: In the present study, the relation of the sciatic nerve to the piriformis muscle was studied in 36 specimens (18 cadavers) during routine dissection in Anatomy Department. The variation was recorded and illustrations were prepared from the actual specimens. Variations of sciatic nerve were classified into Typical and Atypical groups. Results: In one specimen, unilateral variation on the left side was observed. In this, the two divisions of sciatic nerve were passing above and below the two heads of piriformis muscle (fleshy and tendinous bellies). The common peroneal nerve (dorsal division) was passing above the piriformis and tibeal nerve (ventral division) was below the piriformis muscle. They joined at the lower border of piriformis. Conclusion: Such variation of sciatic nerve in relation to piriformis muscle may be of considerable help to the orthopaedic surgeons operating in that area, for sciatic nerve block and administering intramuscular injection in gluteal muscles.

PARK, Hyuoung Woo[1], Won Kyu KIM[2], Tae Ho BYUN[3], Jeong Tae KIM[3.] Dept. of Anatomy, College of Medicine, Yonsei University[1] 134 Shinchondong, Seodaemungu, Seoul, 120-752, Korea; Dept. of Anatomy[2] and Plastic Surgery[3], College of Medicine, Hanyang University; 17 Hangdangdong, Sungdonggu, Seoul, 133-791, Korea. A study on the development of upper eyelid in Korean embryos and fetuses.

The eyelids are one of the important part in the plastic surgery. It is required a careful reconstruction to repair eyelid trauma. In addition, congenital abnormalies of the eyelids result from aberrations in the various developmental stages. Thus, in order to provide basic understanding for gross anatomical structures and give a chance to understand mechanisms of congenital anomalies in the upper eyelids, the authors have studied 18 cases of embryos and 29 cases of fetuses to demonstrate the development of the upper eyelid in Korean. The external feature of the developing upper eyelids are photographed by stererscope and digital camera, and the internal structures are studied by hematoxylin and eosin, Gomori's and Masson's trichrome stains.The results obtained were as follows: Upper eyelid fold develops in stage 18 (Carnegie stage). Upper and lower eyelids begin to fuse with each other from the lateral side in stage 22, and their fusion is completed at the 9th week. Re-opening of the eyelids is completed at the 20th week. Follicles of

eyelash and orbital part of orbicularis oculi muscle is formed at the 12th week, and eyelash and its appendages and tarsal plate under the mesenchymal condensation are found at the 14th week. Tarsal gland begins to develop within the tarsal plate at the 18th week. Central fat pad and preseptal fat are formed at the 16th and 18th week, respectively. Each arterial arcades develops from the 14th week. Ciliary part of the orbicularis oculi muscle is found at the 28th week. Orbital septum and aponeurosis fo levator palpebrae superiois run parallel to each other at the 12th week, thereafter they fuse with at 20th week and insert into the ciliary part of orbicularis oculi together at the 32nd week. Muller's muscle appears at the 14th week, and its tendon is attached to the tarsal plate at the 16th week. In summary, upper eyelid in Korean appears at the end of 6th week, and re-opening of both eyelids are occurred during fetal period. In addition, many structures inside upper eyelid begin to form from the 12th week, and are very similar to adult structures at the 36th week. Consequently, it is suggested that these results help to understand the basic anatomical differences of levator palpebrae superioris, Muller's muscle, orbital septum and fat tissures between Korean and Caucasian. In addition, it it thought that further studies are needed to understang the developmental differences between the upper and lower eyelids.

PARK* Jin Seo, Min Suk CHUNG*, Jun Won LEE*, Dong Sun SHIN*, and Yong-Wook JUNG*. Department of Anatomy, Dongguk University College of Medicine, Republic of Korea, and Department of Anatomy, Ajou University School of Medicine, Republic of Korea (sponsored by Chang-Seok Oh). MRIs, CTs, and advanced anatomic images of female cadaver pelvis.

Anatomic images of human body with real color and high resolution have certain advantage in learning and teaching of anatomy. The anatomic images of female pelvis would be applied in many ways by clinicians who work in those fields. Therefore, we have made 2,500 anatomic images (horizontal direction, 0.1 mm intervals, 0.1 X 0.1 mm pixel size, and 48 bit color) by serial-sectioning of the female cadaver pelvis. In addition, we have made 220 3T MRIs and 220 CTs (1 mm intervals, 1 X 1 mm pixel size, and 16 bit color) of the same cadaver pelvis. The MRIs and CTs corresponded to the anatomic images. In this research, advanced technique and equipment enabled us to prepare the MRIs, CTs, and anatomic

images of pelvis. They are expected to contribute to understanding of topographic anatomy of female pelvis.

PARYANI*, Mohammad R. and Hassan GILANPOUR* (sponsored by Quentin A. Fogg). Department of basic sciences, Faculty of veterinary Medicine, Islamic Azad University, Karaj branch, Iran. Department of basic sciences, Faculty of veterinary Medicine, University of Tehran, Tehran, Iran. Topographical study of brachiocephalic trunk in Caspian miniature horse.

Caspian miniature horse is one of the rare small horses in Iran. Brachiocephalic trunk originate from the craniodorsally of the convex part of the aortic arch and supply the head, neck, forelimbs and cranial part of thoracic cavity. It is well known that there are anatomical differences between species of animals. In this research topographical situation of branching of brachiocephalic trunk from aorta and its ramifications have been studied. Five Caspian miniature horses about two years old were used in this study. The horses were exsangunated and three horses were embalmed and two other were studied in fresh condition. The thorax was dissected in standing position and the topographical location of brachiocephalic trunk was determined relative to the ribs and intercostals spaces. These results showed that there are general similarity with some topographical variation between Caspian miniature horse and the other horses.

PATHER, Nalini and Sanushka PILLAY*. School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa. Anatomical landmarks for pediatric spinal anaesthesia.

Lumbar spinal anesthesia is a common technique used in pediatric practice. Conus medullaris (CM) trauma is a particul;lar concern in lumbar punctures and subarachnoid blocks. Recent literature documents an earlier than usual ascent of the spinal cord from the neonatal position of L3-L4 to the adult level of L1-2. This study aimed to investigate the vertebral level of CM in neonates and to relate this to the intercristal line (IL) and the posterior superior iliac spine (PSIS) which are common landmarks used in spinal anesthesia. Thirty neonatal cadavers (15 female and 15 male) were dissected to determine the level of the CM termination. The distance and number of vertebrae between the CM and the IL and the PSIS were recorded. The results demonstrated that the IL lies at a higher level. The CM terminated at the level of L2 and L3. It is proposed that the PSIS

is a safer landmark than the IL to determine the level of CM termination. The anatomical differences in pediatric patients should be highlighted as they may have practical implications in the administering of neonatal spinal anesthesia.

PEDERSEN, Ruth L., Terry D. REGNIER, Dean R. FISHER and Karen M. MILLS, Department of Anatomy, Mayo Clinic, Rochester, MN. The Convocation of Thanks: A Meaningful Memorial Service for Donor Families and Students.

The bequeathing of one's body to science is one of the most altruistic decisions that a person can make. In honoring this decision, it is important for the family and the students to come to closure with this gift. The Convocation of Thanks is a memorial service that was created to allow family and students to join together for closure. The Mayo medical students and physical therapy students have created a service that honors this gift. Each year on the first Saturday in May, the students invite recent donor families to the Mayo campus for a service of singing, poetry and prose, followed by a brunch and fellowship. The planning starts in January, when medical students and physical therapy students volunteer for committees. These committees consist of two chairpersons, one from each class; a booklet, flower, program, music, ushering, and food committee. A member of the Anatomy staff speaks on behalf of the donor program and a chaplain from Mayo finishes the Convocation with words of closure.

PERRY, L. Amanda[1], Pranjal PATEL[1], Sonali PATEL[1], M. Josh PHILLIPS[1], James M. WILLIAMS[2], and Vassyl A. LONCHYNA[2]. Rush Medical College[1], Department of Anatomy and Cell Biology[2], Rush University Medical Center, Chicago, IL, USA Buhler's anastomotic artery: long forgotten in the annals of anatomy.

There are many arterial anastomoses (AA) throughout the human body. The overlapping blood supply in watershed areas may be lifesaving if a supplying artery has an occlusion or stenosis. Buhler's AA (BAA), described in 1904, between the superior mesenteric artery (SMA) and the celiac trunk (CT) is a long forgotten anastomosis that is reemerging because of an increase in surgical procedures such as liver transplantation and pancreatic resections. While dissecting a 79 year-old Caucasian female cadaver, our group discovered an unusual accessory right hepatic artery (aRHA). The proper hepatic artery (PHA)

gave off both right and left hepatic arteries. The aRHA from the SMA coursed laterally, posterior to the portal vein and anastomosed with the PHA. This anomalous artery gave off the dorsal pancreatic artery, the superior pancreatico-duodenal artery, the aRHA, the cystic artery respectively and then anastomosed with the PHA. The anastomosis between the aRHA and the PHA is called BAA. There are reports in current radiologic and surgical journals as a result of their significance in liver transplantation. The BAA takes on hemodynamic significance when there is an occlusion of the CT or the SMA. Preoperative identification of this anomaly is important in planning hepatico-pancreatic operations.

PICHLER Wolfgang[1]*, Gunther WINDISCH[2]*, Gottfried SCHAFFLER[3]*, Stephan GRECHENIG[1]* and Andreas H. WEIGLEIN[2]. [1]Department of Traumatology, [2]Institute of Anatomy, and [3]Department of Radiology, Medical University Graz, Austria.
CT-aided three dimensional measurements of the Lister's tubercle and its consequences on volar plate fixation of distal radius fractures.
The objective of this study was to measure the height of Lister's tubercle and the depth of the extensor pollicis longus (EPL) groove to assess the risk of injury to the EPL tendon when perfoming volar plating of distal radius fractures. Measurement of length and height of Lister's tubercle and the depth of the EPL groove were obtained from CT scans of 20 forearms using a 64-slice Siemens SOMATOM Sensation® CT system (Resolution 0.6mm) and 3D rendering by MIMICS® software (Materialise, Leuven, Belgium). The size of Lister's tubercle varied from 1.4 to 6.6mm (m: 3.5mm) in height radial to the tubercle and from 5.6 to 16.3mm (m: 13.3mm) in length. The depth of the EPL groove varied from 0.6 to 2.5mm (m: 1.4mm). The height on the ulnar side, between the depth of the groove and the tip of the tubercle (combined height) varied between 2.2 and 5.8mm (m: 3.3mm). In conclusion, the varying individual and combined height of Lister's tubercle and the depth of the EPL groove needs to be considered in volar plating of distal radius fractures. Thus, determination of presence and amount of pastpointing of the distal screws may be difficult if not impossible.

PORTA[1], David J., Andrew R. KEMPER[2]*, Charles BARRETT, JR.[1]* and Stefan M. DUMA[2]*. [1]Department of Biology, Bellarmine University, Louisville, KY. [2]Virginia Tech – Wake

Forrest Center for Injury Biomechanics, Blacksburg, VA. Is traction a reasonable mechanism of injury explaining an isolated ruptured lumbar disc?

A published case report implicated traction as the cause of an isolated lumbar disc rupture. In an attempt to quantify the distracting force needed to cause such an injury, 8 embalmed spines (6 females age 55-83, 2 males age 55 and 84) were tested. L-1 was potted in casting resin and a cable winch applied traction force to the pelvis through an in-line force transducer (Omega DLC 101-5K). Traction was increased over 5-10 seconds until gross failure was detected. The potting failed in 2 specimens (at 128 and 218 lbf.). In the remaining 6, failure force ranged from 195 - 270 lbf. and no isolated ruptured discs were produced. Three tests resulted in sacral fractures (avg. 237 lbf.) and 3 resulted in vertebral fractures (avg. 226 lbf.) with associated ligamentous injuries. An MTS 810 Materials Testing Machine was utilized to apply traction force to 2 unembalmed male spines (ages 61 and 41). Failure occurred at 313 and 505 lbf (after 10 and 13 mm displacement respectively) and in both cases there were vertebral fractures and ligamentous injury- no disc ruptures. It appears from these experiments that traction is an unreasonable mechanism of injury to explain an isolated ruptured lumbar disc.

PRABHU*, Latha V., Anu V RANADE*, Rajalakshmi RAI* and Prameela MD*. Department of Anatomy, Kasturba Medical College, Mangalore, KA, India. Incidence of Extensor digitorum brevis manus muscle and the other additional extensor tendons to the index finger: An emphasis on its anatomic and clinical aspects.

The Extensor digitorum brevis manus, a supernumerary muscle in the fourth extensor compartment of the dorsum of the wrist, is relatively a rare anomalous muscle. Extensor digitorum brevis should be included in the differential diagnosis of soft tissue masses on the dorsal aspect of the hand as it may mimic cystic, neoplastic, inflammatory, and infectious masses arising in the dorsum of the wrist. Seventy two upper limbs of male and female cadavers were dissected and examined to study the pattern of extensor tendons of the index finger. In the present study we observed three cases of the extensor digitorum brevis manus on the left side. In one cadaver there was an additional tendon arising from the extensor indices which was inserted to the radial side of the dorsal digital expansion of the index finger. According

to earlier studies, the extensor digitorum brevis manus muscle are found in those individuals where the extensor indicis is absent. The aim of the present study is to report the incidences of this muscle there by creating awareness of its existence and of its characteristic appearance to the surgeons.

PRABHU Shiv*[1], Charlie QIU*[1], Brandi SCHMITT[2], Chi-Cheng CHU*[1] and Rajit GADH*[1]. [1]Wireless Internet for the Mobile Enterprise Consortium (WINMEC), UCLA, Los Angeles, CA. [2]Univ. of California, Office of the President, Oakland, CA.
SpecimenTrak: a demonstration of the anatomical specimen tagging and tracking.

SpecimenTrak is an RFID-based Windows based system developed using the .NET Framework 2.0/3.0 at Wireless Internet for the Mobile Enterprise Consortium (WINMEC) RFID Lab, UCLA. It has two different modalities – a 'desktop' station for preparation and administrative activities and a 'mobile' station with secure wireless connectivity for locating and inventory audit. The architecture is modular and intuitive. It captures the logic of the process workflow and streamlines the activities of a standard anatomical materials program. The activities supported by the current version of SpecimenTrak span from cataloging of specimens at the point of preparation through to disposal which will be explained and demonstrated. Different features in each of the modules, which guide the personnel through the workflow, will be highlighted. The association of the unique tag ID and the specimen code which facilitates identification of the specimen based on different parameters such as facility, date of cataloging, type, and donor will be discussed at length. Other features including precisely locating a specimen with respect to a container and facilitating inventory audits in real-time will be shown. Issues such as complete data capture, mitigation of protocol and practice oversight, securing and minimizing the misplacement and improving productivity will be discussed. "(Sponsored in part by WINMEC, UCLA and Office of the President, Univ. of California)"

PRABHU, Shiv*[1], Charlie QIU*[1], Chi-Cheng CHU*[1], SCHMITT Brandi[2] and Rajit GADH*[1]. [1] Wireless Internet for the Mobile Enterprise Consortium (WINMEC), UCLA, Los Angeles, CA. [2] Univ. of California, Office of the President, Oakland, CA.
SpecimenTrak: an RFID system for tagging and tracking anatomical specimens.

SpecimenTrak is an ongoing research activity at the UCLA – WINMEC RFID Lab. The application was created for tracking anatomical specimens using Low Frequency – Radio Frequency Identification (RFID) technology. In this research, attempt has been to develop and observe RFID-assisted processes to automate the workflow of anatomical materials services throughout the entire duration of the life cycle (receipt, inventory, allocation and disposal) of the specimen. The discussion will cover system architecture, different system modules and features in the current version of the system. Salient operational features of the system are the ability to assign unique identity to an individual specimen, assign a location to the specimen, accurate and instant tracking and tracing capability using the unique identity, maintaining hierarchy between the specimen harvested from a donor, detail specimen related activity and event logs, and maintain chain of custody. Potential benefits are data entry error mitigation, improved productivity and accountability, better security and anti-pilferage measures, automatic supervisory oversight, rapid inventory reconciliation, and better regulatory and protocol compliance monitoring. The system trial planning, pilot studies, deployment issues and other results will be presented. Future development and the potential of using this system in other healthcare applications will also be shared. (Sponsored in part by WINMEC, UCLA and Office of the President, Univ. of California).

PURDY*, Lisa, Cady BLACKEY* and Jennifer BRUECKNER. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY. A novel approach to teaching and learning embryology through origami.

This abstract describes a collaborative effort between students and faculty in the design and creation of an innovative instructional manual that will be used in both teaching and learning medical embryology. The goal of this manual is to better incorporate active learning and visual conceptualization into the study of human development. The need for this project stems from the inherently abstract nature of embryology; it is difficult to imagine and envision the structures and events that define this topic area. Traditional academic medicine does not teach embryology in an effective three-dimensional manner. Two dimensional line drawings are the primary teaching tool for this course in medical schools across the nation. Published textbooks define developmental events either by time or organ

system and fail to integrate the two in an effective spatiotemporal manner. Student understanding of the "big picture" suffers as a result. The manual will consist of two unique features that together will present the material in a spatiotemporal manner in tune with the true nature of events: 1) paper patterns (akin to those used in sewing) for creating 3D models of embryonic structures through cutting, folding and taping and 2) flow charts of developmental processes that incorporate both structural and temporal concepts in development.

RADI*, Sanaa H. and Mohamed B., ATTALLAH*, Alexandria Faculty of Medicine, Departments of Histology and Otorhinolaryngology. Early surgical interference in juvenile otosclerosis : a clinical and histological study.
Stapes surgery for correction of conductive hearing loss in children, caused by otosclerosis, is a scarcely done procedure for fear of the risk of post-operative sensoneural hearing loss. This study aimed at evaluation of the role of early surgical interference in these cases based upon the postoperative outcomes and the progressive histological changes affecting the stapes footplate with advancement of the disease with age. Twenty two children and six adults suffering from juvenile onset otosclerosis were operated upon. The footplate of the stapes were harvested and prepared for histological examination. Four normal stapes bones obtained from cadaver were also histologically examined as control group. The hearing results pre- and post-operatively were compared. The histological study of the footplate of the stapes revealed that microscopic changes were progressive with the duration of the disease; the more the time lapse after the onset of the hearing loss, the more the changes and the hardening of the footplate cartilage took place.

RANADE, Anu V*, Raghuveer C. VASUDEVAN*, Vinodini N. ANANTHARAYA*, Rekha D. KINI*, and Nayanatara A KUMAR*. Role of administration of vitamin E on the histopathological changes in the rat testis following torsion and detorsion. Testicular torsion is a medical emergency, especially in neonatal or adolescent males.
Testicular atrophy is a common clinical outcome and is a significant urological issue. It is evident from literature that use of antioxidants in the prevention of testicular reperfusion injury following detorsion is conflicting. This study was designed to know the role of Vitamin E on testicular reperfusion injury

following detorsion. Male Wistar albino rats were divided into Group I,II, III and IV. The animals of Group IV were pretreated with 100mg/kgbw Vitamin E for 30 days. Ischemia was induced manually by rotating the testis 720° clockwise and counter rotated for reperfusion. The testis was fixed in Bouin's fluid and processed for histopathological examination. The present study showed a significant decrease in the standard tubular diameter and the epithelial height in Group III compared to Group I and II. However, upon pre-treatment with vitamin E (Group IV) the seminiferous tubules in these animals showed a recovery in the standard tubular diameter and epithelial height when compared to their untreated control groups. The results of this study showed that vitamin E can offer better protection as it can block the release of oxygen free radicals from many sources. (Sponsored by Medical Education and Research Trust, Karnataka).

RASK*, Ted and Brion BENNINGER, Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, OR. Using 3D visual anatomy; Visual Human Dissector Pro ™ improves navigation of imaging anatomy.

Does exposure to 3D anatomical images at twice weekly intervals as formal presentations improve students' navigation of imaging anatomy? Many anatomical courses are incorporating radiological anatomy using various image mediums based on 2D imaging. One of the challenging skills for any healthcare provider or anatomist is the ability to recognize and understand the relationships of various anatomical structures on cross-sectional images. Several texts and computer programs demonstrate static 2D cross-sectional anatomy with excessively labeled images. We chose a 3D human anatomy program to better aid orientation and knowledge of anatomy. Using Visual Human Dissector Pro ™ on an actual 3D screen (6ftx15ft) designed for Oregon 3D, students received a 15-minute informative navigational tour of human anatomical cross-sections which related to corresponding radiology. We applied cognitive load theory throughout the study. Following each tour, students entered the dissection lab and compared CT and MRI cross-sections with the day's dissection in lab. We assessed their knowledge of radiological anatomy, ability to navigate images, and comfort levels. Results revealed both high scores on didactic exams and increased comfort levels when assessing

anatomy from images. This suggests, students benefit when exposed to 3D anatomy prior to lab dissection and radiological images.

RAVICHANDIRAN Kajeandra[1], Mayoorendra RAVICHANDIRAN[1], Karan SINGH[1]*, Michele OLIVER[3]*, Nancy MCKEE[1]* and Anne AGUR[1], [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada, [2]Department of Computer Science, University of Toronto, Toronto, Ontario, Canada, [3]Biological Engineering, University of Guelph, Guelph, Ontario, Canada. Comparison of computation of physiological cross sectional area directly from a 3D computer model and indirectly from equation based methods.

Introduction: Physiological cross-sectional area (PCSA), used for muscle force comparisons, has been calculated by PCSA=Volume* cos (PennationAngle)/Fiber Bundle Length. This calculation is based on idealized whole muscles rather than individual fiber bundles. Purpose: To compute PCSA of extensor carpi radalis brevis(ECRB) and pectoralis major(PM) directly from muscle models, constructed from densely digitized fiber bundle(FB) data, and compare with the muscle level equation. Methods: Digitized FBs of ECRB (100-150FBs/muscle; n=8) and PM (700-800FBs/muscle; n=3) were used to construct 3D models. For the equation, PCSA was calculated using means of all digitized bundles for its parameters. To determine PCSA directly from the model, each FB was represented as a cylinder with a radius half the distance to the closest digitized FB; all FBs' CrossSectionalArea*cos(PennationAngle) were summated. Results: PCSA methods compared with paired t-test showed no statistical significance ($p<0.05$) for either muscle. Computationally, PCSA of ECRB was 6.11±1.29 cm^2 and from equation 5.73±1.33 cm^2; PM 18.02±1.69 cm^2, 18.23±2.04 cm^2 respectively. Conclusion: Fick (1911) emphasized the importance of including the CSA of all muscle FBs when defining PCSA. Many muscles do not have a single plane where all muscle fiber bundles are found due to varying FB arrangements (Brand, 1981). Use of densely digitized FBs assures inclusivity of FBs and overcomes concerns about sparse fiber bundle parameter measurements.

RAVICHANDIRAN Mayoorendra[1], Kajeandra RAVICHANDIRAN[1], Karan SINGH[1]*, Michele OLIVER[3]*, Nancy MCKEE[1]* and Anne AGUR[1] [1]Division of Anatomy, Department of

Surgery, University of Toronto, Toronto, Ontario, Canada, [2]Department of Computer Science, University of Toronto, Toronto, Ontario, Canada, [3]Biological Engineering, University of Guelph, Guelph, Ontario, Canada. Use of motion capture to quantify normal and abnormal hand function.

Introduction: Motion capture has been used to define motion spaces of each digit to create more realistic hand animations. This technology may be used clinically to quantify abnormal hand movement. Purpose: To explore the possibility of creating a database of normal and abnormal hand movement using motion capture. Methods: Ten normal and four subjects with hand pathology were assessed while performing a defined motion drill. A six MX-3+ camera Vicon Motion Capture System at 100 frames/second was used. Eleven retroreflective markers placed on the dorsum of each hand, two on each digit over the interphalangeal joints and one at the wrist were used to track movement while performing the motion drill. The kinematics of hand movements were compared using Maya™. Results: Preliminary results suggest that the movements of normal and abnormal hands can be quantified using motion capture. In the abnormal hand, the timing and range of movements of individual digits were altered compared to the movements of the normal contralateral hand. Some subjects with hand problems commented on lack of awareness of how differently the two hands behaved. Conclusions: Motion capture could be developed to aid in diagnosis and treatment of hand pathology. Incorporating motion capture into rehabilitation protocols would allow for feedback on performance.

RAY, Biswabina*, Brijesh KUMAR*, Shahin A. HUNNARGI*. Department of Anatomy, Kasturba Medical College, Manipal, KA. Non-metrical variations of basioccipital region.

Purpose: Non-metrical variations of basiocciput are of interest for anatomists and clinicians because they produce clinical symptoms or lead to misinterpretations of radiological images. This is the first report on non-metrical variations of basiocciput observed in Nepal and first comparative study between Indian and Nepalese variations. Materials and Methods: 202 dry human occipital bones (12) and crania (190) belonging to Indian (167) and Nepalese (35) population were examined for non-metrical variations of basiocciput over a period of six years. Variations were divided into hyperostotic and hypoostotic goups. Results: Morphological variations observed in the present study were

precondylar tubercle, third occipital condyle, exostosis on anterior margin of foramen magnum (hyperostotic), basioccipital cleft, fossa navicularis (hypostotic). Precondylar tubercles were the only variation observed in skulls studied in Nepal. Significant differences with previous studies were observed in the incidence of precondylar tubercles, fossa navicularis and basioccipital cleft. Incidence of hyperostotic variants was lower and hypostotic variants was higher than previous reports in most instances. Conclusions: Unique findings of this pilot study will be useful not only to radiologists, anatomists and surgeons interested in the skull base and basiocciput in particular but also to study anthropological significance and guide future researchers in this field.

RENGIER*, Fabian, Sara DOLL, Joachim KIRSCH*, Hendrik VON TENGG-KOBLIGK*, Hans-Ulrich KAUCZOR*, and Frederik L. GIESEL*. Department of Radiology E010, German Cancer Research Center Heidelberg, Germany and Department of Anatomy, University of Heidelberg, Germany. Radiological virtual anatomy course for first-year medical students: is there an additional benefit compared to the traditional dissection course?
The purpose of this study was to develop a radiological virtual anatomy course for first-year medical students supporting the traditional dissection course. We investigated if this combined approach to learning human anatomy provides additional benefits to the participating students. The course ran in parallel to the gross anatomy lab and emphasized especially those structures which are difficult to dissect. Up-to-date image post-processing software was used for interactive viewing of computed and magnetic resonance images, corresponding anatomical cross-sections and three-dimensional volume rendering. Anonymous evaluation among the 120 participating first-year medical students was performed using a five-point scale ranging from full agreement to full disagreement. The majority agreed that i) the course provided additional benefits to the traditional dissection course (full agreement 76.7%; overall agreement 99.2%), ii) that it helped to better understand difficult anatomical topics and topographical relations (full agreement 59.2%; overall agreement 95.8%) and iii) it led to greater enthusiasm for anatomy (full agreement 20.8%; overall agreement 83.3%). In conclusion, the radiological virtual anatomy course provides great additional benefits for first-year medical students. In particular, it improves three-dimensional

appreciation of human anatomy, which is crucial for every day clinical practice.

REZAIAN, Maryam and Mohammad E. AKBARI*. Division of Histology, Department of Basic Sciences, Faculty of Veterinary Medicine, Tehran University, Tehran- IRAN. Histological study of the cervix in Caspian Miniature Horse.

Cervices of 4 female adult (3-4 years) healthy Caspian miniature horses were studied histologically at breeding season. Samples of 1cm thickness from endocervices and exocervices were fixed with 10% buffered formalin. Routine histological laboratory methods were used and paraffin sections were stained with H& E and PAS and studied under light microscope. The endomertrium of the endocervices comprised of wide and large primary papillae with, secondary and tertiary papillae on them. Simple columnar epithelium with a few ciliated and secretory cells were covered the mucosa. Lamina propria submucosa composed of dense fibrous connective tissue. Smooth muscle fibers from the inner circular muscle layer entered to the base of the primary papillae. Simple tubular gland was observed at the base of secondary papillae. Muscle layers were in two layers of inner circular and outer longitudinal. A small vascular layer was seen between 2 muscle layers. Serosa covered the cervix from the outside. the mucosal papillae of the exocervices had shorter primary, secondary and tertiary papilla with various types of epithelia, namely, simple columnar, nonkeratinized stratified squamous and a transitional form from simple columnar to stratified squamous. Few or no mucosal gland was seen. Remainder layers were the same as in endocervices.

RICHARDSON, April D., Nathan F. JOHNSON, Brian MACPHERSON, and Jennifer K. BRUECKNER. Department of Anatomy and Neurobiology, University of Kentucky, KY. Comparison of podcasting as a learning tool for cross-sectional anatomy among populations of medical professional students.

Cross-sectional anatomy has been historically difficult for medical professional students to grasp due to the one-dimensional presentation of anatomical structures. To address this obstacle, students at the University of Kentucky were provided verbal narratives and visual guidance through a series of cross-sections of the body. These “guided tours” were created using Camtasia software and were made available on Blackboard to be downloaded in any format, including podcast

files. The present study compares the use of this technology among medical professional students, highlighting the differences in learning styles and preferences in study aides among physician assistant, physical therapy, and dental students. Students generally welcomed the supplemental information and responded positively to future incorporation into course materials. Considering the diversity of learning styles, some students preferred independent study, while others suggested additional educational cues, such as landmarks or hints that would help to more easily identify the orientation of the cross-section. Further analysis will determine which specific categories of cross-sections were most beneficial to students, and will aid in the development of this tool for use in the professional programs.

RODRIGUEZ*, Jolie R. and Jeffrey SOSNOWSKI. Department of Pathology, University of South Alabama, Mobile, AL. Caudal regression and sirenomelia: the detailed dissection of a "Mermaid Baby".

The distinction between sirenomelia and caudal regression has long been the subject of debate. While several anomalies are common to the two diagnoses, they are traditionally thought to have different etiologies and unique anatomic findings. Recent literature suggests caudal regression and sirenomelia are part of a spectrum of congenital anomalies that share a common origin. We report the autopsy findings of a 17 week fetus with multiple major malformations of the musculoskeletal, cardiovascular and gastrointestinal systems. On gross examination, major anomalies included agenesis of the external genitalia, anorectal atresia and a single midline lower extremity, ending in a club-like foot without distinct digits. Radiographic examination confirmed a button-like sacrum, absent coccyx, partial fusion of the femora and a single tibia. On internal examination, the aorta is normally formed to the level of the renal arteries, after which it is in direct continuity with the umbilical artery. The umbilical vein arises abnormally from the hepatic vein. The transverse colon ended blindly, and was distended with meconium. The kidneys were present bilaterally; however, there was agenesis of the distal ureters and urinary bladder. This dissection identified findings strongly associated with both diagnoses, likely supporting the theory of a caudal regression – sirenomelia spectrum.

SAKAI*, Ryo, Jodie JENKINSON*, Nicholas WOOLRIDGE*, Marcin WASOWICZ*, and Gordon TAIT*. Biomedical Communications, Institute of Medical Science, Faculty of Medicine, University of Toronto, ON, Biomedical Communications, Institute of Communication and Culture, University of Toronto Mississauga, ON, and Department of Surgery and Department of Anaesthesiology, University of Toronto, ON (sponsored by A. Agur). Use of a three-dimensional interactive web-based module for understanding anatomical relationships and the clinical techniques associated with sciatic nerve block.

A three-dimensional interactive module was developed to assist medical residents with learning regional anaesthesia techniques. This project was published in a web-based format, available for residents to review at their convenience. This teaching tool is intended to enhance medical residents' understanding of the spatial relationships relative to surface anatomy and regional anesthetic techniques, and thus improve their confidence in practice. All models were developed in Maxon Cinema 4D R10 and 3D surface rendering of bones and arteries were obtained by importing CT scans into Osirix. Flash CS3 was used to create the graphical user interface. Multiple scroll bars were designed to allow the user control over rotation and the opacity of the surface anatomy in relation to the underlying structures. Animated content demonstrates the process of sciatic nerve block.

SANGARI, Santosh K. and Kamlesh KHATRI * Cell Biology and Anatomy, Weill Cornell Medical College, NY., Department of Anatomy, University College of Medical Sciences, Delhi, India. (sponsored by department of anatomy, University College of Medical Sciences ,India). Pre and Postganglionic innervation of rat adrenal gland by fluorescent tract tracer – Fast blue.

The motor innervation of rat adrenal gland was studied by a fluorescent tract tracer fast blue. 5μl of 2% aqueous suspension of fast blue was injected into left adrenal gland. After a survival period of 4-5 days, spinal cord , sympathetic ganglia , suprarenal ganglion, coeliac ganglion and left adrenal gland were dissected out and 15μm thick plastic sections (JB 4 Polysciences) were examined under a fluorescent microscope. Retrogradely labeled Preganglionic neurons were observed in the ipsilateral intermediolateral column of spinal cord from T3 to L2 spinal

segments with maximum concentration of labeled neurons from T6 to T11. The labeled neurons were multipolar, spherical or fusiform in shape with transverse diameter 10 -20 μm and vertical diameter varying from 12 – 30 μm. Postganglionic labeled neurons were also observed in the left suprarenal ganglion and left sympathetic ganglia (T5 –L2) with maximum concentration from T6 to L1. Labeled neurons varied from 12 to 30 μm in diameter and were randomly distributed throughout the ganglion .The pre and postganglionic nerve fibers to the adrenal gland might be responsible for the hormone release by regulating blood flow and also by directly innervating the parenchymal cells.

SATO, Tatsuo. Professor Emeritus, Tokyo Medical and Dental University (Clinical Anatomy), Tokyo Japan. DVD demonstration of topographical anatomy from the posterior approach: minute dissection of the fine peri-aortic lymphatics and their relationships with various structures.

In order to enhance the 3-dimensional comprehension of the topographical relationships of the peri-aortic lymphatics, we performed a detailed dissection from the unique perspective of the posterior approach. After removal of the vertebral column and ribs, as well as the tissues surrounding the aorta, the aorta was cut and removed, revealing the complex network of lymphatics and autonomic nerves immediately in front of and along the sides of the aorta. By careful removal of the surrounding connective tissues, the autonomic nerve plexuses were dissected and then the thin lymph vessels which were intertwined within the plexus could be identified and traced. The connections of these lymphatics with the iliac lymphatics of both sides, renal lymphatics, and testicular lymphatics were traced backwards. Also lymphatics of the abdominal peri-aortic area were traced to the thoracic duct. As this DVD clearly demonstrates the convergence mode of lymphatics and the intimate relationship of the lymphatics with the nerve plexus, it may enhance 3-d comprehension for students and also facilitate the development of future function-preserving surgical techniques.

SAXTON*, Ernestina H., James D. COLLINS, Samuel S. AHN*, Hugh GELABERT*, and Alfred CARNES*. Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA,

Los Angeles, CA. Thyroid goiters crimp the great vessels in patients with thoracic outlet syndrome (TOS) and hypothyroidism: Role of MRI/MRA/MRV in management of these patients

Thyroid goiters are enlargement of the thyroid gland, which may occupy the anterior superior mediastinum and extend laterally to splay apart the carotid sheath, backwardly displace the aorta and crimp the great vessels (Clin.Anat. 1995; 8:1-16). Bilateral MRI /MRA/MRV demonstrates compression by the mass of the veins and lymphatics in the supraclavicular fossae and the neurovascular bundles, obstructing venous return. These patients present with symptoms of hypothyroidism and thoracic outlet syndrome (TOS), including dyspnea and dysphagia; upper extremity numbness and tingling; neck, back and leg pain; color and temperature changes; visual blurring and "floaters", and headache. Thyroid goiters have areas of fat necrosis within the parenchyma, displayed on MRI as high signal intensities, reflecting areas of decreased function. On isotope scans these areas are interpreted to be “cold nodules” and are often biopsied under ultrasound guidance. MRI distinguishes fat necrosis from areas of tumor growth. This presentation, conducted on the 1.5 Tesla (GE Signa LX) with abduction external rotation, 4.0mm thickness and 512 x 256 matrix size, displays two selected patients with TOS and hypothyroidism with and without goiter. It demonstrates that the MRI may obviate the need for invasive biopsy procedures in patients with goiter, offering a noninvasive alternative.

SHAH Priti A.[1]*, Barry D DALY[1]*, Clinton W SLIKER[1]*; Nancy KNIGHT[1]*, Kenneth B. HISLEY[2]; [1]Department of Diagnostic Radiology, University of Maryland School of Medicine; [2]Department of Anatomy, Des Moines University. Development of a CT autopsy imaging service to augment the State Medical Examiner’s investigations of traumatic death: logistic issues, techniques, findings, and future potential.

This project involves the logistic and technical aspects for the development of an x-ray computed tomography (CT) autopsy imaging service supporting the State Medical Examiners (ME) investigation of traumatic death. Specific goals gauged the efficacy of this new tool by comparing and contrasting CT imaging autopsy radiological interpretation against the ME’s findings and to consider the future potential of CT imaging autopsy. The design, development and testing of novel technical

interpretation aspects, protocol development and workflow. Pilot CT-based autopsies were performed in 20 cases of blunt/penetrating trauma and compared with the ME's corresponding autopsy findings. CT imaging autopsy is an accurate tool for the detection of most major injuries and causes of death resulting from blunt trauma. It has the potential to replace conventional ME autopsy in deaths resulting from accidental blunt trauma and may facilitate rapid retrieval of ballistic fragments in cases where forensic autopsy is required. Logistic and technical challenges to the development of a CT autopsy imaging service require further educational efforts and infrastructure development. The ME finds these results of the value of CT-based autopsy encouraging and supports future investigations and the role of imaging autopsy in forensics.

SILVERMAN, Bruce*, and David J. ELIOT, Basic Science Department, Touro University California, Vallejo, CA. A novel approach to the anatomy of the pharynx and larynx.
Traditionally the pharynges are studied by splitting the head midsagittally or by separating the head from the neck at the atlantooccipital joint. Both procedures are time consuming and invasive. Each has its advantages, but neither gives the student a simple, fully clinically relevant view of the pharynx and larynx. We decided to try a different approach as part of a prosection and demonstration-based anatomy laboratory session. The skin around the neck and face was removed to expose the masseter and strap muscles bilaterally. The mandible was sawn bilaterally at the angle of the mandible anterior to the attachments of the masseter and medial pterygoid muscles. Using blunt dissection, the retropharyngeal space was developed as far superior as the pharyngeal tubercle. Starting at the cut in the mandible, all soft tissue structures were then cut across the jaw and across the constrictor muscles just above the uvula from one side to the other. Pulling the liberated jaw and tongue anteriorly exposed the oropharynx, laryngopharynx and larynx in a manner that simulates the laryngoscopic view. Students were better able to understand the workings of the epiglottis and the vocal folds even if the constrictor muscles and cricoid cartilage were subsequently bisected.

SMITH, Gregory. Department of Biology, Saint Mary's College of California, Moraga, CA. Visualizing anatomic transitions using morphing software.

Visualizing anatomic changes that occur over a time span is difficult for first time anatomy students as well as experienced educators. Embryonic development, surgical reconstructions, time lapse transitions and evolutionary trends require a mental ability to visualize these spatial changes. Computer animations make spatial visualization easier but they may require considerable programming skills or access to expensive software. This project demonstrates that simple photography and affordable morphing software can be used to create movies demonstrating difficult to visualize anatomic transitions. A simple photographic studio consisting of a digital camera, lighting source, appropriate backdrop and myriad anatomic specimens along with the morphing software will allow an educator to create morphing movies for any anatomic system or discipline. These movies can be saved as QuickTime movies for universal viewing or Flash files for wide internet access.The primary goal of this project is to create a library of movies that are readily available to students studying the anatomic sciences.

SMITH*, Kyle D., Terry F. LANPHIER*, Tarnjit S. SAINI*, Margaret A. JERGENSON, and Neil S. NORTON. Departments of Oral Biology, Oral & Maxillofacial Surgery, and General Dentistry, School of Dentistry, Creighton University, Omaha, NE.
Using cone beam computed tomography (CBCT) imaging technology to demonstrate the clinical anatomy of the nasal cavity.

The Nasal Cavity is a dual chamber structure separated by the nasal septum, and located posterior to the nose and anterior to the nasopharynx. The nasal cavity provides a passageway for air, and receives drainage from the paranasal sinuses and nasolacrimal ducts. The neurovascular supply is vast, receiving arterial blood from branches such as the ophthalmic, maxillary and facial arteries, and innervations from the olfactory nerve, the trigeminal nerve and autonomics from the pterygopalatine ganglion. Because of the complex anatomy, there are a cascade of anatomical relations including the anterior cranial fossa, paranasal sinuses, orbit, pterygopalatine fossa, and most important for dental clinicians, the oral cavity. For many general dentists, the nasal cavity has often been neglected. However, recent advancements in dentistry, such as implants, are becoming a common procedure in dentistry, which requires a thorough understanding of the osseous anatomy of the oral cavity. Cone beam computed tomography (CBCT) provides 3-

dimensional imaging at sub-millimeter resolution that may serve as an adjunct to pre and post-operative treatment. In this study, we sought to use CBCT to 3-dimensionally reconstruct the nasal cavity to explain the clinical anatomy of this important region.

SPINNER, Robert J., Stephen W. CARMICHAEL, Huan WANG*, Thomas J. PARISI*, John A. SKINNER*, Kimberly K. AMRAMI*. Departments of Neurologic Surgery, Orthopedics, Anatomy and Radiology, Mayo Clinic and Mayo Clinic College of Medicine, Rochester, MN. Patterns of intraneural ganglion cyst descent.
Predictable patterns of proximal ascent have been described for fibular and tibial intraneural ganglion cysts in the knee region. The mechanism underlying distal descent into their terminal braches has not been elucidated. The purpose of this study is to demonstrate if and when cyst descent distal to the articular branch– joint connection occurs in intraneural ganglion cysts. Twenty-one patients with fibular and four with tibial intraneural cysts arising from the superior tibiofibular joint were retrospectively analyzed. These patients demonstrated ascent of intraneural cyst to differing degrees and previously unrecognized MRI evidence of distal descent: within the proximal most portions of the deep and superficial fibular branches in fibular intraneural ganglion cysts and descending tibial branches in tibial intraneural ganglion cysts. We demonstrate that distal descent occurs regularly in patients with fibular and tibial intraneural ganglion cysts and believe that it follows ascent up the articular branch from an affected joint of origin. This mechanism for bidirectional flow is dependent on pressure fluxes and resistances. This new pattern is consistent with principles described in our unified (articular) theory, is generalizable to other intraneural ganglion cysts arising from joints, and has important implications for pathogenesis and treatment.

STAIDLE, Jonathon*, Quentin A. FOGG, Benjamin R. HESS*, Lance G. NASH and Neil ASHWOOD*. University of Glasgow, Glasgow, UK; American University of the Caribbean, Sint Maarten, NA; Queens Hospital, Burton, UK. The surgical relevance of significant variations within a sample population of cadaveric biceps brachii muscles.
The biceps brachii muscle is highly variable. Regular reports of these variations are essential as they frequently differ from previously reported differences, and often involve areas of surgical importance. This study documents the variations

observed in a sample population of 120 cadaveric specimens. The results indicated a wide variety of variations. Additional heads were identified in 14 cases (12%). Of these, 13 specimens had a third muscle head, and one specimen had third and fourth muscle heads. The additional muscle heads (n=15) were attached proximally to the medial aspect of the humerus (or medial intermuscular septum)(n = 8; 53%), lateral aspect of the humerus (or lateral intermuscular septum)(n = 4; 27%) or to the lateral lip of the intertubercular groove (n = 3; 20%). The incidence and variability of the observed specimens is illustrative of the potential for clinical complications. That no secondary modifications (distal muscle atrophy, vascular congestion) were observed suggests that these variations had not noticeably limited the function of the individuals. Internal fixation of humeral fractures may be a likely complication associated with these variations, especially where additional attachments to the humerus exist. The report of these variations is therefore of practical importance.

STEFAN, Cristian[1], Richard FORSTER[2]*, Charles MAYO[3]*, and Thomas J. FITZGERALD[3]*. [1]Academy of Medical Educators, Touro University College of Medicine, Hackensack, NJ, [2]Department of Medicine and [3]Department of Radiation Oncology, University of Massachusetts Medical School, Worcester, MA. Innovative three-dimensional rendering of human anatomy incorporated in a medical procedures lab session for interns and residents in internal medicine.

The pilot activity presented in this abstract was conducted with interns and residents in Internal Medicine at the University of Massachusetts Medical School in the summer of 2007 as part of an introductory training session focused on common medical procedures performed on the Internal Medicine ward. The interns and residents rotated among several stations, with hands-on learning activities. As a premiere for this program in particular and for the training of our residents in general, one substation was added last year for the review of neck and thorax based on 3-D virtual reconstruction of human anatomy. As presented at the previous AACA meeting, we have used the Eclipse Treatment Planning System (Varian Medical Systems) to design creative applications and strategies in medical education. The innovative methodology we developed was adapted and used on this occasion as a platform for small group discussions that reinforced the spatial relationship among anatomical

structures in the neck and thorax with emphasis on their clinical significance related to successfully and safely performing a/an subclavian and internal jugular central venous line placement and thoracocentesis. The method offered the additional advantage of linking the anatomy to radiological imaging, which was also appreciated by the participants.

STEIN, Pamela S., Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, KY. The anatomy of self defense.
"The Anatomy of Self Defense" is a self defense course developed by an anatomy professor and a campus police officer to increase student awareness regarding potential victimization and to help students protect themselves in the event of an attack. A secondary goal was to reinforce anatomical concepts covered previously in class by presenting them in a unique format highlighting relevance. To our knowledge no such course has been developed by collaboration of an anatomy professor and police officer. The police officer began the course by providing some basic principles of protection. This was followed by demonstration of several self defense maneuvers i.e. elbow strike, shin kick, groin injury. After each individual demonstration, the anatomy professor explained the anatomy that contributed to the success of the technique. At the end of the course, students were asked to anonymously complete a survey. Fifteen students completed the survey. All fifteen students felt the course was valuable stating that the course helped them feel better prepared to handle an assault. In conclusion, creating a course for students that blends anatomy with self defense maneuvers not only helps to prepare students to defend themselves but may also reinforce anatomical concepts covered in class.

TADJALLI*, Mina, Reza GHAZI* and Paria PARTO*. Department of Anatomy, School of Veterinary Medicine, Shiraz University, Shiraz, Iran (Sponsored by Gregory R. Smith). Gross anatomy of ostrich's heart.
Today, with emphasis on the mechanical heart and transplantation from one human to another and one species to another, a knowledge of the anatomy of the bird's heart could contribute to these accomplishments. Eight male adult ostriches were used to study the heart macroscopically. This study revealed that the ostrich's heart has some special features from the other birds and mammals as well as human. The ostrich

heart have conical shape with three surfaces. The fibrous pericardium as asternopericardial ligament attach along the thoracic surface of the sternum. A distinct sinus venousus is a part of the typical adult ostrich heart. It is a small triangular shaped chamber and its slit-like aperture is guarded by the right and left sinuatrial valves. The central edge of muscular valve hang down into the right ventricle and give attachment to it's rough parietal wall by a thick muscular stalk. Unlike the other birds the left and right pulmonary veins enter the left atrium independently and their openings are completely separated from each other by a septum. Also unlike the other birds and human in the ostrich heart the moderator bands found in both right and left ventricles in different location. The right ventricle presents one tendinous moderator band about base of ventricle that extends from septum to the muscular valve. Also the moderator band as tendinous thread like or flat sheet are usually about apex of right ventricle that extends from septum to parietal wall. In the left ventricle there were some tendinous moderator bands close to the apex that extends from septum to parietal wall and between trabeculae carneae of parietal wall.

TAN, Yun*; Waheed M. RANA*; Jeff WATSON*; Margaret H. COOPER; John R. MARTIN, III; Yunxi TAN*. Center for Anatomical Science and Education, Department of Surgery, Saint Louis University School of Medicine. An additional approach in preserving the medial and lateral pectoral nerves in modified radical mastectomy.

Modified radical mastectomy (Patey modification) includes complete removal of the pectoralis minor muscle (Minor) with Rotter's lymph nodes. Both medial and lateral pectoral nerves (MPN, LPN) are preserved to ensure innervation of the pectoralis major muscle (Major). The courses and distributions of LPN and MPN, and their relationships with vessels were studied in 50 cadavers (100 sides). The clavi-manubrial (C5-7) and sternal (C7) branches of LPN innervate different portions of Major. The sternal branch supplies Minor (47%) or even passes through it (14%). The communicating branch from C7 is joined by MPN to form a V or Y shaped loop (71%). Sometimes, thesternal and communicating branches anastomose to form a network (21%). MPN divides into medial and lateral branches. The medial MPN branch divides into branches to innervate Minor and some of them penetrate the muscle to supply the lower portion of Major. The lateral MPN branch wraps around the lateral border of Minor

to innervate the lowest portion of Major. Based on these observations, surgically splitting the clavicular from the sternal heads of Major will expose the branches of LPN, and cutting the origin of Minor will preserve branches of MPN, all of which may prevent muscle atrophy.

TESCH[1], Norbert P*, Wolfgang PICHLER[2]*, Hans CLEMENT[2]*, Angelika SCHWARZ[1]* and Andreas H. WEIGLEIN[1]. [1]Institute of Anatomy and [2]Department of Traumatology, Medical University Graz, Austria. The neurovascular bundle of the extensor compartment of leg in relation to treatment of tibia fractures with the 9-hole and 11-hole less invasive stabilisation system.

The Less Invasive Stabilization System (LISS) has been developed to reduce soft tissue damage and preserve blood supply. Objective of this study was to investigate the risk of lesions of the deep peroneal nerve by LISS-plate in tibia fractures. In twenty female adult legs the length of the tibia was measured and a 9-hole and a-11-hole LISS-plate were placed as described by the manufacturer. After inserting 2,0-mm K-wires the extensor compartment was dissected. The tip of the 11-hole plate touched the bundle in two cases, crossed the bundle between the 10th and 11th hole in three cases, and crossed over the 11th hole in 3 cases. The tip of the 9-hole plate touched the deep peroneal nerve in six cases, in five cases the bundle crossed over the 8th hole and in one case the 9th hole. The bundle crossed under the 9th hole in three cases and the 8th hole in one case In conclusion. the risk of damage to the neurovascular bundle is high. Thus, a larger incision to dissect the neurovascular bundle to minimize this risk should be considered.

THAI, Al[1], Kajeandra RAVICHANDIRAN[1], Piroska L. SZABO[2] and Anne M. AGUR[1]. [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, Ontario, Canada. [2]Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, New York, USA. Architecture of the musculotendinous complex of the popliteus muscle: a 3D computer modeling study.

Introduction: There is an ongoing debate in the literature regarding the morphology and attachments of the popliteus muscle (Paraskevas, 2006). However, the architecture of the muscle belly has not been well documented. Purpose: To map the three-dimensional architecture and attachment sites of

popliteus, and quantify fiber bundle (FB) length, pennation angle (PA) and muscle volume. Method: Four formalin embalmed cadaveric specimens (76.5±8.7years) were serially dissected and digitized(up to 2000FBs/muscle). This data was modeled (Maya™) and analyzed (SPSS16™). Results: The muscle belly consisted of two distinct parts: a quadrangular superficial part composed of parallel FBs attaching proximally to the joint capsule and a deep triangular part forming two intramuscular tendons that blend with the popliteal tendon. The muscle was found attached superior to the tibial soleal line, to tibialis posterior aponeurosis and the joint capsule of the knee. The superficial FB length (2.88±0.69cm) was longer than the deep (2.42±0.62cm). The deep part(16.6±9.3°) tended to be more pennated than the superficial (11.8±6.3°). Muscle volume varied from 14.4-43.3cm^3 with the superficial part comprising about 1/5 of the total muscle volume. Conclusion: Architecture of the popliteus muscle belly is more complex than previously reported: two distinct parts were identified based on muscle architecture and attachment sites.

TOSHIYUKI, Saito, M.D., Ph.D., Hanno STEINKE, Ph.D., Tomoe IWABUCHI D.D.S., Toshiyasu KITAYAMA, D.D.S., Yoshiyuki OI, M.D., Ph.D., Takayoshi MIYAKI VMD., Ph.D., Masahiro ITO M.D.,Ph.D. Anesthesia, Nihon University, Dental School, Chiyada-ku, and Anatomy, Tokyo Medical University, Shinjuku-ku, Tokyo, Japan. Branches of the Posterior Ramus of the Spinal Nerve.

Background: In the needle insertion of epidural and spinal anesthesia, the needle can pass through the longissimus muscle in the dorsum of the human body. During the needle insertion, when the needle touches a nerve in the muscles, the people may experience pain in the back. Obviously the needle should avoid the nerve tract. To provide better anesthetic service, the analysis of the structure and lie of the nerves concerned in that region is inevitable. Method: We studied fifteen cadavers in this study. With twelve of the cadavers, we studied the nerve layout of the posterior rami of the spinal nerve near the stem. Three of them were used for the study of transparent specimen, with which we studied the course of the posterior rami inside the longissimus muscle. Results: We observed there were three principal branches at the stem of the posterior rami of the spinal nerve, i.e. medial branch, medial branch of the lateral branch (=intermediate?) and lateral branch of the lateral branch just

outside of the foramen intervertebrale as Bogduk reported in the lumbar segments. While the medial branch supplied to the m. multifidus and the lateral branch supplied to the m. iliocostalis, the intermediate branch supplied to the longissimus muscle. With the transparent specimen, we found that there were structured nerve layouts in the medial and intermediate branch of the posterior ramus inside the muscle. Discussion: The medial branch and the intermediate of the posterior rami both covers the region near the spinal column. The both nerves could be misunderstood each other when we dissect from the dorsal direction. Conclusions: There were three major branches at the stem of the posterior rami of the spinal nerve. In the upper lumbar segments of the m multifidus, the medial branch and the intermediate branch of the spinal nerve produced layers, where the needles can touch the nerve. Anesthetists have to consider the existence of the medial and the intermediate branch of the posterior rami of the spinal nerve when they insert the needles into the spinal column.

TRELEASE, Robert B. Department of Pathology and Laboratory Medicine, David Geffen School of Medicine at UCLA, CA. Diffusion of innovations: Smartphones and mobile anatomy learning resources.

At previous AACA meetings, the author reported on using handheld computers (PDAs) and personal media players for anatomical education. Special attention was directed to coming integration of PDA functions into ubiquitous cellular telephones. Unfortunately, limited distribution of early "smartphones" (e.g., Palm Treo and Blackberry) has provided few potential users for anatomical learning resources. In contrast, iPod media players have been self-adopted by millions of students, and "podcasting" has become a successful medium for distributing lectures, images, and video-based educational content. With recent introduction of Apple iPhone and iPod touch wireless handhelds, larger touch screens and scalable Web access have been added to the iPod's basic capabilities. The author translated his successfully distributed iNatomy limb muscle "flashcard" resource from iPod Notes Reader (HTML subset) format to (X)HTML. The new application was openly distributed on public Web servers. Existing PDF educational documents, video lectures, clinical and 3D imaging arrays were also successfully tested. These touch-interfaced, "wearable" computing devices represent just the first of a new generation providing practical,

scalable wireless Web access. With widespread student self-adoption of such new personal technology, educators can look forward to increasing portability of well-designed, multiplatform "learn anywhere" resources.

TUBBS, R. Shane, Marios LOUKAS, Mohammadali SHOJA*, John C. WELLONS*. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran. Anatomy and surgical considerations for endoscopic third ventriculostomy. an institutional experience.
In patients with triventricular hydrocephalus endoscopic third ventriculostomy (ETV) is a option to standard CSF shunts. The authors reviewed their experience with over 200 pediatric cases of ETV performed between 1996 and 2008. We have found that ETV has been found to be very sucessful in carefully selected patients with optimal intraventricular and cisternal anatomy.The anatomy that must be understood during such procedures as well as technical aspects, complications and failures will be discussed.

TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, Nihal APAYDIN and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, Ankara University School of Medicine, Ankara, Turkey. C4 contributions to the brachial plexus without prefixation.
The intradural contributions of the C4 nerve rootlets have not previously been evaluated for their connections to the brachial plexus. Sixty cadavers underwent dissection in order to evaluate for extradural C4 contributions to the brachial plexus and if present, these were excluded from further study. No specimen was found to have a postfixed brachial plexus. Of the remaining 51 sides, 21.6% were found to have intradural neural connections between C4 and C5 dorsal rootlets and one connection between the ventral roots of C4 and C5. Communications between these two adjacent dorsal cervical cord levels were of three types. Type I was a vertical communication between the more horizontally traveling dorsal roots. Type II was a forked communication between adjacent C4 and C5 dorsal rootlets. Type III communications were applied to connections between ventral rootlets. Although communications were slightly more frequent on left sides, this did not reach statistical significance. In approximately 20% of normally

composed brachial plexuses we found intradural C4 to C5 neural connections. Such variations may lead to misinterpretation of spinal levels with pathology of the spinal axis and should be considered with surgical procedures of this region.

TUBBS, R. Shane, Marios LOUKAS, Mohammadali SHOJA*, John C. WELLONS*. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran. Medial pectoral nerve to musculocutaneous nerve neurotization for the treatment of brachial plexus birth injuries: a ten year institutional experience.

Medial pectoral nerve (MPN) to musculocutaneous nerve (MCN) neurotization for biceps reinnervation is an option following brachial plexus injury. A criticism of the technique in infants is the smaller size of the MPN and therefore mismatch of viable axons. We describe our institutional experience utilizing this procedure and examine functional outcomes. Hospital records from the Children's Hospital of Alabama were reviewed from 1997 to 2007. Of the 49 patients undergoing brachial plexus exploration, 15 underwent MPN to MCN neurotization as a part of an overall procedure to treat birth injury and had at least 9 months follow up. MPN to MCN neurotization was chosen if the examination and intraoperative electrophysiological evidence was consistent with medial cord function. Functional biceps recovery was defined as the ability of the child to bring the hand to the mouth. 73% gained functional biceps recovery. The median age of surgery was 6 months. Median follow up was 16 months. Preoperative hand function predicted functional biceps recovery. MPN to MCN is a valid surgical option in the reinnervation of the biceps muscle following brachial plexus birth injury when the hand is functional preoperatively. Useful arm function can be provided to most of these children.

TUBBS, R. Shane, David Bauer*, Mohammadali M. SHOJA*, Marios LOUKAS, and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI. Study of the effects of flexion on the position of the conus medullaris.

Prior anatomic and radiographic studies of conus position with flexion and extension of the spine have had conflicting results. We performed a cadaveric study with direct visualization of the conus during flexion and extension to further study this question and potentially determine if flexion and extension of the spine

during MRI may prove to be a diagnostic tool in such pathologies as occult tethered cord syndrome. We performed T12 to L3 laminectomies in five fresh adult cadavers and exposed the conus and cauda equina. Cadavers were fully flexed at the waist and neck and the conus position observed. In all specimens, the conus terminated between T12 and L1 in the prone position. During flexion, the conus position remained stable with no ascent. However, flexion produced stretching and medial displacement of the cauda equina. Flexion of the spine does not cause the conus medullaris to change position in fresh human cadavers, however, flexion does cause the cauda equina to stretch and displace medially over the conus. Therefore, it is unlikely that the conus would change position during spine flexion during imaging or procedures such as lumbar puncture.

TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, E. George SALTER and Aaron COHEN-GADOL*. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, and Clarian Neurological Institute and Indianapolis Neurosurgical Group, Indianapolis, IN. Surface landmarks for the junction between transverse and sigmoid sinuses: application for surgical planning.

Localization of cranial anatomy based on landmarks is paramount in decreasing surgical morbidity. To facilitate the placement of a “strategic” burr-hole near the sigmoid-transverse sinus junction, one-hundred skulls underwent intracranial drilling of a small hole 5mm inferior to the border of this junction. Localization of this hole from the surface of the cranium was made from a horizontal line established by extending a line parallel to the superior border of the zygomatic arch and a vertical line fashioned by connecting the mastoid notch superiorly to the squamosal suture. For left sides, 81% of the burr-holes were inferior to the zygomatic line and 86% were medial to the mastoid line. For right sides, 91% of the junctions were inferior to the zygomatic line and 97% were medial to the mastoid line. For left and right sides, the mean distance from an established zygomatic line was 4.5 and 7.7 mm, respectively. For left and right sides, the mean distance from the mastoid line was 9.1 and 9.8 mm, respectively. As landmark data in the literature for externally identifying the transverse sigmoid sinus junction is variable, we have attempted to refine this location with the largest sample size to date.

TUBBS, R. Shane, Marios LOUKAS and Mohammadali SHOJA*,. University of Alabama at Birmingham, St. George's University, Grenada, Tabriz Universtiy of Medical Sciences, Iran. The existence of arachnoid villi along the hypoglossal nerve.
Although rare, arachnoid villi have been mentioned occasionally in the literature as being found along some cranial nerves. To date however, no study has investigated the presence of these structures along the hypoglossal nerve (HN).To observe for these potential structures, 10 fresh human adult cadavers underwent dissection and harvesting of their HN. Samples were submitted for histological and immunohistological analysis.We identified arachnoid villi in 60% specimens. These structures ranged in size from 279 x 1894μ to 1581 x 3195μ .Regionally, these were more concentrated along the canicular segment of this nerve and were variable in shape.The present study has demonstrated that arachnoid villi may also be found along the HN. Further animal studies are now necessary to prove that CSF traverses these villi and is absorbed into such cranial nerve villi.

TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS, Nihal APAYDIN and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI, Ankara University School of Medicine, Ankara, Turkey. The existence of hypoglossal root ganglion cells in adult humans: potential clinical implications.
Ganglion cells of the hypoglossal nerve (HN) have been confirmed in certain animals but have been thought to not be present in man. To investigate for the presence of these structures in adult humans and if present, to verify their functionality, the present study was performed. We harvested adult cadaveric HN and observed for ganglion cells. Histological and immunohistochemical analyses were performed on all specimens. Ganglion cells were found in 33% of specimens. Using immunohistochemistry, we found that these ganglia were sympathetic in nature. Based on our findings, ganglion cells do exist in the human HN although they are located sporadically and are found inconstantly. Such information may be valuable in elucidating other functions of the HN and may aid in the histological diagnosis of this nerve. Additionally, pathology of the autonomic nerves such as paragangliomas, are supported by our

findings of the presence of autonomic ganglion cells in some specimens.

TUBBS, R. Shane, Mohammadali M. SHOJA*, Marios LOUKAS and E. George SALTER. University of Alabama at Birmingham, Tabriz University of Medical Sciences,Tabriz, Iran, St. George's University, Grenada, WI. The contralateral long thoracic nerve as a donor for upper brachial plexus neurotization procedures: cadaveric feasibility study.

Various donor nerves, including the ipsilateral long thoracic nerve (LTN), have been used for brachial plexus neurotization procedures. To our knowledge, neurotization to proximal branches of the brachial plexus using the contralateral LTN has not been explored. In an attempt to identify an additional nerve donor candidate for proximal brachial plexus neurotization, eight adult human cadavers underwent dissection of the LTN, which following distal transection, was passed deep to the clavicle and axillary neurovascular bundle. This passed segment of nerve was then tunneled subcutaneously and contralaterally across the neck to a supra and infraclavicular exposure of the suprascapular and musculocutaneous nerves. Measurements were made of the length and diameter of the LTN. All specimens were found to have a LTN that could be brought to the aforementioned contralateral nerves. Neural connections remained tension free with left and right neck rotation of approximately 45^0. The mean length of the LTN was 22 cm. The overall mean diameter of this nerve was 3.0 mm. Based on the results of our cadaveric study, the use of the contralateral LTN may be considered for neurotization of the proximal musculocutaneous and suprascapular nerves.

TUNALI*, Selcuk[1,2], Michael FARRELL[2*], Ian C. SHARP[2*], Beth K. LOZANOFF[2*], Sara DOLL[3], Frederik GIESEL[4*], and Scott LOZANOFF[2]. [1]Department of Anatomy, Hacettepe University Faculty of Medicine, Ankara, Turkey, [2]Department of Anatomy, Biochemistry & Physiology, University of Hawaii School of Medicine, Honolulu, HI, [3]Institut fur Anatomie und Zellbiologie, University of Heidelberg, Heidelberg, Germany, [4]Department of Radiology, DKFZ, Heidelberg, Germany. A multi-lingual computerized 3D anatomical instructional system for use in outreach education.

The University of Hawaii is located in a unique geographical location facilitating delivery of outreach anatomical education to

allied medical health student communities in Asia. The purpose of study was to develop and implement an ease-of-use interface with multi-lingual capability for anatomical instruction to non-native English speakers during outreach educational activities. Anatomical models were obtained from various sources including CT, MRI, cone-beam, and hand-held scanner modalities, exported in .dxf, .obj, and .stl formats, and converted to .xdf format. Files were input into Maya and WinSURF, edited, and partitioned into individual objects and saved. Audio files (.wav) were recorded in multiple languages based on these individual objects. An icon-driven interface called SURFviewer, was developed and written relating a 3D anatomical model to its corresponding 2D sectional images, a reference schematic, audio file, and roll over script. These separate data files were read simultaneously and viewed interactively by the student during the dissection. An evaluation questionnaire using a Likert scale was presented to the students. It is concluded that this system provides a simple yet effective reference tool for outreach anatomical education in multiple languages. Further work will be directed at increasing the database and implementing it in conjunction with an electronic laboratory guide.

TUNALI* Selcuk, and Ruhgun BASAR*, Hacettepe University Faculty of Medicine Department of Anatomy, 06100 Ankara, Turkey. (Sponsored by Scott Lozanoff). Morphometry and variations of the auricle in adults.

Morphometrical analyses of the auricle were performed in 313 healthy adults. The variations were also noted. The distance between the helix and the temporal scalp was measured with a digital caliper compass at supraaural and tragal levels. Then, two digital photographs were taken from two lateral sides by the same investigator, from a standard distance, with the same camera. A scale bar was present in each photo. The images were studied with the digital image processing and analysis software Image J (provided from National Institute of Health). All the measurements were recorded as millimeters with two decimals. The dimensions of the auricle and face were measured and proportions were calculated. Quantitative data was obtained to contribute to establish standards for Turkish adult population, as well as for male and female genders. In statistical analysis, the ear width showed a statistically significant difference between males and females ($P<0.05$) but no statistical significance was found among other parameters between

genders. The position of the auricular tubercle was defined as angular data for the first time in literature. This study provides a modern methodology to facial anthropometry and also definitive data for auricle morphometry in adults.

TURCHIN* Katie, Monica BRANIGAN*, and Anne AGUR. Department of Surgery and Department of Family and Community Medicine, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada. Coping with stress: a comparison between 1st and 2nd year medical students.

Medical students have reported feeling stress from many causes, including heavy workload, feeling overwhelmed, fear of failure, and strained personal relationships (Moffat, et al., 2004). The purpose of this study is to compare the changes in coping mechanisms and usage of student support services between first and second year medical students. Parnandi (2006) developed an online survey and administered it to the first year medical students. In this study a slightly modified version of the survey was administered to the same group of students, now in second year. Results showed that the major stressor for second year students was personal issues, compared with academics during first year. The Program for Advice and Support of Students was consulted by 4.4% of students, Office of Student Affairs by 10.1% and a Professor/Academy Director/Tutor by 12.2%. Similar to Parnandi's (2006) findings, the most widely used coping strategies were friends outside of medical school (34.4%) and family (22.5%). Students reported improvements in lifestyle in 2nd year: more free time, more sleep and less stress. In order for student support services to stay in tune with student needs, feedback must be sought on a regular basis and appropriate strategies developed to increase awareness of what each resource has to offer.

TURNER*, John, and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Integrative Biosciences, Department of Surgery, Oregon Health and Science University, Portland, OR. The Anatomy Regarding Centric Relation and the Temporomandibular Joint.

The purpose of this study was to analyze the anatomy of centric relation. Many clinicians believe that maintaining CR is critical in oral pathology treatment. The temporomandibular joint (TMJ) is important because of its essential role in mastication, speech and breathing. The head of the mandible has a position within

the TMJ called centric relation that is considered to be the most stable musculoskeletal position of that joint. Definition and morphology of this position have changed or evolved since it was described in the 1920's and remains controversial. Two schools of thought include: a static definition “The head of the mandible positioned most superiorly and anteriorly within the mandibular fossa” and a dynamic definition, which includes “the soft tissue intimate with the joint.” We reviewed the most commonly used clinical anatomy and specialist texts to examine the anatomy and clinical significance of centric relation. Our results revealed prosthodontic and oral surgery texts described the topic of centric relation while clinical anatomy texts and atlases gave little attention to centric relation. Considering the importance of TMJ pathology and the anatomical nature of centric relation, our findings suggest it be emphasized with the TMJ in clinical anatomy texts.

UPADHYAYA*, Prashant K. and Alan T. RICHARDS. Department of General Surgery, Creighton University Medical Center and Department of Head and Neck Surgery, University of Nebraska Medical Center, NE. Circumferential compression of trachea and esophagus by hypertrophied tubercles of Zuckerkandl.

Tubercles of Zuckerkandl (TZ) are posterolateral projections of the lateral thyroid lobe present in upto 75 % of normal thyroid glands. They range in size from a micro nodule to projection greater than 1 cm (Grade 3). We present our experience of thyroidectomy in six patients with bilateral enlargement of TZ causing circumferential compression of the trachea and esophagus. Five of the patients were morbidly obese (BMI 39.16 + 7.2). Four patients had varying degrees of retrosternal extension, pressure symptoms and hypothyroidism. Type of surgery included Total (2), Subtotal (3) and near total (1) thyroidectomy. Average weight of the specimen was 135.16 + 83.4 grams, greatest dimension of each lobe measured approximately 6.75 + 1.4 centimeters. RLN was not visualized in three cases and was found to be entering the TZ substance in one. No major complications (Hyperparathyroidism, RLN injury) were encountered. No patient had recurrent symptoms on follow up (2 to 60 months duration). Obese patients with enlarged goiters and Mediastinal extension may have an increased incidence of severely hypertrophied TZ. Thyroid surgery appears safe in this population. Possibility of variation in anatomy of the

RLN and parathyroid glands in relation to the TZ should be kept in mind.

UZ, Aysun[1]*, Nihal APAYDIN[1]*, Marios LOUKAS[2], Richard S. TUBBS[3] and Simel KENDIR[1]*, [1]Department of Anatomy, Ankara University School of Medicine, Ankara, Turkey, [2]Department of Anatomical Sciences, St. George's University, Grenada, West Indies, [3]Section of Pediatric Neurosurgery, University of Alabama at Birmingham, Birmingham, AL. Vascularization of the fibularis longus and brevis muscles with emphasis on fibular graft harvesting.

Necrosis of the fibularis longus and brevis muscles after fibular osteocutaneous flap harvest or fibular grafts is a common problem experienced by orthopedic and plastic and reconstructive surgeons. The fibularis longus (FL) and fibularis brevis (FB) muscles are known to be supplied primarily by the anterior tibial artery (ATA) and the fibular artery (FA). However, the exact localization of these vascular pedicles is not to found in the extant literature. Therefore, the aim of this study was to investigate the exact location of the vascular pedicles for the FL and FB and to describe the points of penetration of these vessels through the posterior and anterior intermuscular septa. Sixteen adult cadavers underwent latex injection of the popliteal artery bilaterally. Following dissection, the distances between the apex of the head of the fibula and each of these vascular pedicles and the points where these arteries pierced the intermuscular septa and the length of the vascular pedicles were measured. In all cases, a single artery coursing in the lateral compartment of the leg was identified. This artery was a branch of the ATA and supplied the proximal and middle thirds of these muscles. The distance between the origin of this artery and the apex of the fibular head was on average 8.7 cm. The mean length of this artery was 10.6 cm and the average number of branches was 4.2. In all specimens, the FA supplied the distal portion of the fibular muscles. In 16.7 % of the specimens, the distal portion of the fibular muscles was also supplied by branches arising from the posterior tibial artery. Knowledge of the exact points of the vascular pedicles to the fibularis muscles will aid surgeons in fibular osteocutaneous flap harvest or fibular grafts and minimize tissue necrosis. Conservation of the main branch of the ATA coursing in the lateral compartment of the leg is imperative in order to preserve the blood supply to the fibularis muscles.

VOGT*, Keith M., Courtney Y. KAUH*, David M. HOLDER*, and Robert M. DEPHILIP. College of Medicine, Division of Anatomy, The Ohio State University, Columbus, OH. Experimental and clinical imaging of a retroesophageal right subclavian artery.
Cadaver dissection by medical students of a 79-year-old male revealed a retroesophageal right subclavian artery arising from the aortic arch distal to the left subclavian artery and passing posterior to the esophagus and trachea. The right common carotid artery branched directly from the aortic arch and passed anterior to the trachea, while the left common carotid and left subclavian arteries were in their normal positions. To further study this common anatomical variation (0.2-2% occurrence), the aortic arch and its branches were filled with radiopaque contrast medium and images obtained with a portable fluoroscope. In an AP view, the right subclavian artery and the right common carotid artery were superimposed, suggesting a normal brachiocephalic trunk. However, the course of the variant artery was evident on oblique images taken at 30 degrees or greater from normal. Review of this patient's medical records revealed axial computed tomography images of the chest with contrast enhancement. These clinical images clearly demonstrated the variant artery in life and showed compression of the posterior esophagus. This study highlights some of the different possibilities for viewing anatomical variation with experimental and clinical images.

WACKER, Charlotte and Zhanetta HARRISON*. School of Medicine, University of California, Davis, 4800 Broadway, Suite 100, Sacramento, CA. Reflection on the 2007 UC Davis Body Donor Memorial Service.
The second year medical students at the University of California, Davis School of Medicine (SOM) hold an annual memorial service to honor whole body donors for health science education and research. This event is organized with assistance from the Body Donation Program, SOM faculty and staff, and students from a local mortuary science fraternity. The planning begins months in advance and includes donations from Sacramento area businesses. In 2007 the event was held at the Medical Education Building of the SOM. Attendees included more than five hundred friends and relatives of donors, students, SOM faculty and administration, representatives from other programs that benefit from the body donors, and community representatives. The event had two parts: a ceremony and a

reception. The ceremony featured musical performances by students, speeches by faculty, and family tributes. It closed with a poetry reading and a dove release. The reception included a catered lunch and desserts made by students. The reception allowed attendees and students to have personal interactions. This ceremony often serves as a final farewell and perhaps a necessary sense of closure for many of the donor families, and helps medical students develop a deeper appreciation for the value of the donor gift.

WARD, Peter J. Division of Structural Biology, West Virginia School of Osteopathic Medicine, WV. Dissection-based anatomy retreats – An international exchange stretching from the busy streets of Tokyo to the hills of West Virginia.
In the Osteopathic medical tradition, there is a clear emphasis on the importance of anatomy for clinical practice and manipulative medicine. Osteopathic doctors are full physicians in the United States but that is not the case in other countries. Because Osteopaths outside of the United States are not granted the rights of full physicians, they are limited in their study of anatomy and are rarely able to perform dissections or observe prosections. This lack of dissection-based study makes it difficult for the students to accurately visualize the 3-dimensional nature of the musculoskeletal, nervous, visceral and lymphatic structures of the body and is a severe educational limitation. This is especially true when one considers that their major treatment modality is manipulative medicine. To address this, the West Virginia School of Osteopathic Medicine and the Japan College of Osteopathy have conducted week-long anatomy retreats during the Summers of 2006 and 2007. While the retreats were short, they gave a tremendous boost to participating students who had previously studied anatomy exclusively through textbooks and topographical palpation. This anatomy-themed retreat has broadened our institution's engagement internationally and may serve as a template for other groups seeking to broaden their global activity.

WATANABE*, Koichi, Tsuyoshi SAGA*, Noriyuki KOGA*, Kensuke KIYOKAWA*, and Koh-ichi YAMAKI*. Department of Anatomy and Department of Plastic and Reconstructive Surgery and Maxillofacial Surgery, Kurume University School of Medicine, Kurume, Japan (sponsored by M. Miura). Anatomical

Study of latissimus dorsi myocutaneous flap vascular distribution.

The object is to elucidate the three-dimensional vascular distribution of a latissimus dorsi myocutaneous flap and to establish a safe procedure for creating the flaps. Micro-angiography was conducted on 9 fresh cadavers and examined the vascular territories. In the muscle, 3 vascular territories were observed. The 1st territory was formed by the thoracodorsal artery, the 9th intercostal artery perforators and the lateral part of 10th intercostal artery perforators. The 2nd territory was formed by medial part of the 10th intercostal artery perforators and the 11th intercostal artery and the subcostal artery perforators. The 3rd territory was formed by the 1st and 2nd lumbar arteries perforators. In the dorsal skin above the muscle, 2 vascular territories were observed. The 1st territory was formed by the thoracodorsal artery perforators, the 9th through 11th intercostal arteries perforators and the scapular circumflex artery. The 2nd vascular territory was formed by the subcostal artery and the 1st and 2nd lumbar arteries perforators. When using the flap, the muscle can be safely elevated up to the 12th rib. Skin can be safely harvested up to the iliac crest including the 9th intercostal artery perforators or lateral part of the 10th intercostal artery perforators.

WEINBERG*[1], Annelie M., Wolfgang PICHLER[2]*, Stephan GRECHENIG[2]*, Hans CLEMENT[2]*, Angelika SCHWARZ[3]* and Andreas H. WEIGLEIN[3]. [1]Department of Pediatric Surgery. [2]Department of Traumatology, and [3]Institute of Anatomy, Medical University Graz, Austria. Success rate of intra-articular puncture of finger joints - physician's experience. Intra-articular punctures and injections are routinely done by physicians and specialists. In case of injuries, acute or chronic arthritis and arthrosis punctures are applied to either release joint effusion, or to inject drugs. The purpose of this study is to investigate the frequency of a correct needle position in the joint. A total of 300 injections of cadaveric finger joints were performed using two different approaches (dorsal and dorso-radial). An inexperienced resident and a skilled specialist inserted the injections. Following the injection of methyl blue, the joints were dissected to assess whether the fluid was in the joint or not. The rate of peri-articular injections was clearly higher than expected: specialist 14.7 percent, resident 32 percent, with an overall of 23.3 percent. A

significant higher failure rate was observed in the joints of the little finger and in the distal interphalangeal joints of all fingers. In conclusion, accuracy of finger joint punctures varies depending on the location (finger and the joint of the finger) and the experience of the physician. Unintended peri-articular injections of drugs may affect the ligaments or tendons leading to serious complications. In case of doubt, fluoroscopy may help to position the needle correctly into the joint.

WHEELER*, Laura R., Brion BENNINGER, and Gary WIND.
Department of Surgery, Department of Integrative Biosciences, Department of Oral Maxillofacial Surgery, Oregon Health and Science University, OR. The important layers of the medial knee: 'superficial and deep' pes anserine complexes.
The purpose of this study was to analyze the distal insertion of 3 structures: medial retinaculum, medial collateral ligament (MCL), and semimembranosus to see if they exist as an integrated structural unit. Current literature does not illustrate these 3 structures as a distal unit of the medial knee. Individually, each structure is clinically important in knee stability and pathology. The recognized pes anserine complex is a 'superficial' distal unit consisting of sartorius, gracilis and semitendonosus along the medial knee. We believe that a distal deep unit of 3 structures also exists. We dissected 80 knees and reviewed illustrations from current texts: clinical anatomy, surgical, and anatomical atlases. Findings from cadaver dissections demonstrated that the medial retinacular fibers, MCL, and the semimembranosus formed a structure distally--suggesting a 'deep pes anserine complex'. Review of texts found these three structures were not shown or described as a distal unit. The distal medial knee structural unit proposed as the 'deep pes anserine complex', is formed from the medial retinacular fibers, medial collateral ligament (MCL) and the semimembranosus. These structures are important in knee stability and awareness of this unit may contribute to better understanding of total knee morphology.

WHITHAUS*, Kenneth C., Elizabeth A. MANCI*, and Jeffery S. SOSNOWSKI.
University of South Alabama, Department of Pathology, Mobile, AL. Ectodermal dysplasia in twin gestation, a case report and review ofthe literature.
Ectodermal dysplasias represent an uncommon, heterogeneous group of disorders which affect the skin and its appendages.

These disorders are defined by a primary defect in the development of tissue that is derived from embryonic ectoderm. This group of disorders was originally classified based on which ectodermal component(s) were affected. The
current classification schemes are based on functional groups related to the underlying pathophysiologic defect. We report a rare series of 2 cases of ectodermal dysplasia that occurred in diamniotic, monochorionic twin male infants. Both infants were delivered preterm at approximately 30 weeks of gestation. One of the infants expired immediately after delivery, while the second twin was treated in our institution's neonatal intensive care unit until he expired on day of life 10. Autopsy findings revealed a striking absence of adnexal structures in both infants. Histologic sections of the skin had no identifiable epidermis and a markedly attenuated reticular dermal component. There was histologic evidence of dehydration with desiccation in the second infant. Based on these findings and the clinical setting a diagnosis of severe ectodermal dysplasia was made. Using the modern classification this unusual case is best considered a defect in developmental regulation/epithelial-mesenchymal interaction manifest as hypohydrotic ectodermal dysplasia.

WILLIAMS*, Jarrett G., Ramon BROWN*, Virgil WILLIAMS*, Rebecca SEALAND*, Christopher MAY* and Lawrence E. WINESKI. Department of Anatomy & Neurobiology, and Division of Information Technology, Morehouse School of Medicine, Atlanta, GA, and Catholic Healthcare West, Oakland, CA.
Interactive cross-sectional human anatomy.
Many biomedical programs subscribe to the concept of self directed learning. With more time spent outside the traditional lecture-based classroom, there is an increasing need for tools that supplement the classic text book to aide independent learning. We have developed a computer-based, interactive program in cross-sectional anatomy that offers a way to structure and deliver information while simultaneously allowing the student flexibility in pacing their studies and managing schedules. The material is presented through a series of labeled digital images of cadaver cross sections, CT's, and MRI's. Menus allow the user to choose which anatomical region to view and whether each cross section will be a gross sectional image or a radiographic image matched to that gross image. There is a "labels on" and "labels off" feature for each image that allows for review and self quizzing. There is also a "drag and drop" test

feature that allows the user to drag an answer from a list and drop it on the appropriate location on the image. Future development will include more advanced self-testing media and score tracking mechanisms. (Supported in part by NIH PO3 1B040107 and G12-RR 03034)

WILSON, Adam B.[1]*, Christopher ROSS[2]*, James M. WILLIAMS[1] and Laura E. THORP[1]. [1]Department of Anatomy and Cell Biology, Rush University Medical Center, Chicago, IL and [2]Department of Emergency Medicine, John H. Stroger, Jr., Hospital of Cook County, Chicago, IL. Bringing anatomy to life: clinical emergency procedures laboratory for first-year medical students (*pilot study*).

This study examined the effectiveness of demonstrating clinical procedures in the anatomy lab to emphasize anatomical knowledge for clinical practice; offer students another means by which to learn anatomy; and introduce students to common emergency procedures. After medical anatomy, first-year students participated in an additional laboratory experience. Students took an anatomy and clinical pretest then received a syllabus outlining 5 procedures. Students were randomized into control (CG; n=9) or experimental groups (EG; n=20). The EG observed and practiced 5 procedures on cadavers. The CG participated in a traditional lab. Similar posttests were administered after the experience. Student opinions were assessed by survey and focus group. Data were analyzed with repeated measures ANOVA and t-tests. Anatomy pre and posttest scores increased (68% to 74%; $p=0.089$ and 72% to 76%; $p=0.184$) for the EG and CG groups, respectively. Clinical pre and posttest scores increased from 18% to 85% (EG; $p<0.001$), in contrast to the CG (13% to 23%; $p=0.089$). Students in the EG agreed the laboratory improved their understanding of anatomy and underscored the importance of anatomical knowledge for clinical practice. Clinical posttest scores (EG vs. CG) imply that demonstrations of clinical procedures were more beneficial than a written syllabus alone.

WON[1]* Sung-Yoon, Mi-Sun HUR[1]*, Vadim SHEVERDIN[1]*, Hyun-Ho KWAK[2]*, Kyung-Seok HU[1]*, Christian FONTAINE[3], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea,

[2]Department of Oral Anatomy, School of Dentistry, Pusan National University, Busan, Korea, [3]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France. Extra- and intramuscular nerve distribution patterns of the muscles of ventral compartment of the forearm.

This study demonstrates the extra- and intramuscular nerve branching and distribution patterns, thereby provides the critical information on the efficient botulinum toxin injection point to reduce muscular spasticity. Twenty-three dissections and whole mount nerve staining (Sihler's stain) were performed from 23 Korean and French cadavers to investigate the nerve entry point and intramuscular nerve arborization patterns. The nerve entry point and abundant arborizing area of each muscle were analyzed on 20 sections with reference to the transverse lines (x axes) dividing the forearm into ten equal divisions (level 1 ~ 10) and a vertical line (y axis) bisecting the medial and lateral halves of the forearm. The nerve entry points of the 1st and 2nd (superficial) layers of forearm muscle were located at medial level 3 and level 2, respectively. The entry points of median and ulnar nerve innervating the flexor digitorum profundus (3rd layer) were located at medial level 4 and level 3, repectively. The intramuscular regions of the abundant arborization in every muscle were located one level distal to the nerve entry point. This study shows the map on nerve entry and abundant arborization of motor nerve innervating each muscle of the ventral compartment of the forearm. (Sponsored by Grant No. R01-2007-000-11219-0 from the Korea Science and Engineering Foundation (KOSEF)).

WON[1]* Sung-Yoon, Jae-Gi LEE[1]*, Wu-Cheol SONG[2]*, Doo-Jin PAIK[3]*, Hee-Jin KIM[1]*, Kyung-Seok HU[1]*. [1]Division in Anatomy & Developmental Biology, Department of Oral Biology, Human Identification Research Center, Brain Korea 21 project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Anatomy, College of Medicine, Konkuk University, Seoul, Korea, [3]Department of Anatomy and Cell Biology, College of Medicine, Hanyang University, Seoul, Korea. Comparative study on trabecular bone pattern of the maxilla and mandible using Micro-CT in Koreans. The aim of this study was to observe the trabecular pattern of the jaw bone from Micro-Computed tomography in a viewpoint of the fact that trabecular bone microarchitecture plays an important role in dental implant osseointegration. In order to analyze the trabecular structure of

the jaw bone, we got the micro-CT images from forty Korean specimens (20 maxillae and 20 mandibles). These specimens were classified into four types according to Lekholm and Zarb's classification method based on the bone morphology such as cortical bone, cancellous bone, and types of trabecular pattern. In mandible, the incisive region and molar region showed higher trabecular bone density than premolar region. In maxilla, the trabecular density did not show differences by region. In most cases of the specimen, the dentulous mandibles were classified as type 2 and 3, which showed higher compact bone and trabecular bone density. On the other hand, the dentulous maxilla was mostly classified as type 4 showing poor trabecular bone density. Edentulous jaws showed overall decrease in bone volume, trabecular bone density, and changes in the trabecular meshwork. In conclusion, the trabecular density showed differently from the maxilla and mandible, by the existence of the tooth and the specified region. (Sponsored by KRF-2007-331-E00004 from the Korean Research Foundation Grant by the Korean Government (MOEHRD))

YAKEISHI*, Akira, Tsuyoshi SAGA*, Kei-ichiro NAKAMURA*, and Koh-ichi YAMAKI*. Department of Anatomy, Kurume University School of Medicine, Kurume, Japan (sponsored by M. Miura). Ultrastructure of submandibular glands and expression of aquaporin-5 in Sjögren's syndrome mice after administration of cevimeline.

Cevimeline was orally administered to Sjögren's syndrome model mice (SS model mice) and the ultrastructural changes of acinar cells of submandibular glands were monitored. As well, the localization of aquaporin-5 (AQP-5), a water channel existing mainly in cell membranes, was examined immunohistochemically. Ultrastructurally, a remarkable reduction of secretory granules was seen in cevimeline treated submandibular acinar cells. There was an increase of the rough endoplasmic reticulum and an expansion of intercellular spaces in acinar cells. Condensing vacuoles of the Golgi apparatus were also observed. As well, it appeared that salivary production was promoted secondarily. In normal mice AQP-5 was localized in apical and lateral plasma membrane of submandibular acinar cells. In SS model mice, localization was disordered in parts of the cytoplasm as well as in apical plasma membrane. After cevimeline administration, AQP-5 was mostly found in the cell apical membrane of acinar cells of SS model mice, suggesting

improved localization of AQP-5. These results clearly showed that cevimeline induces saliva secretion and production in SS model mice. It was also demonstrated that the location of AQP-5 is temporarily normalized by the administration of cevimeline.

YAMAGUCHI*, Kumiko[1], Tomoyuki MOCHIZUKI[2]*, Keiichi AKITA[1]*. [1]Unit of Clinical Anatomy, Tokyo Medical and Dental University, JAPAN, [2]Department of Orthopedic surgery, Tokyo Medical and Dental University, JAPAN (sponsored by Tatsuo Sato). Is the superior glenohumeral ligament a true ligament?
Three ligaments are known to stabilize the glenohumeral joint: superior glenohumeral ligament (SGHL), middle glenohumeral ligament (MGHL), and inferior glenohumeral ligament (IGHL). Here, we compared the histological structure of these three ligaments. Five shoulders of three cadavers were dissected. From each shoulder, three blocks containing SGHL, MGHL and IGHL were embedded in paraffin. Serial sections were stained, and types 1 and 3 anti-collagen antibodies were applied to identify the fibers. MGHL and IGHL consisted of parallel compact fibers. They were stained dark with anti-type 1 and 3 collagen antibodies. Connective tissue observed between long head of the biceps tendon (LHB) and tendon of subscapularis (SSC) was intermingled with compact and less compact fibers. These fibers stained dark only with the anti-type 3 collagen antibody. This area was thought to contain SGHL and CHL based on the macroscopic observation, however the border between them was unclear. SGHL is thought to be a part of CHL which has extended into the space between LHB and SSC. From the histological study, MGHL and IGHL showed a typical ligament structure, however, SGHL did not have a typical ligament structure. SGHL turned out to be connective tissue which extended from CHL.

YANG[1]* Hun-Mu, Da-Hye KIM[1]*, Jong-Tae PARK[2]*, Kyung-Seok HU[1]*, Heung-Joong KIM[2]*, Christian FONTAINE[3], Hee-Jin KIM[1]*. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project, Yonsei University College of Dentistry, Seoul, Korea, [2]Department of Oral Anatomy, College of Dentistry, Chosun University, Gwangju, Korea, [3]Department of Anatomy, Faculty of Medicine, Lille II University, Lille, France. Functional analysis of the masticatory system of the dog with relation to the human.

The aim of this study is to identify the species characteristics of the dog mastication compared to the human by analyzing 10 landmarks on the heads from seven beagle dogs. The masticatory unit of the dog was relatively located posterior than the human. The predominance of horizontally-oriented fibers of the temporalis was shown, despite vertical mandibular movement. The biomechanics of the coronoid process and the temporalis revealed backwardly-rotating the coronoid process not superiorly-elevating like the human. The masseter was also obliquely -oriented and the temporalis was observed in distinct two-layers. In the dogs, the higher coronoid process compared to the condyle was observed; the vertical difference of them was larger than the human. It appeared the temporalis performs stronger action than masseter and corresponded with marked horizontally-acting of the temporalis. These morphologies indicate the mastication of the dog needs strengthened horizontal stability and it was taken by the cervical muscles attached backwardly to the skull. Thickened temporalis is adapted in feeding. The dentition was longer and farther from the condyle and the pterygoid muscles were not well-developed than the human, indicating unfavorable lateral movement. These findings were consistent with evolutionary tendency, feeding without using hands and narrow skull. (Sponsored by Grant No. KRF-2007-314-E00003 from the Korean Research Foundation Grant by the Korean Government (MOEHRD)).

YUE Bin[1]*, Dai-Soon KWAK[1]*, Moon-Kyu KIM[2]* and Seung-Ho HAN[1], [1]Department of Anatomy, Catholic Institute for Applied Anatomy, College of Medicine, The Catholic University of Korea, Seoul, Korea. 2Department of Neurosurgery, Kangdong Sacred Heart Hospital, Hallym University, Seoul, Korea. Morphometric analysis of trajectory for C2 crossing laminar screws.

C2 crossing laminar screw fixation was described as a method for upper cervical rigid fixation with minimal chance of vertebral artery injury. However，this technique still has the potential possibility of neurologic injuries or laminar fractures from breakthrough of the inner or outer cortex of the laminar because of the incorrect screw trajectory. With increasingly used in clinical work，many cadaveric morphometric studies concerning the size, length and potential limitations of the translanminar screw's applications were performed. However, to the author's best knowledge, there are few reports mentioned about the morphometric analysis of the screw

trajectory. We designed this study aiming at providing valid guidelines for correct trajectory of C2 crossing laminar screw fixation. We used 60 specimens (3-D reconstruction models, female: 30, Male: 30) from Digital Korean human model. The location of entry point was decided at the most posterior and superior point in the basis of split spinal process. Safety region was determined by computational method (Mimics, Materialise, Belgium) for the proper angles of the screw trajectory in the axial plane. In superior view, the trajectory's minimum safe angle for the inner laminar cortex was 34.0±4.4 degree, the maximum safe angle for the outer cortex at the 1/2 laminar length is 54.1±6.6 degree from mid-sagittal plane. And the recommended angle for correct trajectory was range 43~46 degree.(To pass 2/3 length of laminar, 90% safety ratio).

YUEN Chris[1], Anne AGUR[2], Nancy MCKEE[2]* [1]Department of Exercise Science, University of Toronto, Toronto, Ontario, Canada [2]Department of Surgery, University of Toronto, Toronto, Ontario, Canada. Muscle architecture of the gastrocnemius and soleus in boys with Duchenne Muscular Dystrophy.

Purpose: To quantify and visually compare i*n vivo* ultrasound (US) changes in pennation angles (PA), fibre bundle length (FBL) and muscle thickness (MT) of the medial (MG) and lateral (LG) Gastrocnemius, and posterior Soleus (PS) in Duchenne Muscular Dystrophy (DMD) and in controls. Methods: Thirty-six boys (5-15y) were recruited (18 DMD/18 Control). Architectural measurements were quantified from US images in relaxed and maximally contracted states. A 6-level qualitative rating scale was used to describe the appearance of images and cross-referenced with two clinical timed function tests (TFT; walking and stairs). Data was compared using SPSS (t-test and Pearson correlation). Results: Only LG (DMD) had significant differences in both FBL (shorter) and PA (greater) compared to controls ($p \leq 0.05$). MG (DMD) and PS (DMD) had significantly greater PA and FBL respectively. MT was significantly greater in DMD than in controls at all sites. Ninety-four percent of DMD scans were qualitatively rated as “severe” or “obliterated”. Qualitative scores were well correlated with TFTs ($r=0.690$ for walking; $r=0.809$ for stairs). Conclusion: Architecture of DMD subjects is significantly different than controls. DMD muscles were thicker, had larger change in PA, and significantly different FBL on contraction. US may be a useful clinical tool for monitoring changes in DMD muscle.

ZHANG, Han and Leonard J. CLEARY. Dept. of Neurobiology and Anatomy, Univ. Texas Medical School Houston, Houston, TX. Production of a series of gross anatomy dissection videos.
Modifications to our Gross Anatomy course over the last several years have led us to recognize the need for a complete series of dissection videos. To assess feasibility of the project and estimate its cost, we worked with the in-house production team on a single episode. Production of that one video with overdubbed voice track required two weeks at a cost of $2000. The high cost encouraged us to produce the entire project ourselves. In order to provide rapid access for students, we decided to work through the entire series in several stages, rather than perfecting one video before moving on to the next. During the Fall of 2007, we completed the first phase by recording the dissection of a single male cadaver and a female pelvis. In order to keep up with the pace of the course, the videos were converted into digital video files with minimal editing and posted on the streaming video server. Student response to these videos was very positive (3.6 on a 4 point Likert scale). We are currently implementing the second phase, in which each video is being edited for time and content. In later phases, scripted narrations and didactic annotations (e.g. labels, highlights) will be added.

ZURADA, Anna and Jerzy GIELECKI, Departament of Anatomy, Medical University of Silesia, Poland. 3-D interactive virtual reality analysis of the middle cerebral artery.
The middle cerebral artery (MCA) is a main cerebral vessel supplying the basal ganglia, cortical areas responsible for language, higher cognitive functioning, and some descending pathways. The studies were carried out on archived files of angio-CT scan from 115 patients (75 female and 40 male) ranging from 12 to 78 years. Then files were imported into computer data base system. The precise measurements of the geometric (diameter, length, volume), spatial and stereoscopic (direction cosine) parameters of the proximal M1 segment of MCA had been analyzed using a 3-dimensional interactive virtual reality (3D-IVR) method. The M1 was analyzed according to symmetry, age and sexual dimorphism. The mean diameter of M1 segment was 2.23 mm^2, length was 15.62 mm and the volume was 63.92mm^3. Diameter and length were higher in men than woman but the differences were not to be found statistically

significant. However, the volume shown the statistically significant differences in gender After the direction of cosine, tortous and deviation index of M1 had been analyzed there were no statistical differences according to the age and gender. The geometric, stereotactic and spatial description of the MCA is helpful to neurosurgeons and neuroradiologists during operation of the aneurysms and other vascular procedures.