

**The 23rd
Annual Meeting
of the
American Association
of Clinical Anatomists**



Milwaukee Art Museum (Photo: Timothy Hursley)

July 11-15, 2006

Milwaukee, WI

Jointly sponsored by the

**American Association of Clinical Anatomists
and
Medical College of Wisconsin**



We Practice What We Teach



Office of the Mayor

CITY OF MILWAUKEE



Proclamation



hereas:

The 5th Annual Meeting of the American Association of Clinical Anatomists takes place in Milwaukee on July 11-14, 2006, at the Hyatt Regency Hotel; and,

WHEREAS, Clinical anatomists from all over the world are gathered to celebrate and learn from world renowned experts; and,

WHEREAS, Clinical anatomy is defined as anatomy in all its aspects - gross, histological, developmental and neurological as applied to clinical practice, the application of anatomic principles to the solution of clinical problems and/or the application of clinical observations to expand anatomic knowledge; and,

WHEREAS, The American Association of Clinical Anatomists meets 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; and,

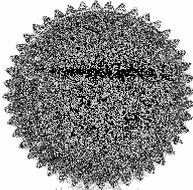
WHEREAS, The City of Milwaukee appreciates the American Association of Clinical Anatomists for its research, its application of anatomic principles to the solution of clinical problems to prevent disease and save lives, and wishes the organization a successful meeting;

NOW, THEREFORE, I, TOM BARRETT, Mayor of the City of Milwaukee, do hereby proclaim Wednesday, July 12, 2006 to be

CLINICAL ANATOMIST DAY

throughout the City Of Milwaukee.


TOM BARRETT
Mayor



**23rd Annual Meeting of the
American Association of
Clinical Anatomists**



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**Hyatt Regency Hotel
Milwaukee, WI**

The American Association of Clinical Anatomists officially began on October 17, 1983 to advance the science and art of Clinical Anatomy, to encourage research and publication in the field and to maintain high standards in the teaching of Anatomy.

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Clinical Anatomy

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

Editor-in-Chief – Stephen W. Carmichael
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Annual Banquet

Thursday July 13th, 2006

Hyatt Regency Hotel Regency Ballroom

6:00 pm – Reception - *Atrium*

7:00 pm – Dinner and presentation of *Honored Member and Distinguished Service Awards*

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

* deceased

Honored Member, 2006



The American Association of Clinical Anatomists

Recognizes and awards Honored Member to

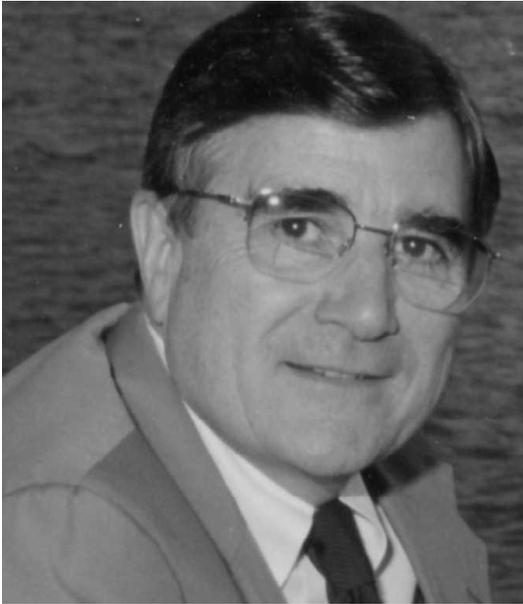
**Peter H. Abrahams, MB BS, FRCS (Ed),
FRCR, DO (hon)**

International Clinical Anatomist, Teacher, Author, Family Doctor

For his distinguished career, and enthusiasm for clinical anatomy as both clinician and anatomist, and particularly in recognition of his teaching of medical students the world over, and his prolific authorship of anatomical textbooks and electronic teaching resources in many languages.

Awarded at the 23rd Annual Meeting of the AACA,
Milwaukee, Wisconsin, July 13, 2006

**R. Benton Adkins Jr.
Distinguished Service Award, 2006**



The American Association of Clinical Anatomists

Recognizes and awards R. Benton Adkins Jr.
Distinguished Service Award to

Daniel O. Graney, Ph.D.

For his outstanding record of service to the Association,
as Program Secretary, Co-Chair of its Willd Body SIG,
AACA Newsletter Editor, President-Elect, President, Past-Present,
and his enthusiastic commitment to the of teaching clinical gross
anatomy.

Awarded at the 23rd Annual Meeting of the AACAA,
Milwaukee, Wisconsin, July 13, 2006

**The 2006 Keith L. Moore/Lippincott,
Williams & Wilkins Presidential
Speaker**

*“Why do they say that about limb development? A
progress report on developmental mechanisms.”*

John F. Fallon, Ph.D.,



Dr. John F. Fallon is the Harland Winfield Mossman Professor of Anatomy at the University of Wisconsin-Madison. He earned his PhD degree from Marquette University and has been on the faculty at the University of Wisconsin-Madison for 37 years. He is a former President of the American Association of Anatomists and serves as the Reviews Editor for *Developmental Dynamics*. His studies on pattern formation in the tetrapod limb are funded by NICHD.

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 *Regency D*.

Exhibit hours: 7:30am - 5pm Wednesday and Thursday;
7:30am-1pm on Friday

Bacus Laboratories
Bone Clones
Carolina Biological
Elsevier
Holt Anatomical
Lippincott Williams & Wilkins
Mopec
Overhead Camera Systems
Mortech Manufacturing
Oxford University Press
Thermo Electron Corporation
Thieme
Touch of Life Technologies

Tuesday, July 11th

- 2:30- 3:00 PM Furnishing a State of the Art Lab
Rick Bell
Mopec
- 3:00- 3:30 PM Disposition Alternatives
Gordon Kaye, Ph.D.
Waste Reduction by Waste
Reduction, Inc. (WR2)

Career Development Committee

- 4:30 p.m. - 5:30 p.m. **Reception for Young Anatomists**
1st floor – Lakeshore Ballroom

Welcome Reception

- 6:00 - 8:00 p.m. **The Netter Welcome Reception**
(sponsored by Elsevier) (for all
meeting attendees and accompanying
persons) – *Atrium 2nd Floor*

Wednesday, July 12th, 2006

- 7:00 - 8:30 a.m. **Editorial Board Breakfast Meeting for Editors/ Associate Editors of *Clinical Anatomy*, - Crystal Room**
- 7:00 - 8:30 a.m. **Career Development Committee - Milwaukee Room**
- 7:30 - 4:00 p.m. **Registration - Regency Prefunction Area
Commercial Exhibits – Regency C/D**
- 9:00 a.m. **Accompanying Persons' Program departs hotel**

8:30 – 9:00 a.m. **Opening Ceremonies /Remarks:**
Regency A/B

Thomas H. Quinn, Ph.D.
AACA President, Creighton University

The Honorable Thomas Barrett
Mayor of Milwaukee

Kenneth B. Simons, M.D.
Senior Associate Dean for Academic Affairs
Medical College of Wisconsin

Joseph C. Besharse, Ph.D.
Chair, Department of Cell Biology
Neurobiology and Anatomy
Medical College of Wisconsin

Wednesday, July 12th

8:00 a.m.- 4:30 p.m. **Poster Session 1 –
THORAX / ABDOMEN / PELVIS / EXTREMITIES – Regency C**

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

¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award.

§ Requested consideration for the Presidential Travel Award Presentation.

Thorax

- 01 ¶ The clinical anatomy of the greater and lesser splanchnic nerves. **BETANCOR, Jorge**^{1*}, Lisa CADOO^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ² Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 02 Hypertensive elongation and crimping of the great vessels trigger neurologic symptoms in patients with thoracic outlet syndrome (tos) and migraine: MRI/MRA/MRV. **COLLINS, James, D.**, Ernestina H. SAXTON, Theodore Q. MILLER, Hugh GELABERT and Alfred CARNES, Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA.
- 03 § Situs inversus totalis in an anatomical cadaver. **KALMEY, Jonathan K.**, Randy J. KULESZA Jr., Walter R. BUCK and Bertalan DUDAS*. Department of Anatomy, Lake Erie College of Osteopathic Medicine, Erie, PA.
- 04 ¶ The medial papillary muscle complex: An endoscopic cadaveric approach. **ROSENTHAL, Julie**^{1*}, Robert G LOUIS JR^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.

- 05 Occupational hazards predispose patients to thoracic outlet syndrome (TOS) and Paget-Schroetter's syndrome. **SAXTON, Ernestina H.**, James D. COLLINS, Theodore Q. MILLER, Hugh GELABERT and Alfred CARNES. Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA.
- 06 ¶ The clinical anatomy of the moderator band: An endoscopic and cadaveric approach. **SUMREEN, Vaid**^{1*}, Robert G LOUIS Jr^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 07 ¶ "High takeoff coronary arteries"; an endoscopic, angiographic and cadaveric approach. **TABAK, Russel**^{1*}, Rodion HUNTE^{1*}, Robert G LOUIS Jr^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 08 ¶ An endoscopic cadaveric approach to anatomic barriers of the cardiac venous system. **TARIQ, Afreen**^{1*}, Jeremy PINYARD^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 09 The clinical anatomy of the superior phrenic artery. **WARTMANN, Christopher**^{1*}, Robert G LOUIS JR^{1*}, Ehsan ESMAEILI^{1*}, Allyson C BAGENHOLM^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.

Extremities

- 10 Navigation for percutaneous repair of the ruptured Achilles tendon: anatomical study of the posterior part of the ankle joint. **APAYDIN, Nihal***, Ali F. ESMER*, Murat BOZKURT*, Ibrahim TEKDEMIR* and Alaittin ELHAN*. Department of Anatomy, Ankara University Medical School, Ankara, Turkey.
- 11 Abnormal brachial plexus formation with resultant radial-to-ulnar nerve communication and ulnar nerve innervation of the triceps brachii. **CLEMENTE, F. Richard** and Rachel A. Woods*. Department of Physical Therapy, John G. Rangos, Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA.
- 12 ¶ Surgical anatomy of the medial and lateral calcaneal nerves. **DIROCCO, Tom**^{1*}, Ehsan ESMAEILI^{1*}, Allyson C BAGENHOLM^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 13 ¶ Bilateral accessory flexor digitorum longus muscles with multiple additional anomalies: a case presentation and literature review. **DOWNIE, Sherry A.**, Hannah J. RAPAPORT*, Susan T. SOTARDI*, Anastasia R. LAMBERT*, Debbie Hana YI*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 14 ¶ A rare case of an anomalous tendon from the extensor digitorum communis (EDC) to the thumb. **FITZSIMMONS, John**, Rifat Ali KHAN, Lauren KLEIN, Jennifer LOUSSIA. Department of Radiology, Michigan State University, MI.

- 15 § ¶ Revisiting an unusual absence of the Extensor Pollicis Brevis. **FITZSIMMONS, John**, Rifat Ali KHAN, Lauren KLEIN, Jennifer LOUSSIA. Department of Radiology, Michigan State University, MI.
- 16 ¶ Sural-tibial and sural-fibular communications. **FLORES, Augustine**^{1*}, Lucas McARTHUR^{1*}, G LOUIS JR^{1*}, William MERBS^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 17 § ¶ Muscular influence over fibrous support of the posterior knee capsule: a functionally and clinically significant account of variations. **FREEMAN*, A. Jay**, Nathan A. JACOBSON*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES.
- 18 Tendinous architecture of the pectoralis major: a three-dimensional morphologic study. FUNG*, Lillia Y., Brian WONG*, **Anne AGUR**, and Amr ELMARAGHY*. Divisions of Anatomy and Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, Canada.
- 19 ¶ Distal distribution of the saphenous nerve and its vulnerability to injury during saphenous vein access procedures. GIBSON, Michael, A.*, Ralph GER, Sherry A. DOWNIE, Philip D. CHEUNG*, Alan C. WONG*, **Debbie Hana YI***, Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 20 ¶ § Unusual variations of the thigh: Incidence, development and significance. **JACOBSON*, Nathan A.**, A. Jay FREEMAN*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES.

- 21 Congenital bowing of long bones: Report of a rare case. **JEVOOR, Praful S.**, and Sharad M. ANTIN*
Departments of Anatomy and Orthopedics, Jawaharlal
Nehru Medical College, Belgaum, INDIA.
- 22 ¶ The surgical anatomy of radial and ulnar nerve
communications in the dorsal surface of the hand.
KRAMER, Jessica^{1*}, Robert G LOUIS JR^{1*}, Brian
CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical
Sciences, St George's University, Grenada, West Indies,
²Harvard Medical School, Department of Education and
Development, Boston MA, USA.
- 23 § A experimental study on the anatomy of trauma induced
by 2 different boat motor propellers. **PORTA, David J.**,
Tyler A. KRESS*, and Anne M. KROMAN*. Department
of Biology, Bellarmine University, Louisville, KY and
University of Tennessee, Knoxville, TN.
- 24 ¶ The surgical anatomy of the axillary nerve branches within
the deltoid muscle. **SANTORO, Pete**^{1*}, Robert G LOUIS
JR^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of
Anatomical Sciences, St George's University, Grenada,
West Indies, ²Harvard Medical School, Department of
Education and Development, Boston MA, USA.
- 25 ¶ Type I Split Cord Malformation with an unusual bony
morphology. **SHOKOUHI**^{1*}, **Ghaffar**, R. Shane TUBBS²,
Mohammadali MOHAJEL SHOJA^{1*}, W. Jerry OAKES².
¹Department of Neurosurgery and Anatomy, Tabriz
University of Medical Sciences, Tabriz, IRAN.
²Department of Cell Biology and Division of Pediatric
Neurosurgery, University of Alabama at Birmingham, AL.
- 26 ¶ Unusual origins of pericallosal arteries: the first report of
an association. **SHOKOUHI**^{1*}, **Ghaffar**, R. Shane
TUBBS², Mohammadali MOHAJEL SHOJA^{1*}, A.
ASHRAFIAN^{1*}, W. Jerry OAKES². ¹Department of
Neurosurgery and Anatomy, Tabriz University of Medical
Sciences, Tabriz, IRAN. ²Department of Cell Biology and
Division of Pediatric Neurosurgery, University of
Alabama at Birmingham, AL.

Wednesday, July 12th

- 27 ¶ Innervation of the articular muscle of the elbow: a novel three- dimensional representation. SULEMAN, Shazeen*, Piroška L. SZABO, and **Anne M.R. AGUR.** Division of Anatomy, Department of Surgery, University of Toronto, Toronto ON, Canada and Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, NY.
- 28 Architectural evidence of anatomical partitioning in human peroneus longus muscle. **TANIGUCHI***, **Keigo**, Masaki KATAYOSE*, and Seiji NORIYASU*. Department of Physical Therapy, School of Health Sciences, Sapporo Medical University, Sapporo, JAPAN (sponsored by MURAKAMI, Gen).
- 29 ¶ Extensor Pollicis et Indicis revisited. **WEBER, Daniel**, Michelle DORAN, FITZSIMMONS, John. Department of Radiology, Michigan State University, MI.
- 30 A three-dimensional study of pectoralis major muscle architecture. WONG*, Brian, Lillia Y. FUNG*, **Anne AGUR**, and Amr ELMARAGHY*. Divisions of Anatomy and Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, Canada.

Abdomen

- 31 ¶ An unusual case of inferior vena cava duplication with left iliac vein anomaly. **DOWNIE, Sherry A.**, Emily SCHONFELD*, Jennifer SCHACHAR*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx. NY.

- 32 Major anatomical variations concerning the vascularization of the left medial division of the hepatic parenchyma. **MATUSZ¹ Petru L.**, Enikö ST. HORDOVAN^{1*}, Agneta Maria C. PUSZTAI¹, Delia Elena D. ZAHOI^{1*}, Klara I. BRINZANIUC^{2*}, Elena G. POP^{1*}. ¹Department of Anatomy, University of Medicine and Pharmacy "Victor Babes", Timisoara, ²Department of Anatomy, University of Medicine and Pharmacy Tirgu-Mures, ROMANIA.
- 33 Major anatomical variants of the intrahepatic biliary ducts system. Study on corrosion casts. **MATUSZ¹, Petru L.**, Elena G. POP^{1*}, Klara I. BRINZANIUC^{2*}, Delia Elena D. ZAHOI^{1*} and Agneta Maria C. PUSZTAI^{1*}, Enikö St. HORDOVAN^{1*}. ¹Department of Anatomy, University of Medicine and Pharmacy "Victor Babes", Timisoara, ²Department of Anatomy, University of Medicine and Pharmacy, Tirgu-Mures, ROMANIA.
- 34 ¶ § Gonadal Arteries Originating from the Renal Arteries: A Possible Common Origin of Accessory Renal and Gonadal Arteries. **MOHAJEL SHOJA^{1*}**, Mohammadali, R. Shane TUBBS², Abolhassan B. SHAKERI^{1*} and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery, Anatomy and Radiology, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.
- 35 ¶ The surgical anatomy of the posterior gastric artery. **ONA, Mel^{1*}**, Christopher WARTMANN^{1*}, William MERBS^{1*}, Brian CURRY¹, Gene L. COLBORN², Marios LOUKAS^{1,3}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Center of Surgical Anatomy and Technique, Department of Surgery, Emory University, ³Harvard Medical School, Department of Education and Development, Boston MA, USA.

Wednesday, July 12th

- 36 ¶ The anatomical basis of celiac artery compression syndrome. **PINYARD, Jeremy**^{1*}, Christopher KINSELLA^{1*}, Afreen TARIQ^{1*}, Sumreen VAID^{1*}, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 37 ¶ The surgical anatomy of the arterial supply of the rectus abdominis musculoperitoneal flap. **POLEPALLI, Srikant**^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 38 Digital-image Analysis of Suprarenal Gland Development Trends. **SONPAL Niket**¹, Jerzy St. GIELECKI^{1,2}, Anna ZURADA¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide², Australia.
- 39 Digital-image Analysis – A Laproscopic Nephrectomy's New Best Friend. **SONPAL Niket**, Jerzy St. GIELECKI^{1,2}, Anna ZURADA¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia².
- 40 ¶ The surgical anatomy of the right renal vein; extension for kidney transplantation. **UDANI, Ankeet**^{1*}, Christopher WARTMANN^{1*}, William MERBS^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 41 ¶ Unusual circumaortic left renal vein variant and potential implications. **WIJDICKS***, **Coen A.**, Daniel A. ROSEMAN*, James M. WILLIAMS. Department of Anatomy and Cell Biology, Rush Medical College, Rush University Medical Center, Chicago, IL.

Pelvis

- 42 ¶ Assessment of nuclear DNA integrity of spermatozoa from ejaculates of fertile and infertile men: correlation with semen parameters. **KHALILI, Mohammad A.***, Fatima AGHAEI-MEYBODI*, Morteza ANVARI*, Ali R. TALEBI*. Fertility & Infertility Research Center, Isfahan University of Medical Sciences, Isfahan; Anatomy Department, Yazd University of Medical Sciences, Yazd, Iran.
- 43 Role of oocyte morphology on fertilization and embryo formation in assisted reproductive techniques (ART). **KHALILI*, Mohammad A.** , Mahdieh MOJIBIA*, and Abdul M. SULTAN*. Fertility & Infertility Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. ART Center, Qatar Women's Hospital, Qatar.
- 44 Female internal genital organs: A review of selected illustrations from the 16th to 20th century. OXORN*, Valerie M., **Anne M. R. AGUR**, Anca STEFAN, Cristian STEFAN and Arthur F. DALLEY. Division of Anatomy, Department of Surgery, University of Toronto, ON, Department of Cell Biology, University of Massachusetts Medical School, MA, and Department of Cell and Developmental Biology, Vanderbilt University School of Medicine, TN.
- 45 Male internal genital organs: A review of selected illustrations from the 17th to 21st century. OXORN*, Valerie M., **Anne M. R. AGUR**, Anca STEFAN, Cristian STEFAN and Arthur F. DALLEY. Division of Anatomy, Department of Surgery, University of Toronto, ON, Department of Cell Biology, University of Massachusetts Medical School, MA, and Department of Cell and Developmental Biology, Vanderbilt University School of Medicine, TN..

Other

46 ¶ A systematic approach for review and publication of anatomical variations. **MOHAJEL SHOJA**^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*} and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.

47 Morphological Relationship between Sebaceous Gland and Arrector Pili Muscle focused on their Function in the Follicular Unit. **Wu-Chul Song**, Ki-Seok Koh. Department of Anatomy, College of Medicine, Konkuk University, 322, Danwol-dong, Chunju, 380-701, Korea.

9:00 a.m. **Platform Session 1 - Abdomen and Pelvis.**
Dave Bolender - Moderator, *Regency A/B*

+ Eligible for Ralph Ger Student Platform Presentation Award.

§ Requested consideration for the Presidential Travel Award Presentation.

9:00 § Three-dimensional CT angiography: a new technique for imaging microvascular anatomy. **ACLAND, Robert D.**, Ashley P. TREGASKISS*, Adam N. GOODWIN*, Linda D. Bright*. Department of Surgery, University of Louisville and Christine M. Kleinert Institute, Louisville, KY.

9:15 §+ Is the dorsal nerve of the clitoris endangered in performing a trans-obturator sling procedure? **PATTERSON, Jennifer J.**,* Lindsay M. HARMON*, Susan B. TATE*, Robert D. ACLAND. Department of Obstetrics and Gynecology, Department of Surgery, University of Louisville School of Medicine, Louisville, KY.

Wednesday, July 12th

- 9:30 §⁺ Morphometry of the relationship between pelvic vasculature and anatomically/radiologically significant landmarks. **SHAH***, **Rajnil**, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES.
- 9:45 § New Characteristic features of the detailed branching of the pelvic plexus (inferior hypogastric plexus), as demonstrated by dissection photographs and video. **SATO Tatsuo**, H. SAKAMOTO*, S. HEIMA*, Y. TSUBOI*, S. MAEJIMA*, and K. AKITA*. Professor Emeritus, Unit of Clinical Anatomy, Graduate School, Tokyo Medical and Dental University, Tokyo, Japan.
- 10:00 - 11:00 a.m. **Refreshment Break** – browse the posters and commercial exhibits – *Regency C/D*
- 11:00 - 12:00 p.m. *Keith L. Moore/Lippincott, Williams & Wilkins Presidential Address*

John F. Fallon, Ph.D.,

“Why do they say that about limb development? A progress report on developmental mechanisms.”

Dave Bolender –Moderator

Dr. John F. Fallon is the Harland Winfield Mossman Professor of Anatomy at the University of Wisconsin-Madison.
Regency A/B

- 12:00 - 1:00 p.m. **Lunch.** *(on your own)*
Browse the posters and commercial exhibits.
Regency C/D

Wednesday, July 12th

- 1:00 p.m. **Scientific Platform Session 2** - Extremities.
Robert Spinner – Moderator.
Regency A/B
- 1:00 § The risk of superficial fibular nerve damage during fascial release in the leg. **APAYDIN, Nihal***, Kerem BASARIR*, Aysun UZ*, Hakan KINIK* and Alaittin ELHAN*. Department of Anatomy, Ankara University Medical School, Ankara, Turkey,
- 1:15 + The cystic transverse limb of the articular branch: a pathognomonic sign for fibular intraneural ganglion cysts at the superior tibiofibular joint. **DESY*, Nicholas M.**, Kimberly K. AMRAMI*, and Robert J. SPINNER. Departments of Radiology and Neurologic Surgery, Mayo Clinic, Rochester, MN.
- 1:30 § Hinged versus free scaphoid waist: a gross and arthroscopic investigation. **FOGG, Quentin A.** American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES.
- 1:45 §+ Anatomical variations of the plantaris muscle and a potential role in patellofemoral pain syndrome. **FREEMAN*, A. Jay**, Nathan A. JACOBSON*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES.
- 2:00 §+ Association of the supraspinatus muscle and tendon architecture with rotator cuff tears: a three-dimensional investigation of the supraspinatus muscle and tendon architecture. **KIM, Soo Y.**, Erin L. BOYNTON*, Tim RINDLISBACHER*, Denyse RICHARDSON*, and Anne M.R. AGUR, Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, CANADA.

Wednesday, July 12th

- 2:15 ⁺ A clinicoanatomic explanation for tibial intraneural ganglion cysts arising from the superior tibiofibular joint. **Mokhtarzadeh***, **Ali**, Terry K. Schiefer*, Nicholas M. Desy*, Kimberly K. Amrami*, Robert J. Spinner. Mayo Medical School, Mayo Clinic, Departments of Radiology and Neurologic Surgery, Rochester, MN
- 2:30 - 3:00 p.m. **Refreshment Break** - browse the posters and commercial exhibits – *Regency C/D*
- 3:00 p.m. **Scientific Platform Session 3** - Head and Neck. Tom Quinn – Moderator. *Regency A/B*
- 3:00 ⁺ T2 contributions to the brachial plexus. **WARTMANN, Christopher^{1*}**, Robert G LOUIS JR^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 3:15 [§] An anatomic study of the buccinator muscle fibres that extend to the terminal portion of the parotid duct, and their functional roles in salivary secretion. **KIM Hee-Jin^{1,2}**, Hyo-Chang KANG^{1*}, Hyun-Ho KWAK^{1*}, Kyung-Seok HU^{1*}, Kwan-Hyun YOUN^{1*}, Christian FONTAINE^{2*}. ¹Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea, ²Laboratoire d'Anatomie, Faculté de Médecine, Henri Warembourg, Université Lille 2, Lille, FRANCE.
- 3:30 ⁺ The arterial supply of the mandible with special regard to implant placement. **KINSELLA, Chris^{1*}**, Theodoros KAPOS^{2*}, Ramachandra SRINIVASA^{1*}, Brian CURRY¹, Marios LOUKAS^{1,3}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Department of Advanced Prosthodontics, Harvard School of Dental Medicine, ³Harvard Medical School, Department of Education and Development, Boston MA, USA.

Wednesday, July 12th

- 3:45 § + Introducing musculoskeletal physical examination skills as a teaching tool in the gross anatomy laboratory. **JONES***, **David B. JR**, Jason A. CAPO*, Becky L. JOHNSON*, Tia R. MILANESE*, Terry K. SCHIEFER*, Stephen W. CARMICHAEL, Wojciech PAWLINA.
Department of Anatomy, Mayo Clinic College of Medicine, Rochester, MN.
- 4:00 § The tectorial membrane: anatomical, biomechanical, and histological analysis. **TUBBS, R. Shane**, Mohammadali M. SHOJA*, E. George SALTER, W. Jerry OAKES*.
Departments of Cell Biology and Anatomy and Neurosurgery, University of Alabama at Birmingham, Birmingham, AL, and University of Tabriz, Tabriz, Iran.
- 4:15 The crucial role of anatomy in the management of malignant neck nodes. **RICHARDS Alan T.**, Division of Head and Neck Surgical Oncology, University of Nebraska, Medical Center, Omaha, NE; T.H. QUINN, Departments of Biomedical Sciences and Surgery, Creighton University School of Medicine, Omaha, NE; Neil S. NORTON, Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE .
- 6:00 - 7:00 p.m. Optional Evening Session: “What’s Rembrandt Got to Do With It?” A Workshop on Anatomy and Medical Humanities. Ruth Hart MD, FACEP

Room - Regency A/B

Wednesday, July 12th

**“What’s Rembrandt Got to Do With It?”
A Workshop on Anatomy and Medical
Humanities**

Ruth Hart MD, FACEP

This ‘hands-on’ workshop will examine how medical humanities; specifically the incorporation of selections from art, film, literature and theater can offer insight, perspective and foster personal growth for medical students as they face the larger than life experience of the study of anatomy. Participants will read, view and discuss specifically chosen pieces ranging from such masters as Shakespeare, Chekhov and Selzer to Rembrandt, Michelangelo and Giacometti as well as drawings done by medical students about what they feel just before they start anatomy. Medical humanities can offer insight into the aesthetic, scientific, ethical, spiritual and historical dimensions of this basic science, while also helping to place it in the larger context of the student’s entire medical school experience and their future careers as physicians.

Whether voiced or not, students contend with a wide gamut of feelings concerning this unique endeavor, from fear, anxiety and uncertainty to a sense of anticipation, curiosity and academic challenge. These selections provide the opportunity to put into words and reflect in visual imagery the somewhat intimidating, awe-inspiring encounter with the anatomy experience. The workshop will demonstrate how these works can be used as vehicles for the sharing of ideas and discussion of universal concerns with students, including such issues as the acknowledgement of their own mortality and that of their families and friends.

Those who select this workshop are encouraged to bring along for discussion any selections from the humanities that they may already be using with students.

Room - Regency A/B

Thursday, July 13th, 2006

7:00 - 8:00 a.m. **Anatomical Services SIG** – Milwaukee Room

7:00 - 8:00 a.m. **Financial Affairs Committee** – Gilpatrick A

7:00 - 8:00 a.m. **Past President's Breakfast** – Pilsner Palace

8:00 - 2:00 p.m. **Registration** – Regency Prefunction Area

9:00 a.m. **Accompanying Persons' Program departs hotel.**

8:00 a.m.- 4:30 p.m. **Poster Session 2 –
HEAD AND NECK / EDUCATION** - Regency C

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

¶ Eligible for the Sandy C. Marks, Jr. Student Poster Presentation Award.

§ Requested consideration for the Presidential Travel Award presentation.

48 Innervation of the lateral pterygoid muscle: A 3D anatomical study. **CHARLES, M.***, B. LIEBGOTT*, G. SANDOR*, C. CLOKIE*, and **A. AGUR**. Division of Anatomy, Department of Surgery, Faculty of Medicine and Faculty of Dentistry, University of Toronto, Toronto, Canada.

49 ¶ Greater occipital nerve zones for treatment of occipital neuralgia. **EL-SEFDY, Abraham¹***, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2,1}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.

50 Variation in the level of common carotid bifurcation: cadaver study and clinical significance. **FUJITA, Keiko***, Yoshiko ASAMI*, Masabumi NAGASHIMA, and Shoichiro ISHIHARA*. Departments of Anatomy and Neurosurgery, Saitama Medical University, Saitama, JAPAN.

Thursday, July 13th

- 51 When anatomy meets the law: Right upper lobectomy results in paraplegia. **GRANGER, Noelle A.**
Department of Cell and Developmental Biology,
University of North Carolina School of Medicine, NC.
- 52 ¶ The branching patterns and the intraosseous course of the mental nerve. **HU Kyung-Seok***, Hee-Sun Yun*, Mi-Sun Hur*, Hyun-Joo Kang*, Hee-Jin Kim. Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea
- 53 ¶ Topography and morphological variations of the lip elevator muscles. **Hur Mi-Sun***, Kyung-Seok Hu*, Hyun-Joo Kang*, Kwan-Hyun Youn*, Hee-Jin Kim. Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea.
- 54 A comparison of radiographic and i-CAT imaging of a double mental foramen. **JERGENSON, Margaret A.**, Neil S. NORTON. Creighton University Medical Center, School of Dentistry, Omaha, NE.
- 55 ¶ The clinical anatomy of the pterygopalatine ganglion. **LEONG, Karen**^{1*}, Theodoros KAPOUS^{2*}, Robert G LOUIS JR^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,3}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Department of Advanced Prosthodontics, Harvard School of Dental Medicine, ³Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 56 Rare Communication between 2 branches of the Mandibular Nerve: LINGUAL NERVE and INFERIOR ALVEOLAR NERVE - CASE REPORT. **MARCHIGIANI Raffaele J***; VLAD STANESCU. Department of Anatomy, American University of Antigua, St John's, Antigua.

- 57 ¶ An unusual duplication of the anterior communicating artery with atherosclerosis of the posterior horn: A microsurgical anatomy. **MOHAJEL SHOJA**^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, A. ASHRAFIAN^{1*}, and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.
- 58 ¶[§] The lateral perforating substance of diencephalon. **MOHAJEL SHOJA**^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, and W. Jerry OAKES². ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.
- 59 ¶[§] A triple dural-venous variation in the posterior cranial fossa: A duplicated plus accessory falx cerebelli and an aberrant venous sinus. **MOHAJEL SHOJA**^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, A. ASHRAFIAN^{1*}, and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.
- 60 Radiological study of retromolar canal and observations on the location of the mandibular foramen in dry human mandibles. **KILARKAJE, NARAYANA**, Department of Anatomy, Faculty of Medicine, HSC, Kuwait University, Safat 13110, Kuwait.
- 61 ¶ Anatomical study of the pterygomandibular raphe. **SANDERS***, **Michelle K.**, Carlos F. SONEIRA. Pikeville College School of Osteopathic Medicine, Pikeville, KY.

Thursday, July 13th

- 62 Relationship of Retrodiscal Tissue to the Temporomandibular Disc and Lateral Pterygoid Muscle. SANSALONE, C.* , B. LIEBGOTT*, G. SANDOR*, C. CLOKIE*, and **A. AGUR**. Division of Anatomy, Department of Surgery, Faculty of Medicine and Faculty of Dentistry, University of Toronto, Toronto, Canada.
- 63 ¶ The clinical anatomy of the mastoid emissary veins. **SPENTZOURIS, Georgios**^{1*}, Jeremy PINYARD^{1*}, Brian CURRY¹, Robert JORDAN¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 64 ¶ The clinical anatomy of the ansa cervicalis. **THORSELL, Ashley**^{1*}, Robert G LOUIS JR^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.
- 65 ¶ Arachnoid Ossifications: hidden in the shadows. **WIJDICKS***, **Coen A.**, James M. WILLIAMS. Department of Anatomy and Cell Biology, Rush Medical College, Rush University, Chicago, IL.
- 66 Location of the infraorbital and mental foramina with reference to the soft-tissue landmarks. **Wu-Chul Song**, Sang-Hyun Kim, Ki-Seok Koh. Department of Anatomy, College of Medicine, Konkuk University, 322, Danwol-dong, Chunju, 380-701, Korea.
- 67 § Relationship Between the Zuckerkandl's Tubercle and Entrance Point of the Inferior Laryngeal Nerve Including Laryngeal Branches. **YALÇIN***, **Bülent** and Hasan OZAN*. Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson).

Thursday, July 13th

- 68 § Variations of the levator palpebrae superioris muscle. **YALÇIN***, **Bülent** and Hasan OZAN*. Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson).
- 69 § A New Description for the Inferior Laryngeal Nerve: Detailed Investigation of the Terminal Portion of the Recurrent Laryngeal Nerve. **YALÇIN***, **Bülent**, Selçuk TUNALI*, Hasan OZAN*, Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson).
- 70 New method of the cerebral arteries evaluation. A solution for description of the variations in three-dimensional space. **ZURADA**¹, **Anna**, Jerzy St. GIELECKI^{1,2}, Grzegorz GAJDA^{1*}. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia².

Education

- 71 The use of Blackboard for dental histology laboratory instruction. **Barritt, L.C.**,* N.S. Norton, and M.A. Jergenson. Creighton University, Omaha NE.
- 72 Using “Learncasting” to Promote Pre-Laboratory Preparation in a Dental Gross Anatomy Course. **BRUECKNER, Jennifer K.** University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY.
- 73 § The author/medical artist partnership: the making of anatomy for surgeons by W.H. Hollinshead, Ph.D. **FACTOR, David A.**, Robert F. MORREALE* and Stephen W. CARMICHAEL. Mayo Clinic Division of Media Support Services and Department of Anatomy, Mayo Clinic and Mayo Foundation, Rochester, MN.

Thursday, July 13th

- 74 Creating a simulated operating room environment for resident anatomy programs. **GILROY, Anne M.** Departments of Surgery, Cell Biology, Orthopedics and Anesthesia, University of Massachusetts Medical Center, MA.
- 75 Wavelet Transforms in Echocardiogram Image Registration. **HILBELINK, Don H.**, Britney R. THOMAS*, Eric HOEGSTROM, College of Medicine and College of Engineering, University of South Florida.
- 76 Design for an innovative visual gross anatomy on-line dissector, based on the transformation of physical and digital dissection knowledge into conceptual graphs, and its real-time application in the teaching laboratory. **HISLEY, Kenneth C.**, Larry D. ANDERSON*, Stacy E SMITH*, Stephen KAVIC*, Paul G NAGY*. Departments of Radiology, Anatomy and Neurobiology, and Surgery, University of Maryland School of Medicine, Baltimore, MD.
- 77 Use of cadavers in instruction of undergraduate anatomy — results of the 2005 HAPS cadaver-use survey. **JACKSON, Jon** and Paul KRIEGER*. Department of Anatomy and Cell Biology, University of North Dakota, Grand Forks, ND; Grand Rapids Community College, Grand Rapids, MI, and the Human Anatomy and Physiology Society, Manchester, MO.
- 78 Implementation and observations of a revised, concise neuroanatomy course in a New Integrated Medical Curriculum. **KRISHNAN Subramaniam.** Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.
- 79 Shift to Integrated Microscope-Multimedia (IMMM) System enhanced motivation in medical students towards histology learning. **Lakshmi SELVARATNAM**, Amri SALIM* and SUBRAMANIAM, Krishnan. Department of Anatomy, Faculty of Medicine, University of Malaya, Malaysia.

Thursday, July 13th

- 80 Enhancement of Teaching Central Venous Access Using Viscous Lubricant in Lightly Embalmed Cadavers. **LOMNETH, Carol S.**, Michael C. Wadman*, and Wesley Zeger*. Department of Genetics, Cell Biology and Anatomy, University of Nebraska Medical Center, and Department of Emergency Medicine, The Nebraska Medical Center.
- 81 Team peer-to-peer clinical case presentations: Fostering teamwork in gross anatomy. **MA, Terence P.**, and Emmett R. FINDLAY. Department of Basic Sciences, Touro University – Nevada, Henderson, NV.
- 82 The use of voice files in PowerPoint™ presentations to enhance lab dissection skills. **MacPHERSON, Brian R.**, Anatomy & Neurobiology, The University of Kentucky College of Medicine, Lexington, KY.
- 83 Integration of pathology with gross anatomy in a clinical anatomy course. **MILLER, Brian T.**, Thomas J. COLLINS*, David E. SMITH*, Judith F. ARONSON*, and Daniel F. COWAN*. Division of Anatomy, Department of Neuroscience and Cell Biology and Department of Pathology, The University of Texas Medical Branch, Galveston, TX.
- 84 Seminar for clinical anatomy, simulation surgery, and feasibility study. **NAGASHIMA, Masabumi**, Tohru MATSUI*, Osamu SHIRADO*, and Hiromi ODA*. Departments of Anatomy, Neurosurgery, and Orthopedic Surgery, Saitama Medical University, Saitama, JAPAN.
- 85 Experiences with using Blackboard in a traditional head and neck anatomy course for dental students. **NORTON, Neil S**, Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, Creighton University, NE.

Thursday, July 13th

- 86 Clinical correlations in the anatomy lab. **POGGENBURG Colleen***, David L. BOLENDER, Michael A. SCHELLPFEFFER*, Gary L. KOLESARI Department of Cell Biology, Neurobiology, and Anatomy Department Family and Community Medicine Medical College of Wisconsin, WI.
- 87 Advancing the Effectiveness of Undergraduate Anatomy Education: Our Experience in implementing innovative teaching methods. **RAOOF, Ameer, D.**, Lowell FISHER*, Sabine HILDEBRANDT*, John STRIBLEY*, Carla BRYANT*, Aaron ESKRIDGE*, Jared VANDERLEEST*, Shreya SINHA*, Ahlam SULTAN*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, Michigan.
- 88 A Pre-matriculation Course in Anatomy Predicts Student Success in Medical Gross Anatomy. **RISSING*, David C.**, Mark F. SEIFERT and Ronald L. SHEW. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN.
- 89 Use of team-based learning as an educational tool for learning developmental anatomy. **SEVERSON, Arlen R.** Department of Anatomy, Microbiology and Pathology, Division of Anatomy and Cell Biology, University of Minnesota Medical School, Duluth, MN.
- 90 ¶ § Willed Body Donation Discrepancies between Asian and Caucasian Populations in the State of Hawaii between 1967 and 2004. **SHARP*, Ian C.**, Mari KUROYAMA*, and Scott LOZANOFF. Department of Anatomy, Biochemistry and Physiology. University of Hawaii School of Medicine, HI.
- 91 Impact of a post-baccalaureate program on performance of first-year medical students in anatomical sciences. **SHEEDLO, Harold J.**, Rustin E. REEVES., Armando A. ROSALES, Department of Cell Biology and Genetics, University of North Texas Health Science Center (UNTHSC), Fort Worth, TX.

Thursday, July 13th

- 92 Histology lab exercises that correlate microscopic images with macroscopic pathological specimens, radiological imaging, and principles of physical diagnosis. **STEFAN, Anca M**^{1*}, Armando FRAIRE^{2*}, Thomas J. FITZGERALD^{3*}, and Cristian STEFAN¹.
¹Department of Cell Biology, ²Department of Pathology, and ³Department of Radiation Oncology, University of Massachusetts Medical School, Worcester, MA.
- 93 Combining the benefits of PowerPoint and markers/chalk by teaching with tablet computers in anatomical sciences courses. **STEFAN, Cristian** and Anca M. Stefan*.
Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA.
- 94 ¶ Virtual anatomy atlas. **WELLS***, **Michael T.**, Neda MIRAFZALI*, Dorothy GOTLIB*, Ameer RAOOF.
- 95 Beyond the first year: Focused anatomy instruction during the clinical years of medical school. **ZUMWALT, Ann C.**, Alexander VAN NIEVELT*, Lawrence MARKS*, Elizabeth LIVINGSTON*, Edward C. HALPERIN*. Duke University School of Medicine, Durham, NC.
- 96 An Assessment of the Usage of Computer Based and Electronic Study Aids Among Medical Students in an International MD Program. **ZURADA**¹, **Anna**, Jerzy St. GIELECKI^{1,2}, Zachary PUTHOFF^{1*}, Niket SONPAL¹.
Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia².
(Sponsored by Jerzy St. Gielecki)

Thursday, July 13th

8:30 a.m. **Scientific Platform Session 4** - Thorax.
Larry Ross – Moderator. *Regency A/B*

+ Eligible for Ralph Ger Student Platform Presentation Award.

§ Requested consideration for the Presidential Travel Award Presentation.

8:30 + A complete separation of the superior and inferior lobes of the left lung. **FINDLAY, Emmett R.**, Suzanne ROOZENDAAL*, S. Yoel LEVY*, and Terence P. MA. Department of Basic Sciences, Touro University – Nevada, NV.

8:45 § A functional anatomical perspective for surgical approach in the treatment of constrictive pericarditis. **LACHMAN, Nirusha.**, Ebrahim A VANKER* and Kapil S SATYAPAL. Department of Human Biology, Durban Institute of Technology, Durban South Africa and Department of Anatomy, University of Kwazulu Natal, Durban South Africa.

9:00 + The clinical anatomy of the phrenic ganglion. **LOUIS Jr, Robert G**^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA.

9:15 § The clinical anatomy of the coronary collateral arteries. **LOUKAS, Marios**^{1,2}, Robert G LOUIS JR^{1*}, Marek DABROWSKI^{3*}, Mirek KIEDROWSKI^{3*}, Artur BARTZAK^{3*}, **Michal KAMIONEK**^{3*}, Martin J. FUDALEJ^{3*}, Teresa WAGNER^{4,5*}, ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA, ³Department of Cardiology, Bielanski Hospital, ⁴Department of Pathology, Institute of Rheumatology, ⁵Department of Forensic Medicine, Warsaw Medical School, Warsaw, Poland.

Thursday, July 13th

- 9:30 ⁺ A multidisciplinary account addressing problems pertaining to the identity of the accessory nerve.
BENNINGER, Brion L* and Jon C MCNEIL*.
Department of Integrated Biosciences, Oregon Health Sciences, University, OR.
- 9:45 [§] Reviving the art and science of observation as part of the teaching objectives associated with clinical case discussions. **STEFAN, Cristian.** Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA.
- 10:00 - 11:00 a.m. **Refreshment Break** – browse the posters and commercial exhibits – *Regency C/D*
- 11:00 a.m. **Educational Affairs Committee**
Special Presentation: Dr. Karen Mann.
- Learning and assessment:
how do they influence each other?**
- Geoffrey Guttman - Moderator*
Dr. Mann is currently a Professor in the Faculty of Medicine and Director of the Division of Medical Education at Dalhousie University.
- 12:00 - 1:00 p.m. **Lunch.** (*on your own*)
Browse the posters and commercial exhibits. *Regency C/D*
- 1:00 - 2:30 p.m. **AACA Annual Business Meeting** (all members and membership applicants) –
Regency A/B
- 2:30 - 3:00 p.m. **Refreshment Break** - browse the posters and commercial exhibits – *Regency C/D*

Thursday, July 13th

Educational Affairs Committee Symposium

3-3:30 pm Cristian Stefan: "Promoting the transfer of knowledge across contexts by use of miniclips"

3:30-5 pm Geoff Guttman and his band of merry helpers:
A workshop on Assessment: How do our own perspectives affect what we assess? Some terms of assessment and what do they really mean?

CAVE exercise

Results of the CAVE exercise

Reflections on the CAVE exercise

This year, the Educational Affairs Committee will make the Educational Affairs Committee Symposium a more interactive experience by introducing a workshop. The workshop expects attendees to participate in some exercises or activities related to assessment. Please bring some of your favorite assessment items to this workshop for discussion.

6:00 p.m. **Reception** (cash bar) - *Atrium*

7:00 p.m. **Annual Banquet** and presentation of Honored Member Award – *Regency A/B*

Friday, July 14th, 2006

7:00 - 8:00 a.m. **Educational Affairs Breakfast** - *Executive A*

8:00 a.m. **AAAC TechFair Session** - Brian MacPherson -
Moderator. *Regency A*

8:00 Congenital heart defects: interactive case-based learning module. **BAPTISTA, Carlos A. C.**, Sarah GLAUSER*, Farid MOUSTOFI*, Ernest G BROOKFIELD*, and Christopher G. MALONEY¹*. Department of Neurosciences, Medical University of Ohio, Toledo, Ohio, ¹University of Utah, Salt Lake City.

8:10 Medical student access to disarticulated skull bones using Quicktime movies. **BERND, Paulette**, Vincent GAROFALO*, and Shirley EISNER*. Department of Anatomy and Cell Biology, SUNY Downstate Medical Center, Brooklyn, NY.

8:20 Browsing software of the Visible Korean Human for learning sectional anatomy. **CHUNG***, **Min S.** and Jin S. PARK*. Department of Anatomy, Ajou University School of Medicine, Korea (sponsored by S. W. Carmichael).

8:30 Development of web-based anatomy flash cards using images from student dissections. **COOKE, John M.**, Sandy C. MARKS, Jr., Charlene A. BARON* and Anne M. GILROY. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA.

8:40 A rapid computerized anatomical modelling system using a hand-held scanner. **FARRELL***, **Michael***, Sarah TAKEKAWA*, Eric NEUFELD*, and Scott LOZANOFF. Department of Anatomy, Biochemistry and Physiology, University of Hawaii School of Medicine, HI, and Department of Computer Sciences, University of Saskatchewan, SK.

8:50 A Talking Brain – Aiding the Nervous in Learning about the Nervous System. **GIELECKI^{1,2}** **Jerzy St.**, Anna ZURADA¹, Niket SONPAL¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia².

Friday, July 14th

- 9:00 Putting the Puzzle In Rather Than Out of Anatomy. **GIELECKI**^{1,2} **Jerzy St.**, Anna ZURADA¹, Niket SONPAL¹, Zachary PUTHOFF^{1*}, Greogorz GAJDA^{1*}. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia². (Sponsored by Jerzy St. Gielecki)
- 9:10 Anatomy Revealed – Volume 1. **HANKIN, Mark H.***, Dennis E. MORSE*, Carol A. BENNETT-CLARKE*, and Roy E. SCHNEIDER*. Medical University of Ohio, Toledo, OH (sponsored by C.A.C. Baptista).
- 9:20 A multimodal teaching experience: Engaging your students via creative instruction through online learning. **LAMBERT, H. Wayne**, University of Louisville School of Medicine, Dept. of Anatomical Sciences and Neurobiology, Louisville, KY.
- 9:30 Portable anatomy: anatomic QuickTime VR movies on the Apple iPod. **SMITH, Gregory R.** Department of Biology, Saint Mary's College of California, Moraga, CA.
- 9:40 Introduction to dissection. **WINESKI, Lawrence E.**, Perry RIGGINS*, Christopher MAY*, Rebecca SEALAND*. Department of Anatomy & Neurobiology, and Division of Information Technology Services, Morehouse School of Medicine, Atlanta, GA.
- 9:50 Interactive color compositing enhances multivariate analysis of magnetic resonance images. **MANSURI***, **Junaid N.**, and Mark J. HOLTERMAN. Department of Surgery, University of Illinois at Chicago, IL.

Friday, July 14th

- 10:00 Female pelvic floor anatomy: A special focus on stress urinary incontinence. **YU***, **Wei Ning**, MACKAY*, Margot B., WOOLRIDGE*, Nicolas HERSCHORN, Sender, and AGUR, Anne. Biomedical Communications, Institute of Communication and Culture, University of Toronto at Mississauga, Institute of Medical Science, Divisions of Urology and Anatomy, Department of Surgery, University of Toronto, Canada.
- 10:10-10:45 a.m. **Refreshment Break** – *Regency D - Exhibits*
- 10:45 a.m. **Platform Session 5: Education 1**
Ralph Ger - moderator - *Regency A/B*
- 10:45 A unique, innovative and clinically-oriented approach to anatomy education. **DRAKE, Richard L.** Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland Clinic, Cleveland, OH.
- 11:00 Emphasizing the clinical in clinical anatomy. **GER, Ralph**, Sherry A. DOWNIE, Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 11:15 Surface anatomy and physical examination of the donor: valuing the perception of the cadaver as a patient. **OLSON, Todd R.** and Sherry A. DOWNIE. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 11:30 Plastinated specimens as an adjunct to dissection: Are they really helpful? **RAOOF, Ameed**, Longping, LIU*, Heping, ZHAO*, Katherine, FALK*, Tim BODNAR*, Eric DUEWEKE*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, Michigan.
- 11:45 CASA: united we stand. **SVOBODA, Kathy K. H.**, Baylor College of Dentistry, Texas A & M Health Science Center, Dallas, TX.

Friday, July 14th

- 12:00 - 1:00 p.m. **Lunch.** (*on your own*)
- 12:00 to 1:00 p.m. **ACA New Council Meeting** – *Executive A*
- 1:00 p.m. **Platform Session 6:** - Education 2
Greg Smith - moderator, *Regency A/B*
- 1:00 Impacts of structured collaborative assessment on student learning, retention, and motivation in large anatomy courses. **TERRELL, Mark A.** Division of Anatomy, College of Medicine and Public Health, The Ohio State University, Columbus, Ohio.
- 1:15 Introduction of the real time video from the operating room to the lecture hall. **MARTINO, Leon J.**, Charles H KITE*, and Nancy A WILSON-MARTINO*. Division of Medical Education, Albany Medical College, Albany, NY.
- 1:30 Anatomical Education Applications for the iPod. **TRELEASE, Robert B.** Department of Pathology and Laboratory Medicine, David Geffen School of Medicine at UCLA, CA.
- 1:45 Survival of a gross anatomy course in the wake of Hurricane Katrina. **SWARTZ, William J.**, Louaine L. SPRIGGS, Peter D. OLIVER*, Judith M. VENUTI, Greg P. CASEY and Richard H. WHITWORTH, JR. Department of Cell Biology and Anatomy, LSU Health Sciences Center, New Orleans, LA
- 2:00 Characterization of neurons and plasticity of axon terminals at the neuromuscular junction in Fetal Alcohol Syndrome (FAS). **KRISHNAN Subramaniam**, Pamela DAVID*. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.
- 2:15 Adjournment

Saturday, July 15, 2006

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



23rd Annual Meeting Postgraduate Course

Current Diagnosis and Treatment of Common Congenital Anomalies; From Embryology to Outcome

Co-Sponsored by the Department of Cell Biology, Neurobiology and Anatomy and the Division of Pediatric Surgery of the

Medical College of Wisconsin

7:30 am - 5:00 pm

Co-Organizer

David Bolender and John Aiken

7:30 am Buses leave Hyatt for Medical College of Wisconsin
(Location: Kerrigan Lecture Hall)

8:00 Continental Breakfast

8:15 Convene and welcome address: John Aiken MD,
Pediatric

Surgery/Dave Bolender PhD

8:30 Update on pediatric surgery John Aiken

9:00 Case studies -- common congenital malformations and
current management - Casey Calkins MD, Pediatric
Surgery

10:00--10:15 break

10:15 Congenital Airway malformations - Steve Conley MD,
Otolaryngology

Saturday, July 15, 2006

- 11:15 Congenital heart disease--strategies for management of single ventricle - Chris Brabant CCP, Cardiothoracic Surgery
- 12:00--1:15 LUNCH
- 1:30 Advances in Fetal Imaging - Randall Kuhlmann MD, Perinatology
- 2:30 Research areas--fatal surgery and interventions - Mary Ames-Castro MD, Perinatology
- 3:30 Laboratory experience Dave Bolender and Ralph Franciosi MD, Pathology
- 5:00 Return to Hyatt

Abstracts

ACLAND, Robert D., Ashley P. TREGASKISS*, Adam N. GOODWIN*, Linda D. Bright*. Department of Surgery, University of Louisville and Christine M. Kleinert Institute, Louisville, KY. Three-dimensional CT angiography: a new technique for imaging microvascular anatomy.

Three dimensional CT angiography (3D-CTA), widely used clinically for blood vessel imaging, provides an important new technique for creating detailed three dimensional images of blood vessel anatomy in cadaveric specimens. In 10 fresh cadavers the superior and deep inferior epigastric arteries were injected with a 65% w/v suspension of lead oxide in a 3% gelatin-water solution. The whole thickness of the abdominal wall was removed, and imaged using a 16-slice spiral CT scanner. We present the resulting images in motion picture format. These demonstrate the clarity and detail that can be attained with this technique. To study detail in large complex specimens, areas of special interest can be defined by digital cropping of the 3D image. Since the particles of the contrast material do not pass through capillaries, the images show arteries only. Using micro tubing filled with contrast material, we determined that the smallest diameter reliably represented was 0.4mm. Our study produced data of clinical importance for reconstructive surgeons concerned with improving the reliability of abdominal skin and muscle flaps.

APAYDIN, Nihal*, Kerem BASARIR*, Aysun UZ*, Hakan KINIK* and Alaitin ELHAN*. Department of Anatomy, Ankara University Medical School, Ankara, Turkey. The risk of superficial fibular nerve damage during fascial release in the leg.

Chronic exertional compartment syndrome of the leg is an increasing problem among athletes. Although the recommended treatment of this problem includes minimal-incision techniques, there is little information about anatomic correlation with structures at risk. The aim of this study was to investigate the risk and analyze the significance of injury of the superficial fibular nerve during compartment decompression operations and to describe a safe zone for one-incision technique. For this aim, 15 cadaveric legs fixed in %10 formaldehyde were dissected with particular attention to the relationship between the superficial fibular nerve and the anterior and posterior intermuscular septum lying between the lateral and the anterior compartments of the leg. In 60%, the superficial fibular nerve was observed to be

located in the lateral compartment and pierced the deep crural fascia an average of 12,3 cm proximal to the lateral malleolus and divided into its terminal branches within 13,5 cm of its exit point. This pattern was noted as type A. In 40%, the superficial fibular nerve was observed to pass into anterior compartment by piercing the anterior intermuscular septum an average of 10,6 cm distal to the fibular apex. It then pierced the deep crural fascia an average of 14,3 cm proximal to the lateral malleolus and divided into its terminal branches within 1,2 cm of its exit point. This pattern was noted as type B. In Type A pattern, a single incision where the nerve divides the intermuscular septum is enough for releasing the compartment but in Type B pattern double incision technique would be necessary for to prevent the superficial fibular nerve injury where it pierce the intermuscular septum.

APAYDIN, Nihal*, Ali F. ESMER*, Murat BOZKURT*, brahim TEKDEMIR* and Alaittin ELHAN*. Department of Anatomy, Ankara University Medical School, Ankara, Turkey. Navigation for percutaneous repair of the ruptured Achilles tendon: anatomical study of the posterior part of the ankle joint.

This study aims to navigate the surgeon regarding the localization of the main anatomical structures at the posterior part of the ankle joint, in order to find easily the safest anatomical landmarks with reference to the neurovascular structures, in particular for percutaneous repair of the ruptured Achilles tendon. The study was carried out on 22 legs of 11 adult cadavers fixed in 10% formaldehyde. In all specimens we examined the posterior ankle in 5 different zones and noted (1) the width, length and the localizations of the Achilles, flexor hallucis longus, flexor digitorum longus, tibialis posterior, fibularis longus and brevis tendon, the distance between the Achilles and (2) the sural nerve, (3) the small saphenous nerve, (4) the tibial nerve, (5) the malleolar arteries. All the measurements were made in relation to the lateral-medial malleolus axis and the talocrural joint and the results were compared statistically. The results were as follows: In 77.3 % the sural nerve was located in Zone 2 and in 90.9% the tibial nerve in Zone 4. According to our study the risk of neurovascular injury is maximal in the 2,0 cm lateral and 1,7 cm medial and 2,8 cm deep to the Achilles tendon. No statistical significance was found between the measurements made in relation to the malleoli and the talo-crural joint. Knowing the exact localization of the anatomical structures

under the guidance of the defined anatomic zones may provide a safer percutaneous surgery.

BAPTISTA, Carlos A. C., Sarah GLAUSER*, Farid MOUSTOFI*, Ernest G BROOKFIELD*, and Christopher G. MALONEY¹*. Department of Neurosciences, Medical University of Ohio, Toledo, Ohio, ¹University of Utah, Salt Lake City. Congenital heart defects: interactive case-based learning module.

Electronic or Computer-aided instruction (CAI) modules have been used in a wide array of educational venues, including professional healthcare education. The modules are rich in visual design that appeals to learners; many modules include multimedia format and interactivity. Surprisingly, there is little data in the professional education literature that supports the superiority of CAI over traditional method of teaching and learning. In a 1995 study, pediatric students who utilized a multimedia module earned higher test scores than students who prepared by attending traditional lecture. However, findings with the same cohort indicated no difference in test scores between students using CAI and using a textbook. In order to examine the effectiveness of computer aided instruction, we constructed the Congenital Heart Defects Interactive module to use in conjunction with traditional teaching strategies. The module consists of clinical cases in Flash video format, along with animations, illustration and texts featuring the most common congenital heart defects.

Barritt, L.C.,* N.S. Norton, and M.A. Jergenson. Creighton University, Omaha NE. The use of Blackboard for dental histology laboratory instruction.

In recent years, the use of web-based education as an instructional method has increased at universities. Web-based technology is considered a useful tool for teaching outside the classroom and offers a range of implementation options. In the past our freshman dental histology course has utilized microscopic analysis of glass slides as the primary method of laboratory instruction. Given some of the inherent difficulties of a glass slide based format, this year we placed the histology laboratories online using Blackboard. This is an integrated web-based support system which enables the user continual access to online material. Due to the format change we sought to examine the effectiveness of using Blackboard and to investigate if changing the laboratory format to an online method of instruction influenced student performance. In this study student

performance was compared between two groups of students (n=67) with equivalent GPA and DAT scores. Group one evaluated glass slides using light microscopy. Group two viewed digitally labeled images of the same glass slides online. Both groups were evaluated using a light-microscopy based lab exam following the completion of a laboratory assignment. There was no difference on student performance between students using traditional methods and students using Blackboard.

BENNINGER, Brion L* and Jon C MCNEIL*. Department of Integrated Biosciences, Oregon Health Sciences, University, OR. A multidisciplinary account addressing problems pertaining to the identity of the accessory nerve.

The accessory nerve (AN) has been surrounded by a cloud of controversy since its discovery in 1664 by Thomas Willis, the Father of Neuroscience. Regarded as a 'supplementary' nerve, Willis did not classify the AN as a cranial nerve. Current organization of 'cranial' nerves includes Willis' accessory (spinal root) with a bulbar/cranial component consisting of roots from the nucleus ambiguus as CNXI. Currently, peripheral nerves exiting skull foramina are defined as cranial nerves, nevertheless all cranial nerves except the spinal AN have nuclei within the cranium making the definition of cranial nerves controversial. Recent embryology, challenges the published modality of the AN, special visceral efferent (SVE), because its target muscles are not branchiomeric. This inconsistency warrants investigation into comparative, neuro, and functional anatomy of the AN-nucleus complex, which was previously influenced by the assumption that the AN is only branchiomeric (SVE). Our findings demonstrate the AN has been misrepresented throughout literature. Neurobiotaxis aids somatosensory development causing a functional relationship between AN-nucleus complex and the sternocleidomastoid-trapezius musculature. We question the definition of cranial nerves, the 'cranial' root of the AN, and provide evidence the spinal root is both GSE and SVE, a combination that has yet to be proposed.

BERND, Paulette, Vincent GAROFALO*, and Shirley EISNER*. Department of Anatomy and Cell Biology, SUNY Downstate Medical Center, Brooklyn, NY. Medical student access to disarticulated skull bones using Quicktime movies.

Medical students are not usually allowed free access to an Anatomy Department's collection of disarticulated skull bones because they are delicate and expensive. Alternatively, we distribute plastic pop apart models of the skull. However, these

are of limited value because they are not as detailed (i.e. no pterygoid canal in the plastic sphenoid). We therefore used the method described by Regan and Smith (AACA 2005) to create Quicktime movies of individual skull bones. Bones were attached to a calibrated Kaidan Pixi turntable directly (or on a rod) using hot glue that did no harm to the bones. A Nikon D100 6 megapixel camera with a Nikon 105mm 2.8 macro lens, two Lowel Pro tungsten spotlights and a black velvet paper background were used. The turntable was moved in 20 degree increments resulting in 18 images that were assembled using VR Worx 2.6 to generate a Quicktime movie. If necessary, images were retouched to eliminate the rod. In the case of several bones, multiple Quicktime movies were needed to demonstrate all features. For each movie, approximately two images were chosen for labeling and saved as pdf files. Both the Quicktime movies and the labeled images were uploaded to the Head and Neck folder in SUNY Downstate's online course management system (Angel) so that students have continuous access to the disarticulated skull bones.

BETANCOR, Jorge^{1*}, Lisa CADOO^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the greater and lesser splanchnic nerves.

Splanchnic neurectomy is an important procedure for the management of chronic abdominal pain and for pain relief in unresectable pancreatic cancer. Recurrence of abdominal pain after splanchnic neurectomies is a common entity that may be due to anatomical variation in the pattern of splanchnic nerves. The aim of our study, therefore, was to investigate the incidence, origin and patterns of distribution of greater (GSN) and lesser (LSN) splanchnic nerves. We examined grossly 200 adult human formalin-fixed cadavers. The GSN was formed from T7, T8 and T9 in 25% of cases, from T7 and T8 in 20% of cases, from T7, T8, T9 and T10 in 19% of cases, from T8, T9 and T10 in 17% of cases, and from T6, T7, T8 and T9 in 19% of cases. The nerves arose symmetrically in 5% of the specimens. The LSN was formed from T10 and T11 in 21% of the cases, from T9, T10 and T11 in 32% of the cases, from T10, T11 and T12 in 21% of the cases, and was absent in 26% of the cases. In light of these variations, a reappraisal of current surgical techniques in thoracoscopic splanchnic neurectomies is warranted.

BRUECKNER, Jennifer K. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington KY. Using "LearnCASTing" to Promote Pre-Laboratory Preparation in a Dental Gross Anatomy Course.

The effective pedagogical use of audio has been underused in anatomical sciences instruction. This trend will change with the advent of "learnCASTing," defined as "the practice of delivering pedagogically sound instructional content designed for [web-based] delivery..." To facilitate student preparation for dental gross anatomy laboratory exercises, "learnCAST" audio files were posted on Blackboard™ for sixteen labs. Two types of mp3 audio files were posted prior to each session: 1) a narration of the procedural steps from the dissector guide and 2) an explanation of 23 key figures from Grant's atlas, emphasizing important anatomical structures and relationships. Forty-five percent of the first year dental class accessed at least one "learnCAST." Students valued the explanations of key Grant' atlas images more than the narration of the dissection procedures. The routine users reported that the atlas "learnCASTs" efficiently focused them on important landmarks for the upcoming lab and helped them interpret the atlas images more effectively. Students indicated that this structured approach to studying the atlas made the dissection guide more easily readable and understandable.

CHARLES, M.*, B. LIEBGOTT*, G. SANDOR*, C. CLOKIE*, and A. AGUR. Division of Anatomy, Department of Surgery, Faculty of Medicine and Faculty of Dentistry, University of Toronto, Toronto, Canada. Innervation of the lateral pterygoid muscle: A 3D anatomical study.

Background: Alteration in neuromuscular recruitment within the lateral pterygoid muscle (LPM) has been shown to predispose the temporomandibular joint to injury and instability (Phanachet, 2003). Purpose: To elucidate the functional characteristics of the LPM based on the extra and intramuscular innervation. Methods: Three edentulous adult cadaveric specimens were dissected. The specimens were stabilized rigidly for digitization of the nerves using a MicroScribe 3-DX digitizer. A 3-dimensional model of the extra and intramuscular innervation to the LPM was developed using Maya TM. Results: The superior lateral pterygoid muscle (SLPM) and inferior lateral pterygoid muscle (ILPM) received both common and independent sources of innervation. The long buccal nerve was found to innervate both the inferior aspect of the SLPM and entire ILPM. Independent

sources of innervation come from the ant, middle and deep temporal nerves to the superomedial aspect of the SLPM. The innervation to the internal ILPM formed a plexus of nervous tissue which innervated the entire inferior head. Conclusions: The innervation pattern of the LPM suggests that both the SLPM and ILPM may function together or independently for a given task. The internal innervation pattern of the LPM is suggestive of various functional units capable of independent recruitment for fine motor control. The SLPM has independent innervation to its superomedial aspect an area of the muscle which is intimately related to the discal tissue. Over activity in this portion of muscle may be involved in pulling the disc anteriorly in cases of chronic anterior displacement.

CHUNG*, Min S. and Jin S. PARK*. Department of Anatomy, Ajou University School of Medicine, Korea (sponsored by S. W. Carmichael). Browsing software of the Visible Korean Human for learning sectional anatomy

From a Korean male cadaver (32 years old), 1,702 pairs of MRIs and CTs (intervals: 1 mm) of whole body were scanned; 8,510 anatomical images (intervals: 0.2 mm, pixel size: 0.2 mm) were made by serially sectioning the cadaver; segmented images were made by outlining 13 important anatomical structures. All the images were named Visible Korean Human. Software for browsing 1,702 sets of the anatomical images, MRIs, CTs, and segmented images (intervals: 1 mm) was composed with the following functions realized: Four kinds of images, which were always corresponding, were displayed; images of interesting levels could be displayed in a real time by using convenient buttons, scroll bar, or image number; names of the segmented anatomical structures could be displayed. Anyone can obtain the software by on-line (anatomy.co.kr) free of charge. The software is expected to contribute on learning sectional anatomy as well as CTs and MRIs more than other learning tools such as serial slices, photograph books, and previous software. The software involves 1,702 sets of anatomical images, CTs, MRIs, and segmented images; by using the images, other researchers can make their own browsing software, three-dimensional images, and virtual dissection software for their own purposes.

CLEMENTE, F. Richard and Rachel A. Woods*. Department of Physical Therapy, John G. Rangos, Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA. Abnormal

brachial plexus formation with resultant radial-to-ulnar nerve communication and ulnar nerve innervation of the triceps brachii. Brachial plexus and peripheral nerve anomalies can confound the interpretation of diagnostic tests, or the preservation/loss of function following injury. With typical brachial plexus organization nerve fibers from ventral rami mix then redistribute as components of other neural structures. Brachial plexus innervation to the upper limb musculature typically reflects an anterior/posterior organization; anterior muscles being innervated by nerves derived from anterior divisions while posterior muscles are innervated by nerves derived from posterior divisions of the plexus. The current case presents anatomical structure inconsistent with typical brachial plexus organization. The ventral ramus of C7 and the posterior division of the upper trunk blend with the lower trunk creating an atypical middle-lower trunk/posterior cord structure. After approximately 2 cm the posterior cord splits from this complex structure. From this posterior cord the radial nerve passes distally and gives off a communicating branch to the ulnar nerve in the proximal 1/3 of the arm. The radial nerve follows a typical course and distribution distal to the communication. The ulnar nerve provides 4 branches to the triceps brachii long head then courses into the medial head of the triceps providing it with one branch. The ulnar nerve resumes a typical course by passing posterior to the medial humeral epicondyle.

COLLINS, James, D., Ernestina H. SAXTON, Theodore Q. MILLER, Hugh GELABERT and Alfred CARNES

Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA. Hypertensive elongation and crimping of the great vessels trigger neurologic symptoms in patients with thoracic outlet syndrome (tos) and migraine: MRI/MRA/MRV.

In thoracic outlet syndrome (TOS) patients with migraine bilateral multiplanar magnetic resonance imaging (MRI), angiography (MRA) and venography (MRV) of the brachial plexus display sequential images of the neck, thorax and shoulder girdle and demonstrate costoclavicular compression abnormalities of the great vessels and neurovascular bundles without the use of contrast material. In patients with hypertension the great vessels are elongated and crimped along with the binding nerve roots, compressing the inferior bicuspid valves within the internal jugular veins. These changes trigger upper extremity pain and paresthesias; migrainous headache with or without visual changes; tinnitus; facial, back and leg pain; muscle spasms and

dystonia, and syncope. Laxity of the sling/erector muscles, abduction external rotation and turning of the head and neck (costoclavicular compression) enhance these symptoms. Bilateral multiplanar imaging was conducted on a 1.5 Tesla GE Signa LX (Clin.Anat. 1995; 8:1-16), with the field of view modified to include the dural sinuses. We have imaged over 50 patients with hypertensive vascular changes. This presentation displays three patients in whom the anatomic changes on MRI/MRA/MRV that trigger TOS complaints and migraine.

COOKE, John M., Sandy C. MARKS, Jr., Charlene A. BARON* and Anne M. GILROY. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA. Development of web-based anatomy flash cards using images from student dissections.

Flash cards are a well-established educational aid to help students gain an understanding of complex subject matter whether they are learning a new language or studying human anatomy for the first time. Human clinical anatomy, with its complexity of language, its density of anatomical fact, and its richness of visual content, is ideally suited to a flash card approach. In undertaking this project, we wanted to produce a set of electronic flash cards that would be easy to use (mimicking the experience of using hand-held flash-cards), based on images from actual dissections, and written in a format compatible with display on our course web site. The flash cards were written in PowerPoint using two slides for each flash card. The first card in the series typically presents two, three or four structures (labeled A,B,C and D as needed) on a digital image of an actual dissection with a single question for each structure (identification, function, clinical significance, etc). Transition to the second card utilizes the wipe down transition function of PowerPoint thereby simulating the hand-held action of using written flash-cards. A second objective was to use the flash card project as a showcase for student dissections and student experiences in the first-year dissection laboratory. To accomplish this, department photographer and technical specialist (Charlene Baron) made periodic visits to the first-year dissection laboratory to photograph exceptionally good dissections of normal anatomy or to document unusual findings of anatomical, embryological or clinical interest. The first set of Anatomy Flash Cards were made available for student use on the course web-site (with a choice of PDF format for note-taking or PowerPoint for dynamic presentation) during the Fall 2005 Human Anatomy Course. A

representative sample of Anatomy Flash Cards will be presented along with details of development of the program and early student evaluations of the product.

DESY*, Nicholas M., Kimberly K. AMRAMI*, and Robert J. SPINNER. Departments of Radiology and Neurologic Surgery, Mayo Clinic, Rochester, MN. The cystic transverse limb of the articular branch: a pathognomonic sign for fibular intraneural ganglion cysts at the superior tibiofibular joint.

The preoperative diagnosis of fibular intraneural ganglion cysts is difficult to establish and superior tibiofibular joint connections may not be identified. Misdiagnosis leads to incomplete treatment; the articular branch connection may not be addressed which can result in cyst recurrences. We hypothesize that knowledge of anatomy of the reproducible u-shaped articular branch and its pathoanatomy in cases of intraneural ganglion cysts can be exploited to allow successful diagnosis of these cysts. Twenty surgically confirmed cases of paraarticular cysts (twelve fibular intraneural ganglia and eight extraneural ganglion cysts) arising from the superior tibiofibular joint were analyzed to determine common MRI characteristics in intraneural ganglion cysts that would allow distinction from extraneural ganglion cysts. We identified and tested 3 radiographic signs describing the cysts and analyzed cyst morphology, muscle compartments and neighboring joints. Retrospective review confirmed that these cysts were frequently misdiagnosed and joint connections were often not recognized. The MR appearance of fibular intraneural ganglion cysts was stereotypic; they were tubular whereas the extraneural were globular. The “tail sign” was 100% sensitive for identifying joint connections but could not distinguish between intra and extraneural ganglion cysts. The “transverse limb” sign [cystic material within the articular branch traversing the anterior fibula] was present in all cases of intraneural ganglia and none of the extraneural ganglia. The “signet ring” sign [the eccentric displacement of fascicles by intraepineurial cyst] was 100% sensitive for intraneural ganglion cysts and 86% specific (it did not identify 2 cysts that did not extend more proximally into the common fibular nerve). There was 100% interobserver concordance between the prospective interpretations by a blinded radiologist and a trained first year medical student with intraoperative findings. Muscle denervation was more common in the intraneural than extraneural ganglion cysts. Abnormalities in neighboring joints were noted nearly universally. This paper demonstrates reproducible MRI features

which facilitates the identification of the joint connection (“tail” sign) in para-articular cysts and the distinction between fibular intraneural and extraneural ganglion cysts (“transverse limb” and “signet ring” signs) at the superior tibiofibular joint with accuracy and confidence.

DIROCCO, Tom^{1*}, Ehsan ESMAEILI^{1*}, Allyson C BAGENHOLM^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George’s University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. Surgical anatomy of the medial and lateral calcaneal nerves.

Subcalcaneal and chronic heel pain of non-traumatic origin could be caused by entrapment of the distal branches of the tibial nerve. Recent reports have suggested that the medial and inferior calcaneal nerves may be involved in such heel pain, including plantar fasciitis, heel pain syndrome and fat pad disorders. The aim of this study was explore the anatomy of the medial and inferior calcaneal nerves related to the aforementioned conditions. We examined 200 formalin-fixed feet and in all specimens the medial and inferior calcaneal nerves were present. The nerves were classified according to their distribution. The medial area of the heel was found to be innervated by a single medial calcaneal nerve in 28% of the cases (type I), by double medial calcaneal nerves in 50% (type II), by three medial calcaneal nerves in 8% (type III) and by four medial calcaneal nerves in 14% (type IV). The origin of the medial calcaneal nerve was from the medial plantar nerve in 58% of the cases and its distribution was to the skin of the posteromedial arch. In relationship with the inferior calcaneal nerve, the medial calcaneal nerve was found to be posterior and superior. The inferior calcaneal nerve was found to be a branch of the lateral plantar nerve in 68%, a branch of the tibial nerve in 22%, and shared a common origin with the medial calcaneal nerve in 10%, of the specimens. A more accurate knowledge of the anatomy of the distal branches of the tibial nerve could have a potential impact to the understanding of heel pain and ensure safe surgical intervention in the medial heel region.

DRAKE, Richard L. Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland Clinic, Cleveland, OH. A unique, innovative and clinically-oriented approach to anatomy education.

The establishment of the Cleveland Clinic Lerner College of Medicine (CCLCM) provided a unique opportunity to design an anatomy program that was effective, time efficient and clinically relevant in a non-lecture, problem-based, organ-systems oriented curriculum. Through collaboration with surgical colleagues, Case-Directed Anatomy was developed. This program uses clinical cases to introduce anatomical information that is reinforced using prosected cadavers and imaging. It involves three steps: 1) Students preview a clinical case with clinical questions and learning objectives; 2) Students acquire basic knowledge using different resources; and 3) Students reinforce their basic knowledge in weekly Case-Directed Anatomy Sessions, which involve an interactive discussion of the clinical case and a laboratory. In the laboratory, students view prosected cadavers and imaging. But, learning anatomy does not stop after the first year. During the second year, students review anatomy in each of the organ-system courses using the same format and second year students can assist residents preparing dissections for the first and second year programs, thus providing a dissection experience. During third year clinical rotations, anatomy will be reinforced and there will be surgical anatomy electives available during their final year. In this way, anatomy is learned and reinforced throughout the entire medical school curriculum.

DOWNIE, Sherry A., Hannah J. RAPAPORT*, Susan T. SOTARDI*, Anastasia R. LAMBERT*, Debbie Hana YI*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Bilateral accessory flexor digitorum longus muscles with multiple additional anomalies: a case presentation and literature review.

Multiple bilateral muscular anomalies of the leg and foot were discovered in a 58-year-old male cadaver including distinct and clinically significant bilateral accessory flexor digitorum longus (AFDL) muscles within the deep posterior compartment. The larger RIGHT AFDL originated in the proximal half of the leg where it separated the tibial nerve from the vascular bundle with the nerve running deep to the muscle. This AFDL became tendinous prior to entering the tarsal tunnel. Within the tunnel, it paralleled flexor hallucis longus (FHL) in a distinct fascial compartment. The plantar portion of the tendon traveled along the medial border of quadratus plantae before joining the flexor digitorum longus (FDL) tendons that inserted on digits II and III. Surprisingly, the AFDL on this side was innervated by a recurrent

branch of the medial plantar nerve, accompanied by vessels, that ascended within the FHL compartment of the tarsal tunnel. The LEFT AFDL originated more distally and was innervated by the tibial nerve. Interestingly, it remained muscular into the tarsal tunnel and became tendinous only prior to exiting. The plantar tendon paralleled the medial border of quadratus plantae before dividing to join the four FDL tendons. Additional muscular anomalies were found on the plantar surface of the feet, including bilateral accessory flexor digiti minimi brevis muscles in the second flexor layer and a unilateral large abductor ossis metatarsi digiti quinti. On the dorsum, bilateral tendons from fibularis brevis contributed to the extensor expansion of the fifth digits. Force applied to the tendons of these muscles produced movement. In contrast to the present case, previous cadaveric studies have reported that most AFDLs are unilateral with a frequency in dissected limbs of 4-8%. In patients undergoing unilateral tarsal tunnel release surgery, AFDLs were identified in 13-16% of cases. In these cases, symptoms usually resolved with AFDL resection.

DOWNIE, Sherry A., Emily SCHONFELD*, Jennifer SCHACHAR*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. An unusual case of inferior vena cava duplication with left iliac vein anomaly.

Duplication of the inferior vena cava (IVC) was discovered in a 70-year-old male cadaver. The IVC on the right side was normal except that it lacked left lumbar veins. The anomalous left IVC was a large diameter vessel (1.4 cm) with a complete infrarenal segment bridging the left external iliac and renal veins. At L5, a large retroaortic transverse anastomosis (1.0 cm) connected left and right IVCs. Prominent lumbar veins emptied into the left IVC at L5 and L2. Veins from the other vertebral levels drained into the left ascending lumbar vein. Superiorly, the left testicular vein joined the IVC prior to its termination. The left renal vein was large (1.8 cm), received the left IVC and suprarenal vein, and crossed the aorta anteriorly to join the right IVC opposite the right renal vein. The proximal half of the left renal vein lay posterior to its accompanying artery. Within the pelvis, an otherwise normal left internal iliac vein had a prominent Y-shaped bifurcation that connected it to both IVCs. The longer right branch crossed the sacrum obliquely and entered the right IVC just inferior to the retroaortic transverse anastomosis. The shorter left branch joined the left external iliac vein anterior to the

sacral ala. Duplication of the IVC is an uncommon congenital anomaly (0.4-3.0%) of the abdominal venous system. Development of the IVC occurs through a complex sequence of events involving three distinct vertical embryonic venous systems. Remnants of these systems combine in a variety of patterns to give rise to multiple types of anomalous IVCs. Unlike other retroperitoneal venous anomalies, IVC duplication is not readily visualized in CT scans and is frequently misdiagnosed. The presence of IVC duplication has significant clinical consequences including complications of deep vein thrombosis and iatrogenic injury during retroperitoneal surgeries.

EL-SEFDY, Abraham^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. Greater occipital nerve zones for treatment of occipital neuralgia.

Some very important structures involved in the pathogenesis of occipital headache are the aponeurotic attachments of the trapezius and semispinalis capitis muscles to the occipital bone. The greater occipital nerve can become entrapped as it passes through the aponeuroses and cause symptoms of occipital neuralgia. The aim of our study was to identify topographic landmarks for the use of anesthetic blockade of the greater occipital nerve. We examined the course and distribution of the greater occipital nerve in relationship to the aponeuroses of trapezius and semispinalis capitis in 140 formalin-fixed cadavers. In addition we correlated the position of the nerve with the distance from the external occipital protuberance to the mastoid. One hundred twenty six (90%) of the greater occipital nerves were located from 10 to 26% (mean = 17%) of the distance from the external occipital protuberance to the tip of the mastoid process. This is the first study proposing the use of landmarks in relation with anthropometric measurements. Based on these observations, we propose a target zone for local anesthetic injection that is based on reliable landmarks and is easily identifiable. We suggest that local anesthetic injection at this target point could be of benefit in the relief of occipital pain.

FACTOR, David A., Robert F. MORREALE* and Stephen W. CARMICHAEL. Mayo Clinic Division of Media Support Services and Department of Anatomy, Mayo Clinic and Mayo Foundation, Rochester, MN. The author/medical artist partnership: the making of anatomy for surgeons by W.H. Hollinshead, Ph.D.

For centuries, as technology has advanced with new and innovative ways of visualizing human anatomy, it is interesting to note the collaborative partnership and the strategic methods used by the anatomist/author and medical artist in the production of anatomical textbooks has not significantly changed. Notwithstanding that steadfast alliance, the techniques and media utilized by the medical artist in the creation of intricate visual representations used in anatomical textbooks has changed. An analysis of the methodologies in the production of an anatomical textbook, particularly the production of *Anatomy for Surgeons*, by W. Henry Hollinshead, Ph.D., indicates some intriguing parallels in the author/medical artist partnership of today in relation to what it was a half century ago in 1954, the publication year of the first edition of *Anatomy for Surgeons*. Our presentation will highlight the joint practices of the author and medical artist(s), such as the planning, the instructional design, the resolution of view point and the approach in deciding how each image is best represented. As a result of implementing today=s emerging technologies, we will demonstrate how to strengthen this unique partnership in a way that does emphasizes of the importance of creating accurate visual information that clearly inform and educate the intended viewer.

FARRELL*, Michael*, Sarah TAKEKAWA*, Eric NEUFELD*, and Scott LOZANOFF. Department of Anatomy, Biochemistry and Physiology, University of Hawaii School of Medicine, HI, and Department of Computer Sciences, University of Saskatchewan, SK. [A rapid computerized anatomical modelling system using a hand-held scanner.](#)

Traditional lectures in anatomy typically rely on two-dimensional illustrations or photographs derived from standard textbooks. With increased sophistication of laptop computing, three-dimensional anatomical reconstructions have increased the ease with which complex models and animations can be used for presenting instructional concepts. However, modelling databases consist primarily of two-dimensional cross sections requiring segmentation that is very time consuming while smaller structures cannot be identified easily or reliably. The purpose of this study was to develop a technique to facilitate computerized anatomical models using a hand-held scanner. Cadaveric material was scanned using a Polhemus hand-held scanner and files were exported in an .obj format. Files were imported into Maya (Alias Software) and vertices were edited accordingly. The models were then exported as a .dxf file and imported into

WinSURF (SURFdriver Software) and rendered with realistic texture and surface maps using SURFdriver Maps software. Once loaded, the reconstructions can be manipulated using rotation and enlargement tools, while colors can be changed to highlight specific areas. Examples are provided for the skull and cervical plexus, ocular testing, and vertebral morphology. Results of this study show that anatomical models can be generated easily and effectively. They can be created and individually tailored for specific learning objectives. Supported in part by NIH-P20RR16467.

FINDLAY, Emmett R., Suzanne ROOZENDAAL*, S. Yoel LEVY*, and Terence P. MA. Department of Basic Sciences, Touro University – Nevada, NV. A complete separation of the superior and inferior lobes of the left lung.

A rare variation of the left lung was found during routine dissection of a 79-year-old female cadaver in the Gross Anatomy laboratory. In this individual, the superior and inferior lobes of the left lung were completely separated, with the heart located between them. The inferior lobe was located in a posterior position, posterior to the aorta and other thoracic structures, whereas the superior lobe was found in an anterior-lateral position. The trachea divided into typical primary, secondary, and tertiary bronchi; however the bronchi did not enter the substance of the left lobes until the tertiary division. The pulmonary arteries followed a pattern similar to that of the bronchi. Each of the separated lobes appeared to be completely ventilated and functional. This is a case report of a rare variation in the lung of an individual who lived a long life; therefore, it is unlikely to have been a debilitating anomaly. However, such variations may have significant implications in the disciplines of surgery and radiology. (We thank Parker College of Chiropractic for permission to use the cadaver in our course.)

FITZSIMMONS, John, Rifat Ali KHAN, Lauren KLEIN, Jennifer LOUSSIA. Department of Radiology, Michigan State University, MI. Revisiting an unusual absence of the Extensor Pollicis Brevis.

Anomalies of the extensor tendons in the wrist are common. Here we revisit the variant anatomy of the extensor pollicis brevis (EPB). A total of 101 wrists were dissected and studied. The EPB tendon was absent in 4 wrists (3.96%) and notably variant in 10 wrists (9.9%). Knowledge of tendon variations in the first extensor compartment is of value in the treatment of De

Quervain tenosynovitis so as to ensure adequate decompression. The EPB tendon may be used to restore thumb opposition and to repair ruptured extensor pollicis longus tendon secondary to rheumatoid arthritis. Therefore all the potential variants of this muscle, including its complete absence, are of clinical significance.

FITZSIMMONS, John, Rifat Ali KHAN, Lauren KLEIN, Jennifer LOUSSIA. Department of Radiology, Michigan State University, MI. A rare case of an anomalous tendon from the extensor digitorum communis (EDC) to the thumb.

Abnormalities of the extensor tendons in the wrist are common. We describe a previously unreported congenital anomalous tendon of the extensor digitorum communis (EDC) that was incidentally identified during gross dissection of a human cadaver. This accessory tendon was found bilaterally originating from the radial aspect of the EDC and has a common insertion with the extensor pollicis longus. No similar anatomic variants were found after dissection of 101 wrists and review of published literature. Knowledge of this variant muscle may be important when investigating the normal function of the wrist extensors or when assessing the diseased or traumatized wrist and hand.

FLORES, Augustine^{1*}, Lucas McARTHUR^{1*}, G LOUIS JR^{1*}, William MERBS^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. Sural-tibial and sural-fibular communications

The rich sensory innervation of the ankle and foot is manifest through the numerous communicating branches linking the neural trunks, particularly between the superficial fibular and sural nerves and between sural and tibial nerves. We examined 200 adult human formalin-fixed lower limbs and were able to identify 110 nerve communications. In type I (36, 18%) there was a communication between the sural and tibial nerves anterior to the calcaneal tendon. In type II (42, 22%), communications were found between sural and superficial fibular nerves anterior to the lateral malleolus and lateral tarsal regions. Type III (32, 16%), communications were found between sural and superficial fibular nerves in the metatarsal region. The communicating branch was straight in 34, U-shaped in 41 and Y-shaped in 35 specimens. We believe that stretching of the proximal communicating branch during forced inversion of the ankle and/or foot or during fractures of the calcaneus, or direct injury in surgical approaches

or arthroscopy of the ankle, may lead to submalleolar pain. Advances in modern imaging may allow recognition of these branches, guidance of infiltration and even neurolysis in cases of failure of conservative treatment.

FOGG, Quentin A. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES. Hinged versus free scaphoid waist; a gross and arthroscopic investigation.

Variable scaphoid mechanics are accepted but not understood. The ligaments attached to the waist of the scaphoid are not clearly described. This study aims to describe variations in these ligaments from a more clinically relevant perspective, i.e. arthroscopically. These observations will be compared with gross observations. Cadaveric specimens (mean age = 79 ± 15 years) were dissected ($n = 75$) or arthroscopically examined ($n = 40$). Through dissection either a radiocapitate ($n = 49$; 65%) or radioscapnocapitate ($n = 26$; 35%) ligament was observed. Where the scaphoid received no palmar attachment to the waist (free) the dorsal intercarpal ligament was attached only to the trapezotrapezoid complex. When there was a palmar attachment (hinged), the dorsal intercarpal ligament was attached to the dorsal aspect of the scaphoid. Arthroscopically, the scaphocapitate joint space seemed elongated and more accessible when the scaphoid waist was without attachments, and shortened and difficult to enter when attachments were present. The "free" scaphoid may rotate about its long axis with little restraint; the "hinged" scaphoid may be prevented from such rotation, but allowed to flex and extend. These gross and arthroscopic observations help explain variations in carpal mechanics, and allow better understanding of arthroscopic approaches to the wrist.

FREEMAN*, A. Jay, Nathan A. JACOBSON*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES. Anatomical variations of the plantaris muscle and a potential role in patellofemoral pain syndrome.

The plantaris muscle is given little attention in the reviewed literature. It is most commonly mentioned only when absent from a specimen. This study aimed to document the precise anatomy of the plantaris muscle and to discuss the clinical significance of the observations. Cadaveric knees ($n = 46$) were dissected to map out the possible variations of the plantaris muscle. The muscle either conformed with standard descriptions ($n = 26$;

56.52%), was present but varied from previous descriptions (n = 14; 30.44%), or was absent (n = 6; 13.04%). The variations consisted of distinct interdigitations with the lateral head of the gastrocnemius muscle (n = 9; 19.57%), and a strong fibrous extension of the plantaris muscle to the patella (n = 5; 10.87%). The interdigitations reinforce the notion of the plantaris muscle supplementing activity of the lateral head of the gastrocnemius muscle, whilst the patellar extension suggests an involvement with patellofemoral dynamics and may play a role in the various presentations of patellofemoral pain syndrome. Greater understanding of the interconnections between these, and other, posterior knee structures will facilitate more precise interpretation and treatment of knee injuries.

FREEMAN*, A. Jay, Nathan A. JACOBSON*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES. Muscular influence over fibrous support of the posterior knee capsule: a functionally and clinically significant account of variations.

The detailed anatomy of the posterior aspect of the knee has been researched extensively. The descriptions from study to study vary significantly, but few account for functionally significant variation. This study attempts to document variation of the tissues that constitute and reinforce the posterior capsule of the knee. Cadaveric knees (n = 46) were dissected. Variations of the semimembranosus muscle's distal attachment were clearly observed. Laterally, variable contributions to the posterior capsule and fibrous extensions of the capsule came from (or went to) the biceps femoris muscle and/or the iliotibial band. In some specimens (n = 20; 43.5%) fibrous extensions from the semimembranosus tendon traversed the knee (typically as the oblique popliteal ligament) and were continuous laterally with extensions from either the biceps femoris muscle and/or iliotibial band. On occasion (n = 8; 17.4%), a dimple-like impression was identified on the superficial surface of the iliotibial band at the point where the extension originated. It is clear that these variants offer a sling-like muscular influence over the posterior knee joint capsule, and may therefore have a significant effect on knee mechanics. The failure to recognize the presence of such dual connections may contribute to poor post-operative results following knee surgery.

FUJITA, Keiko*, Yoshiko ASAMI*, Masabumi NAGASHIMA, and Shoichiro ISHIHARA*. Departments of Anatomy and

Neurosurgery, Saitama Medical University, Saitama, JAPAN.
Variation in the level of common carotid bifurcation: cadaver study and clinical significance.

In the 22nd Annual Meeting of the AACA, we presented a paper entitled: "Varied vasculatures in the head and neck, with consideration of clinical significance." The height of carotid bifurcation was further investigated with 98 sides out of 49 donated cadavers. The bifurcation height was applied to the level of the vertebral body (e.g. C3) or intervertebral disc (e.g. C3/4). Boundaries between levels were virtually lined to make all ranges nearly equal. Results showed that the most frequent level of the carotid bifurcation was the third cervical body (C3), 43% in the right and 51% in the left. In the case of very high-positioned carotid bifurcation, several branches to the head and neck were originated from the common carotid arteries. In the authorized textbook "Radiology of the Skull and Brain" edited by Newton & Potts (1974), the vertebral level of the common carotid bifurcation was described as C4, based on studies by Lazorthes (1961) and Kraysenbuehl and Yasargil (1968). Patients with carotid stenosis are treated by carotid angioplasty with stent (CAS) or carotid endarterectomy (CEA). Variation in this vasculature will be discussed from the therapeutic viewpoint by reviewing clinical cases of CAS in our institute.

FUNG*, Lillia Y., Brian WONG*, Anne AGUR, and Amr ELMARAGHY*. Divisions of Anatomy and Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, Canada.
Tendinous architecture of the pectoralis major: a three-dimensional morphologic study. The architecture of the pectoralis major tendon has been inconsistently described (Lewis, 1901; Ashley, 1952; Wolfe et al., 1992). The purpose of this study is to quantify the architecture of the pectoralis major tendon. Ten formalin embalmed cadaveric specimens were examined: four (1M/3F) were serially dissected, digitized, and modeled in 3D using MAYA(TM); six (3M/3F) were grossly assessed and digitally photographed. The pectoralis major tendon was found to consist of two layers, anterior and posterior, which attach separately to the lateral lip of the intertubercular sulcus. The anterior and posterior layers are continuous inferiorly. Both tendon layers are broad and flat with the anterior layer being composed of a single tendon, and the posterior layer being composed of 2-3 overlapping tendon slips, the most inferior of which receives fibres from the aponeurosis of the external oblique muscle. At the lateral attachment (insertion), the

mean proximal-distal length of the anterior layer is 6.51 ± 0.72 cm and the posterior layer is 7.44 ± 1.90 cm; the mean widths are similar (anterior 0.21 ± 0.08 cm, posterior 0.24 ± 0.11 cm). Understanding tendon morphology with its respective muscular contributions is important when planning tendon repairs or transfers of pectoralis major.

GER, Ralph, Sherry A. DOWNIE, Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Emphasizing the clinical in clinical anatomy.

Anatomic errors by clinicians are responsible for a considerable percentage of morbidity associated with patient care and, in Britain, are the leading cause of malpractice cases. Four cases are presented that emphasize the usefulness of anatomic signs in diagnosing less well-recognized clinical conditions. CASE #1. In evaluating a patient with perineal trauma, prominent hemorrhagic subcutaneous discoloration of the lower abdomen, upper thighs and scrotum points to a ruptured bulbar urethra with extravasation of blood-stained urine filling the superficial perineal pouch. CASE #2. In contrast, evaluating a non-trauma patient with a faint hemorrhagic staining of the right lower abdomen and adjacent thigh together with a swollen and discolored scrotum requires a different explanation. An abdominal CAT scan of such a patient revealed a right adrenal gland carcinoma with hepatic secondaries that had ruptured into the retroperitoneal space with blood gravitating into the scrotum. Abdominal wall staining was masked by a thick subcutaneous fat layer while the scrotal discoloration remained prominent due to the virtual absence of fat. CASE #3. The physical examination of a young Hispanic male suffering from painful cojones revealed a dimple deformity in the distal scrotum. The association of dimpling with testicular torsion is not widely known. Testicular torsion demands urgent diagnosis and treatment to save the testis. The scrotal dimple is a reliable and useful diagnostic sign. CASE #4. Postoperative perianal wounds in the lower ischioanal fossa often produce fibrosis and contraction that distort the perianal region. This situation is further complicated by recurring infections and an embarrassing life-style. Equally convex gluteal contours around the anal opening are anatomically necessary for effective anal toilette. Reconstruction of a functionally normal perianal region can be achieved by a myocutaneous flap containing gluteus maximus, underlying fat and local skin. This allows cleansing of

the area, reduction of infections and return of the patient's self-confidence.

GIELECKI^{1,2} Jerzy St., Anna ZURADA¹, Niket SONPAL¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia². A Talking Brain – Aiding the Nervous in Learning about the Nervous System.

Over the last decade, a plethora of anatomically geared computer programs have been released in order to aid students in thoroughly comprehending difficult concepts through visual demonstration. At the Medical University of Silesia, a program now known as “The Talking Brain” is being developed to maximize the efficiency of central and peripheral nervous system concept learning. The program allows for students to visualize pathways, learn cranial nerve order and function, and finally see the integrated relationships between the autonomic and somatic nervous components of the human body. The program is trilingual (English, Latin and Polish), and has radiological anatomy of the CNS. The tutorial option voices the structure in and allows for the students to repeat the structure or type in its name for self assessment. A recent survey of 317 MS¹ anatomy students reported nearly 75% approval ratings for digital media learning, and nearly half the MS¹ stated. Computer based anatomical learning is taking a role as a necessity rather than preferred media for student learning and comprehension.

Disclaimer: These programs are not available for purchase, rather are for the enrichment of students.

GIELECKI^{1,2} Jerzy St., Anna ZURADA¹, Niket SONPAL¹, Zachary PUTHOFF^{1*}, Greogorz GAJDA^{1*}. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia². (Sponsored by Jerzy St. Gielecki) Putting the Puzzle In Rather Than Out of Anatomy.

Memorization is a key method for the clinical implementation of anatomical facts and knowledge. Students currently studying anatomy are looking for more exciting methods and memorable means of studying anatomy. Thus the reason so many students use mnemonics to memorize facts. A new means for efficiently memorizing diagrams and atlas pictures has been brought to the students docket of plausible techniques. The “Anatomy Jigsaw Jumble” is a program that takes predesigned photos, and or atlas paintings and then creates jigsaw puzzles out of them.

Students then race against the clock to organize the pieces and name the structure in question. Onwardly trying to beat their previous times, and better their memorization skills. For example, taking each of the cranial nerve effector sites, and matching them with the correct pathway and nucleus location. Through repeated exposure to time trialed tasks, their ability to memorize increases and they also learn correct anatomical facts. Disclaimer: These programs are not available for purchase, rather are for the enrichment of students.

GIBSON, Michael, A.*, Ralph GER, Sherry A. DOWNIE, Philip D. CHEUNG*, Alan C. WONG*, Debbie Hana YI*, Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Distal distribution of the saphenous nerve and its vulnerability to injury during saphenous vein access procedures.

The traditional site for great saphenous vein (GSV) access procedures in the leg is two finger-breadths superior and anterior to the medial malleolus. Complications associated with use of this site have been widely reported and include loss of sensation along the medial aspect of the ankle and foot. Recent anatomical research has proposed new GSV access sites located at the ankle and on the dorsum of the foot. The study reported here tested the hypothesis that accessing the GSV at these more distally located sites will significantly reduce the potential for damage to branches of the saphenous nerve. Dissections were carried out bilaterally on the distal lower limbs of 37 adult embalmed cadavers. Skin was excised exposing the medial aspect of the distal lower limb from mid-leg to the dorsal venous arch. The saphenous nerve was located and traced distally to document its branching pattern and relationship to the GSV and tibial malleolus. Results demonstrated consistent division of the nerve at the proximal boundary of the traditional incision site (mean of 4.90 cm superior to the malleolus). In 81.2% of our sample, these branches closely paralleled the GSV within this incision area and would have been vulnerable to injury during venous access at the traditional supramalleolar location. In contrast, in 100% of the limbs studied, the nerve or its branches distal to the traditional cut-down area radiated away from the GSV in a variety of patterns over the ankle and dorsomedial aspect of the foot thus reducing the number of axons at risk. The results of this study confirm that accessing the GSV distal to the malleolus will significantly reduce the size of the denervated skin area frequently associated with the traditional GSV access. In

conclusion, the use of a more distal incision site is likely to improve postoperative outcomes in patients undergoing saphenous vein exposure.

GILROY, Anne M. Departments of Surgery, Cell Biology, Orthopedics and Anesthesia, University of Massachusetts Medical Center, MA. Creating a simulated operating room environment for resident anatomy programs.

Interest in anatomy programs for residents has increased steadily on a national scale and has been especially important for residents in surgical specialties. UMass has been in the forefront of this trend with current residents in plastic surgery, urology, ob/gyn, and anesthesia attending regular anatomy sessions throughout the year. The best medical care, however, requires not only knowledge, but also a high level of technical skill. Historically residents gain these skills by performing on live patients; the conflict between giving patients the best care and providing residents with adequate training is longstanding. The purpose of this project was to create an experience for residents in surgically oriented programs that more closely simulated that which they encounter in the operating room. This included the acquisition of surgical instrumentation, laparoscopic equipment, a dissection table adapted for positioning the cadaver for specialized procedures, and surgical lamps. With a more realistic operating room facility in the anatomy lab, residents are now able to review crucial anatomy in relation to specific procedures while safely practicing basic surgical skills.

GRANGER, Noelle A. Department of Cell and Developmental Biology, University of North Carolina School of Medicine, NC. When anatomy meets the law: Right upper lobectomy results in paraplegia.

A 69 year old woman with a mass in the upper lobe of her right lung underwent a lobectomy via a posterior thoracotomy between the fifth and sixth ribs on the right side. The affected lobe was successfully removed, and during closure of the wound site, topical thrombin and Surgical were used to control bleeding from the intercostal incision. Upon recovery from anesthesia, the patient found that her lower extremities were numb and that she could not move them, a situation that did not resolve overnight. A laminectomy was performed on the first post-operative morning, and an extradural mass was removed, but the patient did not regain neurological function of her limbs. This report details the

source of the extradural mass and reviews the anatomical relationships leading to its occurrence and its effect.

HANKIN, Mark H.*, Dennis E. MORSE*, Carol A. BENNETT-CLARKE*, and Roy E. SCHNEIDER*. Medical University of Ohio, Toledo, OH (sponsored by C.A.C. Baptista). Anatomy Revealed – Volume 1.

Anatomy Revealed is an interactive, multimedia CD-ROM-based program developed to assist medical and allied health students learn human anatomy and its clinical application. Anatomy Revealed takes advantage of computer technology in a number of innovative ways, including: (1) a unique digital layering process reveals anatomical structures in detailed human dissections and demonstrates relationships between structures found at different depths; (2) state-of-the-art morphing techniques transform static images into dynamic demonstrations to illustrate primary muscle actions and joint movements; (3) animated, 3-D reconstructions explain difficult areas of anatomy; (4) radiological imaging mode provides labelled x-rays, MRIs, CTs and angiograms; (5) QuickTime movies of actual patients demonstrate clinical conditions; and (6) a timed self-test simulates a practical examination. Anatomy Revealed – Volume 1 consists of four CD-ROMs: CD1 – Face (including muscles of facial expression, facial nerve, maxillary artery, and temporomandibular joint); CD2 – Orbit (including extrinsic eye muscles and their actions); CD3 – Nasal and Oral Cavities (including a 3D reconstruction of the pterygopalatine fossa); and CD4 – Cranial Cavity (including an animation of dural venous sinus blood flow). Anatomy Revealed was developed in collaboration with the Center for Creative Instruction at Medical University of Ohio.

This abstract does not contain materials to be presented that are currently available for purchase from national publishers/resellers.

HILBELINK, Don H., Britney R. THOMAS*, Eric HOEGSTROM, College of Medicine and College of Engineering, University of South Florida. Wavelet Transforms in Echocardiogram Image Registration.

Quantitative analysis and registration of anatomical geometry has shown efficacy in several clinical applications. The purpose of this study is to provide a method to register heart geometry from diagnostic imaging data for both pathological and in-patient comparisons. A method for digitizing and compressing echocardiogram images is demonstrated based on frequency analysis using the wavelet transform. The approach preserves

global contours of segmented anatomical structures through a wavelet packet approach first introduced by Davatzikos. The technique is extended to propose a new method of recording patient anatomy from echocardiogram images. The capabilities of the technique are demonstrated on diagnostic images of 16 normal adult hearts. The wavelet analysis of each patient was compared with the results of standard protocol for measuring cardiac geometry, which was performed by a certified echocardiogram technician. The wavelet method was successful in providing significantly more patient data than previous techniques with the same data storage requirements and requiring no additional time or labor in the clinical setting.

HISLEY, Kenneth C., Larry D. ANDERSON*, Stacy E SMITH*, Stephen KAVIC*, Paul G NAGY*. Departments of Radiology, Anatomy and Neurobiology, and Surgery, University of Maryland School of Medicine, Baltimore, MD. Design for an innovative visual gross anatomy on-line dissector, based on the transformation of physical and digital dissection knowledge into conceptual graphs, and its real-time application in the teaching laboratory.

Our stated goal here is to provide dissection students with 24/7 access to expert knowledge, maximize the information's relevance and completeness, while simplifying its presentation. Expert assistance to students "at the dissection table" is required for them to learn the synthesis and application of mental models during problem solving, and usually is present in distilled form as a "dissector". Types of information in such dissectors include: 1) didactic (text descriptions), 2) spatial (diagrams, images) and 3) procedural (sequential technique). Unfortunately, timely access to sophisticated face-to-face faculty guidance above and beyond the dissector is limited. To achieve our goal, we designed an online dissector using XML/OWL software to visualize, capture and replay expert-level dissection knowledge and guidance. Thus, the conceptual graph is a dissector region's "instructional backbone" integrating multiple classes of teaching resources into the expert's sophisticated event sequence. This form of knowledge representation, ("conceptual graphs") comprises a sequenced network of conceptual nodes and associations linking successive steps of dissection viewpoints, suggested observations, potential discoveries, mechanical technique and anatomical illustrations supported by supporting hyperlinks embedded at relevant points. Thus, dissection students will have distance-independent, on-demand access to the

sophisticated knowledge of experts focusing on a well-constrained anatomical region and task.

HU Kyung-Seok*, Hee-Sun Yun*, Mi-Sun Hur*, Hyun-Joo Kang*, Hee-Jin Kim. Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea. The branching patterns and the intraosseous course of the mental nerve.

The mental nerve emerges to the lower face through the mental foramen, and supplies mouth corner, lower lip, and mental area. This nerve is vulnerable to injury during lower face surgery. Severe pain and loss of sense are noted in patients whose mental nerve is either entirely or partially lost after these surgeries. We investigated topography of the mental nerve by dissecting 31 Korean hemifaces. According to distribution area, the mental nerve was divided into angular, medial labial, lateral labial, and mental branch. We classified branching patterns of the mental nerve in five types. Type II, where mental nerve is divided into angular, medial labial, and mental branch and lateral labial branch is divided into angular branch occurred the most frequently (35.5%). The mental nerve was classified into loop, no-loop, and reverse-T types by the shape of the anterior loop. The loop type was the highest as 61.5%. No-loop and reverse-T types were 23.1% and 15.4%, respectively. The average distance of the anterior loop was 1.74mm (0.73mm-2.63mm). In the mandibular canal, the case where angular, medial labial and mental branch was located at superficial layer, lateral labial branch middle layer, incisive nerve deep layer was the most frequent.

Hur Mi-Sun*, Kyung-Seok Hu*, Hyun-Joo Kang*, Kwan-Hyun Youn*, Hee-Jin Kim. Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea.

Topography and morphological variations of the lip elevator muscles.

Although facial expression muscles' morphological view and variation were studied, not enough researches are reported. Recently, BTX-A injections are used to treat gummy smile patients, no many clinical-anatomy knowledge could be

supported. 30 Korean cadavers' (male 8, female 7, average age 71) were dissected. The lip elevators are located by levator labii superioris alaeque nasi (LLSAN) and zygomaticus minor (Zmi) on the most outer surface, levator labii superioris (LLS) is partially covered by the deep layers of these two muscles. These lip elevators are merged on nasolabial folds, and inserted to upper lip. Direction of entire lateral slip of LLSAN was toward to mouth corner. The muscle fiber's directions of Zmi are to philtrum. Most cases are showed Zmi covered LLS, and more horizontal than LLSAN and LLS. Directions of fibers of LLS were mostly to the center of upper lip and three asymmetric cases were observed. This study confirmed lip elevators are within the triangle: three composition points of the alare (A), medial 1/4 of A to tragus (AT), and midpoint of nasolabial fold (NL). By injecting BTX-A on the center of this triangle (Yonsei-point), gummy smile patients can expect to reduce lip elevator functions.

JACKSON, Jon and Paul KRIEGER*. Department of Anatomy and Cell Biology, University of North Dakota, Grand Forks, ND; Grand Rapids Community College, Grand Rapids, MI, and the Human Anatomy and Physiology Society, Manchester, MO. Use of cadavers in instruction of undergraduate anatomy — results of the 2005 HAPS cadaver-use survey. A survey was given to the ~1300 active members of the Human Anatomy and Physiology Society in order to better understand cadaver usage patterns across the membership. Its intent was to identify those significant issues—barriers, (institutional and otherwise), space, and cost—that doggedly accompany cadaver use in anatomic instruction. We received replies from 240 individuals (~19%); 32 percent of these utilized cadavers in course instruction and represented a diverse group of higher educational institutions. The “average” school reported using over 8 cadavers annually, at a cost of \$12,300 in preparation and transportation fees. These cadavers were utilized at a reported student: cadaver ratio averaging over 90:1. Cadavers use was associated primarily with the teaching of Anatomy & Physiology courses to allied health and pre-professional students. A group comprising two-year institutions and community colleges reported a cadaver usage rate of 30%, compared with 37% of Universities and four-year baccalaureate institutions. Non-users stated barriers of space and money, but not expertise or institutional will. Cadavers clearly effect the anatomic education of large numbers of students. Continued use of this survey instrument should provide useful data to educational administrators, deeded body program managers, and instructors interested in cadaver use.

JACOBSON*, Nathan A., A. Jay FREEMAN*, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES. Unusual variations of the thigh: Incidence, development and significance.

The variability of the structure of the lateral thigh is minimal. The reviewed literature made no reference to any significant variations. From the sample population (n = 170 legs) multiple variations were observed (n = 9; 5.3%), two of which were bilateral. The basic pattern of variation observed involved displacement of the iliotibial band, medial and deep to the vastus lateralis muscle. The iliotibial band may have been duplicated. When lateral thigh variations were bilateral, additional lower limb variations were observed, namely absence of the sartorius muscles and quadruple-headed gastrocnemius muscles. Whilst obviously embryonic defects, the mechanism of malformation is unclear. No evidence of long-term disability from in utero disposition, amniotic banding, or disruption to limb development can be identified. Given the high incidence of these malformations in relation to documented birth defects, it is important to continue the reportage of such variations. Although unsubstantiated in this report, high incidence of these malformations may be indicative of greater numbers of defects, and potential linkages to more clinically critical variations. Consideration of the functional implications of these variations may increase understanding of the subtleties of limb performance, and the management of limb dysfunction.

JERGENSON, Margaret A., Neil S. NORTON. Creighton University Medical Center, School of Dentistry, Omaha, NE. A comparison of radiographic and i-CAT imaging of a double mental foramen.

The position of the mental foramen becomes significant in dentistry in planning the positioning of dental implants. Conventional dental radiographs are useful in estimating the position of the mental foramen but not for definitive location. Documentation has shown that the foramen can be obscured by features such as the trabecular pattern of the bone or thin bone in edentulous mandibles. The i-CAT Cone Beam dental imaging system provides a relatively low radiation 3-D image. The purpose of this study was to compare a standard radiographic image of a variant of the mental foramen to an i-CAT image for reliability in treatment planning. Double mental foramina are reported in the literature as an infrequently reported variation.

During classroom dissection of a 86 year old female cadaver a double mental foramen was observed on the right side of the mandible. Lateral radiographs were taken of the right mandible, with and without metallic markers. The cadaver head was also scanned using the i-CAT system. The radiograph did not clearly define the position of the foramina. The i-CAT image clearly located the two foramina. This comparison demonstrates the applicability of i-CAT to the identification of unusual variants in treatment planning for mandibular dental implants.

JEVOOR, Praful S., and Sharad M. ANTIN* Departments of Anatomy and Orthopedics, Jawaharlal Nehru Medical College, Belgaum, INDIA, Congenital bowing of long bones: Report of a rare case.

A ten-year-old boy presented with history of multiple skeletal deformities, since seven years of age and also repeated fractures of both upper and lower limbs. Patient was short statured with flat face and had anterolateral bowing of upper and lower limbs sparing humerus. Kyphosis and funnel shaped chest were among other defects observed in association with restricted and painful movements of all limbs. Plain radiograph demonstrated anterolateral bowing of long bones except humerus. Spine radiograph revealed biconcave vertebrae with increased disc space, unossified pedicles and kyphoscoliotic deformities. Diagnosed as compomelic dysphagia, this rare congenital disorder affecting 0.05 to 0.9/10,000 of live births, and is said to be of autosomal recessive inheritance, with mutation in SOX9 gene. This lethal disorder is characterized by development of abnormal curvature of long bones particularly of lower extremities, such as femur and tibia, leading to severe angulations which may mimic fractures and accompanied by growth restrictions, shortness of limbs, talipes equinovarus, bell shaped narrow chest, hydrocephalus, ambiguous genitalia among other defects (Sandra, et al 2000). All most all cases result in neonatal or infantile death commonly due to respiratory complications. However some survivors including a boy alive at 17 years have been reported.

JONES*, David B. JR, Jason A. CAPO*, Becky L. JOHNSON*, Tia R. MILANESE*, Terry K. SCHIEFER*, Stephen W. CARMICHAEL, Wojciech PAWLINA. Department of Anatomy, Mayo Clinic College of Medicine, Rochester, MN. Introducing musculoskeletal physical examination skills as a teaching tool in the gross anatomy laboratory.

Musculoskeletal education and physical examination skills have been shown to be deficient and disproportionate to the incidence of musculoskeletal conditions in the community. To address this deficiency, we introduced clinical exams of the upper and lower extremities in the gross anatomy laboratory as a teaching tool to highlight relevant anatomical relationships. Teaching assistants presented one or two of the clinical skills related to that day's dissection to small groups of students at a time. One question on the practical laboratory examination at the end of each unit was an Objective Structured Clinical Exam (OSCE) station where students were given a clinical scenario and asked to demonstrate a physical exam they would use in evaluating the patient. Students' perceptions of this experience were evaluated using a Likert-scale survey. The survey responses indicated that the students found this experience improved their understanding of the clinical significance of the related anatomy, increased their interest in and motivation to learn the material, and made the lab experience more enjoyable. These results suggest that introducing musculoskeletal physical examination skills in the gross anatomy lab can be an effective way to emphasize the clinical significance of the anatomy, thereby enhancing students' motivation to learn the material.

KALMEY, Jonathan K., Randy J. KULESZA Jr., Walter R. BUCK and Bertalan DUDAS*. Department of Anatomy, Lake Erie College of Osteopathic Medicine, Erie, PA. Situs inversus totalis in an anatomical cadaver.

Situs inversus totalis is a rare, developmental condition where the viscera of the body cavities fail to accomplish a normal migration and as a result are a mirror image of their normal arrangement. It has been noted that individuals with this condition have a higher incidence of other clinical conditions (e.g. heart anomalies). Situs inversus totalis is rare in the normal populace and an anatomical cadaver possessing such an anomaly is highly unusual, therefore our intention is to provide a detailed analysis of neurovascular relationships in this condition. Here we illustrate and describe the anatomical arrangements of neurovascular structures in a cadaver with complete situs inversus. Our findings not only confirm a mirror image arrangement of the viscera, but also describe the unique arrangement of neurovascular structures supporting these organs. Finally, we describe a vascular anomaly involving blood supply to foregut derivatives and speculate a higher incidence of vascular anomalies in persons with situs inversus.

KHALILI, Mohammad A.*, Fatima AGHAEI-MEYBODI*, Morteza ANVARI*, Ali R. TALEBI*. Fertility & Infertility Research Center, Isfahan University of Medical Sciences, Isfahan; Anatomy Department, Yazd University of Medical Sciences, Yazd, Iran. Assessment of nuclear DNA integrity of spermatozoa from ejaculates of fertile and infertile men: correlation with semen parameters.

The objective of this prospective study was to assess the nuclear chromatin integrity of spermatozoa from ejaculates of fertile and infertile men in Iran. 30 ejaculates with abnormal semen analysis and 30 ejaculates with normal semen analysis (control) were collected from infertile and fertile men, respectively. Analyses of all samples were done according to WHO criteria. Then, one slide from each semen sample was prepared for fixation in Carnoy fixative for 2 h. The slides were stained using Acridine Orange (AO) fluorescence dye to segregate the nuclear double stranded DNA (normal) from single stranded DNA (abnormal) of 100 sperms from each sample. Significant differences were observed for semen parameters of sperm concentration, motility, and morphology between two groups of fertile and infertile men ($P < 0.005$). There was an insignificant increase in percentage of normal nuclear DNA of sperms in ejaculates of fertile than infertile individuals (62.4% vs 53.8%; $P > 0.05$). Also, no correlation was noticed between sperm nuclear DNA abnormality and semen parameters. AO is a standard assay for detection of mature sperms which did not show any significant nuclear DNA abnormality in spermatozoa from ejaculates of infertile men, when compared with controls.

KHALILI*, Mohammad A. , Mahdieh MOJIBIA*, and Abdul M. SULTAN*. Fertility & Infertility Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. ART Center, Qatar Women's Hospital, Qatar. Role of oocyte morphology on fertilization and embryo formation in assisted reproductive techniques (ART).

The objective was to assess the influence of oocyte morphology on fertilization and embryo development in ART cycles. 200 oocytes from in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) cycles were evaluated. The morphological features were categorized into: a. normal oocytes; b. granular oocytes; c. cytoplasmic inclusions; d. dark zona pellucida (ZP), e. fragmented polar body (PB); f. non-spherical shape; and g. wide previtelline space. 67 and 78 oocytes were fertilized in IVF

and ICSI cycles, respectively. 46.3% and 35.9% of fertilized oocytes were shown with normal morphology in IVF and ICSI cases, respectively. The rates of grade A & B embryos were higher in oocytes with normal morphology ($P < 0.05$). In IVF+ and ICSI+, fragmented PBs were the highest rates of single abnormality with 11.9% and 14.1%, respectively. Also, multiple abnormalities were observed in 21.0% and 48.5% of oocytes in IVF+ and IVF-, respectively ($P < 0.001$). In IVF and ICSI, the highest rates of fertilization and embryo formation took place in oocytes with normal morphology. The most single morphological features involved in failed fertilization were refractile body in ICSI and ooplasm granulation in IVF cases. The data suggest that oocyte quality plays a major role in success of ART program.

KILARKAJE, Narayana, Department of Anatomy, Faculty of Medicine, HSC, Kuwait University, Safat 13110, Kuwait.
Radiological study of retromolar canal and observations on the location of the mandibular foramen in dry human mandibles.

The present study was planned to investigate the incidences of retromolar foramen (RMF), retromolar canal (RC; $N=242$), and the location of the mandibular foramen (MF; $N=132$; 8 young, 93 adult and 31 old mandibles) in dry human mandibles. A total of 53 (21.9%) mandibles had RMF; of these, 26 (10.7%) showed it only on the right side, 17 (7.1%) only on the left side, and 10 (4.1%) bilaterally. There was no side difference in this trait ($P > 0.05$; Chi square test), and distances between the RMF and other landmarks did not show any side differences either ($P > 0.05$; Mann Whitney 'U' test). In 6 mandibles, the RC was studied by digital subtraction angiography technique. Mandibles 1 and 2 showed vertical RC joining the mandibular canal (MC) (Type I), bilaterally. Mandibles 3 and 5 showed the Type I RC only on the left side. Mandibles 3 on the right side, 4 on both sides and 6 on the left side showed the RC descending vertically, and then coursing backwards to join the MC (Type II). Mandibles 5 and 6 only on the right side showed the RCs descending to the MC, from the middle and anterior aspect of which another canal extended anteriorly superior to the MC (Type III). The distance to the mandibular foramen (MF) from landmarks (head of the mandible, third molar, anterior border of the ramus, lowest point on the mandibular notch, angle of the mandible, and symphysis menti) did not show any side differences ($P > 0.05$; Unpaired Student 't' test), and the ratio between the two sides was one. However, the inter-group differences between young, adult and old mandibles were

significant ($P < 0.001$; Kruskal-Wallis test) indicating gradual symmetrical growth of mandibles away from the MF. In conclusion, the RMF is present in at least 20% of the mandibles having a constant position in the retromolar fossa, and the RC varies in its morphology, although all of them join the MC. The location of the MF maintains absolute bilateral symmetry. These findings should be taken into account during anesthetic, surgical or implantation procedures of the mandible (Sponsored by Kuwait University).

KIM Hee-Jin^{1,2}, Hyo-Chang KANG^{1*}, Hyun-Ho KWAK^{1*}, Kyung-Seok HU^{1*}, Kwan-Hyun YOUN^{1*}, Christian FONTAINE^{2*}.

¹Division in Anatomy and Developmental Biology, Department of Oral Biology, College of Dentistry, Oral Science Research Center, Human Identification Research Center, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, South Korea, ²Laboratoire d'Anatomie, Faculté de Médecine, Henri Warembourg, Université Lille 2, Lille, FRANCE. An anatomic study of the buccinator muscle fibres that extend to the terminal portion of the parotid duct, and their functional roles in salivary secretion.

We performed anatomical and histological examinations to investigate the relationship between the parotid duct and the buccinator muscle using thirty cadaver specimens. Dissection was performed on 22 of these specimens, and the remaining 8 specimens were prepared for histological examination and stained with H&E and Gomori trichrome. In all specimens, small, distinct muscle fibers originating from the buccinator extended to and inserted into the terminal portion of the parotid duct. The topography of these fibers varied, and we classified them into three categories according to where they originated. Type I buccinator fibers, which inserted into the terminal portion of the parotid duct, originated simultaneously from the anterior and posterior aspects of the duct (ten cases, 45.5%). Type II buccinator fibers originated from the anterior aspect of the duct and inserted into the anterior side of the duct (seven cases, 31.8%). Type III fibers originated from the posterior aspect of the parotid duct and ran anteriorly toward the duct (five cases, 22.7%). These results were confirmed in the histological examination of all eight specimens. Based on these findings, we have proposed a tentative description of the physiological role of buccinator fibers in salivary secretion and in the formation of sialoliths.

KIM, Soo Y., Erin L. BOYNTON*, Tim RINDLISBACHER*, Denyse RICHARDSON*, and Anne M.R. AGUR, Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, CANADA. Association of the supraspinatus muscle and tendon architecture with rotator cuff tears: a three-dimensional investigation of the supraspinatus muscle and tendon architecture.

The purpose of this study was to investigate the detailed 3D architecture of the supraspinatus throughout its volume. Ten male embalmed cadaveric specimens (mean age 61.9yrs \pm 16yrs) without any evidence of rotator cuff degeneration were used. Three dimensional coordinates (x, y, and z) of the tendon and muscle fiber bundles were collected in situ using serial dissection and digitization. The data was reconstructed into a 3D model using Maya™. Fiber bundle lengths, pennation angles and tendon dimensions for each architecturally distinct region were calculated and then analyzed using paired t-tests and ANOVA. The supraspinatus was found to be partitioned into distinct regions (anterior, posterior and in 3 specimens a middle region). Within the anterior and posterior region of the muscle, three distinct layers exist (superficial, middle and deep). Mean pennation angles differ significantly between the layers of the anterior muscle belly (superficial $11.5^{\circ}\pm 2.7^{\circ}$; middle $9.8^{\circ}\pm 2.3^{\circ}$; deep $16.6^{\circ}\pm 6.0^{\circ}$). Mean fiber bundle lengths differ significantly between the middle and deep layers of the posterior muscle belly (7.0 cm \pm 0.60 cm; 6.2 cm \pm 0.54 cm). Results suggest the stress distribution through the supraspinatus tendon is not uniform and the muscle and tendon architecture may be correlated with articular-sided tendon tears.

KINSELLA, Chris^{1*}, Theodoros KAPOS^{2*}, Ramachandra SRINIVASA^{1*}, Brian CURRY¹, Marios LOUKAS^{1,3}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Department of Advanced Prosthodontics, Harvard School of Dental Medicine, ³Harvard Medical School, Department of Education and Development, Boston MA, USA. The arterial supply of the mandible with special regard to implant placement.

Although the arterial supply of the anterior mandible from the sublingual arteries has been well described through use of CT and Doppler sonography, case reports concerning life-threatening hemorrhages in the floor of the mouth following routine implant placement emphasize the importance of an accurate anatomical description of common variations. The aim of this study was to explore the anatomical variation of the sublingual artery in

relationship to the mandible, to provide useful information for preoperative planning in mandibular reconstruction in order to help avoid hemorrhagic complications of implant placement. We examined grossly 150 adult human cadavers injected with red latex. The main arterial supply to the floor of the mandible was the sublingual artery. In 73% of the cases the sublingual artery exhibited three notable branches: ascending (72%), descending (54%) and middle (22%) forming a rich network of alveolar branches that supplied the anterior cortical plate of the mandible. Branches of the submental and inferior alveolar arteries contributed to the supply of the external surface of the mandible. We were able to identify anastomotic patterns between the sublingual and inferior alveolar arteries in 92% of the cases, between sublingual and submental in 84% of the cases, and between submental and inferior labial in 54% of the cases. Accordingly we developed danger zones in the mandible in which the anastomotic patterns were always present. Disruption of these anastomoses with an implant placement could produce life threatening hemorrhages.

KRAMER, Jessica^{1*}, Robert G LOUIS JR^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The surgical anatomy of radial and ulnar nerve communications in the dorsal surface of the hand

Sensibility of the dorsal surface of the digits is supplied by the radial and ulnar nerves with the boundary classically being the midline of the ring finger. Overlap and variations of this division exist and a communicating branch (CB) between the radial and ulnar nerve could potentially explain further variations in digital sensory innervations. The aim of this study was to examine the origin and distribution of the CB between the radial and ulnar nerves and to apply such findings to the risk involved in surgical hand procedures. We have grossly and endoscopically examined 200 formalin-fixed adult human hands, derived from 100 cadavers and a CB was found to be present in 120 hands (60%). Of the specimens with CBs, we were able to identify 4 notable types representing different points of connections of the CBs. Type I (71, 59.1%) originated proximally from the radial nerve and proceeded distally to join the ulnar nerve. Type II (23, 19.1%) originated proximally from the ulnar nerve and proceeded distally to join the radial nerve. Type III (4, 3.3%) traversed perpendicularly between the radial and ulnar nerves so that it was not possible to

determine which nerve served as the point of origin. Type IV (18.3%) had multiple CBs arising from both radial and ulnar nerves. According to the origin and distribution of these branching patterns, we were able to create a risk area in which the CB(s) may be subject to iatrogenic injury during common hand procedures.

KRISHNAN Subramaniam. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. Implementation and observations of a revised, concise neuroanatomy course in a New Integrated Medical Curriculum.

Anatomy Departments are under increasing pressure to modify the traditional neuroanatomy course to reduce content and learning activity time. This has come about in order to accommodate the increasing time allocation for molecular and cell biology and also to fit into systems-based clinically oriented curricular formats. In this Department, the advent of a New Integrated Medical Curriculum (NIC) effectively forced the reduction of the neuroanatomy contact hours by more than 50% and the course compacted to three teaching weeks from the original seven weeks. Student-centered activities were nevertheless encouraged. Lectures have been drastically reduced and laboratory sessions confined to models, photomicrographs, plastinated whole brains and perspex-mounted brain slices. The laboratory dissection of brains has been discontinued and case-based scenarios put in place. Students are encouraged to use the well-equipped Anatomy Resource Center for additional study. Formal assessments and examinations in neuroanatomy are limited to a few MCQs, two short assays and a few OSPE stations as part of the neuroscience module. The first cohort under the NIC graduated in 2005. Feedback from clinical teachers suggest that basic anatomical knowledge for the diagnosis of common neurological problems is lacking. The content for this neuroanatomy curriculum is currently being reviewed.

KRISHNAN Subramaniam, Pamela DAVID*. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. Characterization of neurons and plasticity of axon terminals at the neuromuscular junction in Fetal Alcohol Syndrome (FAS).

FAS refers to the deleterious effects of maternal alcohol consumption during pregnancy on the developing fetus. Nervous system abnormalities, growth retardation and developmental

delays are among the manifestations. There is a paucity of information on the pathology occurring at the neuromuscular junction. The purpose of this study was to experimentally induce FAS and study the axon terminals and changes in the spinal motoneurons of hindlimb muscles of the rat. Sprague-Dawley rats were exposed to alcohol in utero and the pups were assessed during early postnatal development. Their spinal cords and muscles were studied histochemically. Alterations in motoneuron pool, motor endplates and muscle features were assessed. Results showed the presence of multiple axon terminals at the developing neuromuscular junctions with increased polyneuronal innervation ($p < 0.01$), suggesting delayed skeletal muscle maturation. Loss of motoneurons and altered cell sizes, reduced muscle weight and an alteration in muscle fiber-type was also observed. The present results confirm the teratogenic effects of alcohol on nerve and muscle during organogenesis. A unique feature is the delay in the maturation process of the nerve-muscle system. This retarded development probably contributes to the muscle weakness, atrophy and lack of muscle coordination often seen in human FAS. (Sponsored by University of Malaya Grant No. F0146/2004B)

LACHMAN, Nirusha., Ebrahim A VANKER* and Kapil S SATYAPAL. Department of Human Biology, Durban Institute of Technology, Durban South Africa and Department of Anatomy, University of Kwazulu Natal, Durban South Africa. [A functional anatomical perspective for surgical approach in the treatment of constrictive pericarditis.](#)

Understanding functional anatomy of the heart is central to understanding clinical impact of constrictive pericarditis and why certain operations are inadequate in relief of these clinical sequelae. Although pericardiectomy remains an established method for pericardial resection, choice of surgical approach remains a controversy. This study presents a functional anatomical perspective on surgical experience of pericardiectomy over 20 years. Clinical reports were analyzed in terms of surgical approach and patient outcome. Median sternotomy approach favoured complete right ventricular and atrial decompression with only partial left ventricular stripping which from a functional anatomical perspective, accounted for the poor results and high mortality for pericardiectomy done through this approach. When compared, the clinical outcome was favoured in the approach concentrating on left ventricular decompression only. The heart is a series pump and it is a

common and serious technical error to perform a pericardiectomy when the left ventricle is incompletely decompressed. In an anterior view, the bulk of the heart is formed by the right ventricle, part of the right atrium and only a fraction of the left ventricle. For wider access, the left ventricle and outflow tract are best approached posterolaterally. The impact of basic anatomical application in surgical management is demonstrated.

Lakshmi SELVARATNAM, Amri SALIM* and SUBRAMANIAM, Krishnan. Department of Anatomy, Faculty of Medicine, University of Malaya, Malaysia. Shift to Integrated Microscope-Multimedia (IMMM) System enhanced motivation in medical students towards histology learning.

Traditionally, medical students studied microscopic slides following in-house histology guidebooks with lecturer supervision. In order to optimize instruction for laboratory sessions, a newly-devised IMMM System with lecturer slide review via central control room was implemented halfway through the first year course. A feedback survey (5-point Likert scale questionnaire) was then conducted on this cohort who had exposure to both traditional and new practical modes to assess perception of the new laboratory sessions and subsequent histology learning. The majority of medical students (n=198; 77% response rate) perceived the IMMM System vastly enhanced comprehension of microscopic slides under review with resultant increased understanding of histology topic under study (mean score 4.0-4.4). With regard to logistics, usage of pointer to identify tissue structures, quality of high resolution microscopic images broadcast and real time lecturer-student interaction via audiovisual links also rated highly (3.7-4.2). Interestingly, students still desired lecturer availability for personal guidance as necessary and stressed continued importance of learning histology theory via lectures (3.8-4.0). Finally, medical students overwhelmingly preferred (99%) the new mode of conducting histology practicals using the IMMM System. Such renewed enthusiasm in histology learning amongst curriculum-overloaded medical undergraduates should be tapped to highlight the fundamental cellular nature of all disease.

LAMBERT, H. Wayne, University of Louisville School of Medicine, Dept. of Anatomical Sciences and Neurobiology, Louisville, KY. A multimodal teaching experience: Engaging your students via creative instruction through online learning.

Most human gross anatomy courses are taught in traditional, predominantly lecture-based courses that also contain a laboratory component. In this type of classroom lecture format, instructors often struggle to energize the learning environment and to empower students to adopt responsibility for their own learning. At the University of Louisville, the development and delivery of interactive Web-based course material has been initiated to replace lectures and to engage dental residents in a required head and neck anatomy course. Through the use of a multimodal teaching experience that includes video, interactive PowerPoint presentations, and continual assessment, this online course will attempt to improve facilitation of knowledge acquisition while assisting learners to become more self-directed and collaborative with peers. This presentation will be a discussion of the steps that are being taken, resources which are available, and the role of the online course management tool Blackboard for the pedagogical shift toward creative instruction through online learning.

LOMNETH, Carol S., Michael C. Wadman*, and Wesley Zeger*. Department of Genetics, Cell Biology and Anatomy, University of Nebraska Medical Center, and Department of Emergency Medicine, The Nebraska Medical Center. Enhancement of Teaching Central Venous Access Using Viscous Lubricant in Lightly Embalmed Cadavers.

Lightly-embalmed cadavers have proved useful for teaching of various clinical skills. After embalming, however, there is very little turgidity to the blood vessels making it difficult to obtain fluid from the blood vessels when practicing central venous access. We were interested in developing a model in which: 1) successful venous access could be determined by withdrawal of colored fluid 2) multiple trials could be done on the same cadaver. Femoral and subclavian vessels are filled distally in order to preserve the surface anatomy at the injection site. Saline, gelatin solutions of various concentrations, and methylene-blue, or red colored lubricant are all examined as potential solutions for the simulation model. The viscosity of the lubricant has advantages over saline, and gelatin solutions in that it allows the blood vessels to be filled to increase their turgidity, prevents leakage from the injection site, and allows multiple aspirations. The location of the blood vessels is determined both by anatomical landmarks and ultrasound. The coloring of the lubricant helps determine if the correct vessel has been penetrated. Injecting selected blood vessels with colored

lubricant enhanced the ability to use the lightly-embalmed cadaver as a model for teaching central venous access.

LEONG, Karen^{1*}, Theodoros KAPO^S^{2*}, Robert G LOUIS JR^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,3}.

¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Department of Advanced Prosthodontics, Harvard School of Dental Medicine, ³Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the pterygopalatine ganglion

Postganglionic parasympathetic nerve fibers of the pterygopalatine ganglion are assumed to join the ethmoidal nerve within the orbit. Postganglionic sympathetic fibers may use the same route or join the ethmoidal via the nasociliary nerve. Recent reports emphasize this pathway by providing satisfactory therapy in cases of vasomotor rhinitis indicating that pterygopalatine efferents were effectively interrupted. The pathway linking pterygopalatine postganglionic parasympathetics and the ethmoidal nerve has not been demonstrated and whether or not they join before entering the anterior ethmoidal foramen is not known. We grossly examined 50 formalin-fixed adult cadavers. In 90% of the specimens gross examination revealed orbital branches traveling from the pterygopalatine ganglion to enter the orbit and the posterior ethmoidal foramen and terminating in the paranasal sinuses. The majority of these branches (70%) also entered the anterior ethmoidal foramen to reach the nasal mucosa. Interestingly, failure of surgical lesions of the anterior ethmoidal nerve as a treatment for vasomotor rhinitis may be attributed to the sparing of the separate parasympathetic nerves. Appropriate chemical lesions, on the other hand, could ensure destruction of isolated parasympathetic nerves while limiting damage to the larger anterior ethmoidal nerve.

LOUIS Jr, Robert G^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the phrenic ganglion.

The origin of the phrenic nerve and its distribution to the diaphragm has extensively been studied over the last century. However, the termination of the phrenic nerve after it exits the diaphragm and the subdiaphragmatic distribution has remained largely unknown. We examined 100 adult human formalin-fixed cadavers grossly and histologically. Dissection revealed that the phrenic nerve exited the diaphragm inferolaterally to the IVC,

following the inferior phrenic artery in 100% of the specimens. On the left side the exit of the phrenic nerve from the diaphragm was highly variable and present in 69% of the specimens. In 75% of the specimens the right phrenic nerve gave off a branch to the right crus after exiting the diaphragm. In 22% of the specimens it joined the phrenic ganglion; in 24% of the specimens it created a nerve plexus that terminated in the suprarenal gland; in 28% of the specimens it connected to the celiac ganglion and in the remaining 26% it created combinations of the aforementioned connections. The phrenic nerve exhibited a similar pattern to the left side. Histologically the phrenic ganglia and subdiaphragmatic portion of the phrenic nerve exhibited autonomic characteristics similar to those of prevertebral ganglia. We suggest that the phrenic nerve carries sympathetic fibers (vasomotor) to the suprarenal gland and receives sympathetic fibers from the celiac ganglia. The precise physiologic mechanism of the phrenic ganglia and subdiaphragmatic portion of the phrenic nerve still remains to be fully clarified.

LOUKAS, Marios^{1,2}, Robert G LOUIS JR^{1*}, Marek DABROWSKI^{3*}, Mirek KIEDROWSKI^{3*}, Artur BARTZAK^{3*}, Michal KAMIONEK^{3*}, Martin J. FUDALEJ^{3*}, Teresa WAGNER^{4,5*}, ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA, ³Department of Cardiology, Bielanski Hospital, ⁴Department of Pathology, Institute of Rheumatology, ⁵Department of Forensic Medicine, Warsaw Medical School, Warsaw, Poland. The clinical anatomy of the coronary collateral arteries.

Normal human hearts characteristically contain small collateral vessels, whereas hearts from patients with myocardial infarction or congestive heart failure typically possess much larger collateral vessels. To investigate these newly formed collaterals we examined 800 coronary angiograms taken from patients with severe occlusion of LAD or RCA and 200 hearts derived from cadavers. We were able to identify ten different collateral anastomoses in hearts with RCA stenosis (400 cases). The most common types were type I (30%): LAD to posterior descending branch of RCA via ventricular septal branches; type II (25%): communication between the distal circumflex artery and distal RCA; type III (20%): obtuse marginal branch of the circumflex artery to posterior left ventricular branch of RCA; type IV (10%): Kugel's artery. In the remaining 600 cases in which the LAD was obstructed seven different collateral types were identified. The

most common types were type I (35%): acute marginal branch of RCA to LAD; type II (25%): proximal ventricular branch of LAD to a very distal septal branch; Type III (20%): obtuse marginal branch of the circumflex artery to LAD; and type IV (10%): conus branch of RCA to conus branch of LAD. These anastomoses are clearly of great clinical importance in that they may provide collateral blood supply to distal segments of occluded coronary arteries, thereby sparing the myocardium from ischemia and infarction. From the anatomical point of view, most of these vessels remain unnamed and morphologically undescribed creating logistical problems in everyday clinical practice. For this reason, further studies need to be undertaken in order to identify all the vascular patterns and propose their nomenclature.

MA, Terence P., and Emmett R. FINDLAY. Department of Basic Sciences, Touro University – Nevada, Henderson, NV. Team peer-to-peer clinical case presentations: Fostering teamwork in gross anatomy.

Contrary to educational best practices, academic preparation of physicians is heavily grounded in didactic and experiential learning that consists of significant teacher-directed learning. To encourage peer teamwork, first-year medical students in gross anatomy were assigned to dissection groups which were also responsible for making a clinically-oriented presentation. Teams were changed for every content block. The team was responsible for all aspects of the presentation including selecting and researching a topic, and creating and delivering a presentation. The purposes are to allow the students to teach a clinical case to their peers, reinforce anatomical knowledge, and practice public presentations. Teams have complete flexibility in the design of the presentation and are graded on the basis of announced criteria. We tracked student attitudes regarding this component of the course. Most students found this experience to be useful for their study of anatomy and in preparation for careers in medicine. A significant majority agreed that they learned valuable information preparing their presentations and from other student presentations. Equally importantly, students appeared to recognize the significance of teamwork and working within peer groups. We believe that these presentations have been a useful mechanism to reinforce active student learning in medical education.

MacPHERSON, Brian R., Anatomy & Neurobiology, The University of Kentucky College of Medicine, Lexington, KY. The

use of voice files in PowerPoint™ presentations to enhance lab dissection skills.

PowerPoint™ laboratory demos have been used for many years to illustrate the dissection approach and critical structure identification for each lab session. They were designed to be viewed before the lab to familiarize the students with the day's dissection – while following along in the dissector. The demos proved highly popular, many students printing them off and taking them to the lab in addition to having their atlas present at the table. However, many groups still either wait for verbal instructions from lab assistants on the dissection approach – or move ahead and do it wrong – even though the images clearly show what their dissected result should look like. This year short digital audio clips were embedded in the demos that verbally stated - if user activated - the dissection instructions clearly. This was done for the first half of the course and the students' response to this enhancement surveyed. Less than 60% claimed to utilize the voice files on a regular basis. Ninety percent of those that used them claimed it clarified the dissection approach and they felt less likely to make a mistake or to wait for lab instructors for verification. Based on student-provided information, 79% of those that did use the voice files, were performing above the 85th percentile level in the course. Instructor evaluation of the experiment was positive. Student suggestions included “should all have voice files” and “why isn't there video files”. The next enhancement will be to include short video clips - with voiceover text - showing the approach.

MANSURI*, Junaid N., and Mark J. HOLTERMAN. Department of Surgery, University of Illinois at Chicago, IL. Interactive color compositing enhances multivariate analysis of magnetic resonance images.

Some of the most commonly used MRI pulse sequences are the Diffusion, T1-, and T2-weighted modalities. Each provides unique biophysical information about the tissue being studied.

Of considerable importance, different tissues sometime appear to have similar gray scale values in one mode, but may be easier to differentiate in another mode. Accurate clinical analysis of MRIs requires the ability to integrate the information obtained from these different pulse sequences modalities. One way to visualize all three modalities simultaneously is by integrating them into a single composite RGB colored image. The process begins with converting each of the gray scale images from the three modalities into a separate color image. These images are

then fused into a single composite RGB image. The composite image incorporates all of the information from the different weightings, which allows for better visual differentiation between tissues. We have developed a program that facilitates the multivariate analysis of MR data sets. Through a graphical user interface, the user can select the color assigned to each modality, control the opacity level of designated colors, and scroll through cross-sections. This integrative approach to complex biological data sets has potential educational, clinical and research applications. (Supported by 7N01LM003508-003)

MARCHIGIANI Raffaele J *; VLAD STANESCU. Department of Anatomy, American University of Antigua, St John's, Antigua. Rare Communication between 2 branches of the Mandibular Nerve: LINGUAL NERVE and INFERIOR ALVEOLAR NERVE - CASE REPORT.

During the routine dissection of the Head and Neck block for the gross anatomy course in our institution, the infratemporal fossa was open in an 83 year old male cadaver. Macroscopic examination of the posterior division branches of the mandibular nerve revealed a large communication between the inferior alveolar and lingual nerves. Although, there have been described different communications between the branches of the mandibular nerve, it is believed that this connection pattern was not reported in the literature. The caliber and the nerve conduction direction of this particular pattern will have an important clinical significance. It explains the nerve damage following oral/maxillofacial surgical procedures and contributes to further modification/improvement of the inferior alveolar nerve block and microsurgical nerve repair techniques.

MARTINO, Leon J., Charles H KITE*, and Nancy A WILSON-MARTINO*. Division of Medical Education, Albany Medical College, Albany, NY. Introduction of the real time video from the operating room to the lecture hall.

Clinical relevance in the teaching of gross anatomy is a goal of all anatomy educators. Introduction of case studies, radiology and patient presentations have promoted and enhanced the relevance of the study of gross anatomy in the medical curriculum. The next step in the enrichment of the anatomy experience is the introduction of surgery to anatomical study. It is impractical to bring the students en mass to the surgical suite. Instead we have attempted to bring the surgical suite to the lecture hall. Through the use of two way live feed video,

students are able to be in the operating room, see the surgical procedure and converse directly with the surgeons. At varied points during the sequence of the gross anatomy course a video link is established between the lecture hall and the operating room. A member of the surgical team is present in the lecture hall to act as a liaison between the students and the surgeon. Throughout the surgical procedure, the operating surgeon will describe the procedure, point out relevant anatomy and answer specific questions from the students. Student interaction has been excellent. The integration of surgical procedures and the ability to visualize first hand those procedures facilitates and encourages the understanding of anatomy and thus aids in the development of practical application of anatomy. While limited in scope at present, we hope to introduce more in depth surgeries to the gross anatomy course.

MATUSZ1 Petru L., Enikö ST. HORDOVAN^{1*}, Agneta Maria C. PUSZTAI¹, Delia Elena D. ZAHOI^{1*}, Klara I. BRINZANIUC^{2*}, Elena G. POP^{1*}. ¹Department of Anatomy, University of Medicine and Pharmacy "Victor Babes", Timisoara, ²Department of Anatomy, University of Medicine and Pharmacy Tirgu-Mures, ROMANIA. Major anatomical variations concerning the vascularization of the left medial division of the hepatic parenchyma.

The left medial liver's division is usually vascularized by the medial branch of the hepatic artery proper (HAP). On a studied material represented by 155 hepatic corrosion casts, we analyzed the major anatomical variations concerning the origin of these branches. The corrosion casts were made by injecting the hepatic vasculo-ductal systems with plastic, followed by corrosion of the hepatic parenchyma with hydrochloric acid. In order to correlate the denominations of the hepatic parenchyma's volumes homologated by Terminologia Anatomica (1988), we used for the medial branch the name of artery of the left median division (ALMD). We revealed a number of four major variants of origin of this artery: TI (modal – 78.71%), with the origin in the left branch of the HAP; TII (1.94%), with the origin in the left gastric artery; TIII (7.09%), situated in the continuation of the left branche's trajectory; TIV (12.26%), with the origin in the right branch of the HAP. In the case of type III, the ALMD crosses over the plane of the umbilical fissure, and in the case of TIII – the plane of the main portal fissure. These anatomical variations can cause complications in the cases of surgical interventions of resection or transplantation.

MATUSZ¹, Petru L., Elena G. POP^{1*}, Klara I. BRINZANIUC^{2*}, Delia Elena D. ZAHOI^{1*} and Agneta Maria C. PUSZTAI^{1*}, Enikő St. HORDOVAN^{1*}. ¹Department of Anatomy, University of Medicine and Pharmacy “Victor Babes”, Timisoara, ²Department of Anatomy, University of Medicine and Pharmacy, Tirgu-Mures, ROMANIA. Major anatomical variants of the intrahepatic biliary ducts system. Study on corrosion casts.

The elements of the intrahepatic biliary ducts system (IHBDS) are usually associated with the distribution elements of the portal hepatic vein. We analyzed the major anatomical variants (MAV) of the IHBDS on 120 hepatic corrosion casts, made by injecting with plastic the elements of IHBDS, followed by parenchyma corrosion with hydrochloric acid. The lateral branch (LBr) presents MAV in 1.67%, represented by gliding of duct III into the medial branch (MBr). MBr presents MAV in 18.33%, represented by variations in number of segmentary ducts (2-4). The anterior branch (ABr) is absent in 2.5%, in which the ducts V and VIII drain directly into the superior biliary confluent (SBC), together with the posterior branch (PBr). In 16.67% the right hepatic duct (RHD) is morphologically absent, and ABr drains either into the SBC (15.84%), or into the left hepatic duct (LHD) (0.83%). PBr presents MAV in 16.67%; they are due either to the drainage of the PBr into LHD (15.84%) or to its direct drainage into SBC (0.83%). Due to these MAV of the IHBDS, SBC presents major variations in 18.17%, due to the absence of the RHD as a morphologic entity and to the distinct drainage of its elements.

MILLER, Brian T., Thomas J. COLLINS*, David E. SMITH*, Judith F. ARONSON*, and Daniel F. COWAN*. Division of Anatomy, Department of Neuroscience and Cell Biology and Department of Pathology, The University of Texas Medical Branch, Galveston, TX. Integration of pathology with gross anatomy in a clinical anatomy course.

In the traditional curriculum at the University of Texas Medical Branch, gross anatomy and pathology were taught as entirely separate disciplines. Despite the advent of an Integrated Medical Curriculum at our institution several years ago, these two disciplines remained largely segregated into two distinct first-year courses. However, over the past several years, we have devised an approach by which students in the Anatomy course interact with Pathology faculty in the Anatomy laboratory to identify, examine, and discuss elements of pathology uncovered by the students during their assigned dissections. In these labs,

one or more academic pathologists go from table to table discussing any problems students might perceive related to variations of their material from normal. Lists of clinically important, interesting or unique pathological specimens are maintained both in the lab and on the course website so that all the students in class have the opportunity to examine these findings. Particularly interesting specimens uncovered during the week are demonstrated to the entire class by a pathologist via a closed-circuit TV presentation during the final lab period of the week.

MOHAJEL SHOJA^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, A. ASHRAFIAN^{1*}, and W. Jerry OAKES^{2*}.

¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. A triple dural-venous variation in the posterior cranial fossa: A duplicated plus accessory falx cerebelli and an aberrant venous sinus.

Variations in dural folds are exceptionally rare and so are that of dural venous sinuses. Anatomical variations of these structures within the posterior cranial fossa may be problematic in various diagnostic and operative procedures of this region. We report our observation of an extremely rare variation of posterior fossa dura and venous sinuses encountered upon dissection of a young male fresh cadaver. After removing the calvaria and brain, and opening the posterior cranial fossa, we realized that the falx cerebelli was duplicated. The length of right falx cerebelli was 45.3 and that of left falx was 49.8 mm. The width of these falx were 5.1 and 5.3 mm at right and left sides, respectively. The distance between two falx was 3.2, 4.5 and 7.8 mm at proximal, middle and distal one third. An accessory small falx (31.8 × 2 mm) was found attached to the underside of tentorium 3.4 mm lateral to the base of right falx cerebelli. Inferiorly, the accessory falx blended with the lateral surface of right falx cerebelli at its lower third. There was only one occipital venous sinus with a diameter of 2.5 mm, proximally, that originated near the right posterolateral rim of foramen magnum and coursed between two falx to enter the confluence of sinuses. At the right floor of posterior cranial fossa, an additional dural venous sinus was found. This aberrant sinus was embedded within the dura matter (was not extradural) and originated from the right sigmoid sinus. While coursing posteromedially, the sinus divided into three branches that joined the occipital and right transverse sinuses.

We believe that such an association is first to be reported here. Neurosurgeons and neuroradiologists should be aware of the variations in the posterior fossa structures.

MOHAJEL SHOJA^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, A. ASHRAFIAN^{1*}, and W. Jerry OAKES^{2*}.
¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. An unusual duplication of the anterior communicating artery with atherosclerosis of the posterior horn: A microsurgical anatomy.

The anterior communicating artery (ACOM) constitutes the most proximal segment of the Circle of Willis. It has been found that the ACOM has a significant role in maintaining cerebral hemodynamics with its diameter being the major determinant for blood collateralization in the settings of an occluded and atherosclerotic internal carotid arterial system. We report an extremely rare variation of the ACOM found in a 63 year-old male cadaver in which the artery was duplicated and had a fine arterial communication between its anterior and posterior horns. The anterior horn was smaller and thicker than that of the posterior horn (length 2 versus 4 mm and width 2 versus 1 mm, respectively). Two long penetrating branches were found to originate from the superior surface of the anterior horn and these coursed toward the posterior perforated substance. The posterior horn had no branches, was oblique in nature, and extended posteroanteriorly from the right to the left side. The fine communicating artery, located between these horns, was 1 mm long and primarily to the left of midline. The internal carotid arteries and the entire posterior horn of the ACOM with its fine communicating branch were atherosclerotic. However, the anterior horn had little if any atherosclerosis. Although a duplicated ACOM is occasionally reported in the radiological literature, its microsurgical anatomy and potential clinical relevance is largely unknown. We believe that the present case is the first to report the single atherosclerotic involvement of only the posterior horn of a duplicated ACOM. Neurosurgeons and radiologist should consider such a variation in the skull base arterial architecture.

MOHAJEL SHOJA^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*} and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical

Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. A systematic approach for review and publication of anatomical variations.

Anatomical variations are potentially important scientific findings. With advancing microsurgical and radiological techniques as well as increasing legal problems related to clinical malpractice, reports of human anatomical variation can be very useful information. Limited access of authors to historical resources as well as inconsistencies between journal reviewers are just two issues that often confound the publication of such reports. We believe that rare anatomical variations justify an appropriate and evidence-based discussion of the possible clinical relevance of such findings. Here, we recommend a systematic approach for the review and publication of anatomical variations. This approach may aid authors and reviewers in simplifying the review process of an anatomical variation report and improve the list of the attributed clinical relevance by actively and indirectly including the reviewers in the writing of the report. The systematic approach would consist of three distinct parts that together form a final report. After recording and preparing one to three paragraphs for describing the observed variation, authors would submit their first draft of the report to an appropriate journal. This would be followed by the editor's selection of expert reviewers in this field. The section on the potential clinical relevance and perhaps the anatomical significance of the variation would be prepared by each individual reviewer and then added to the paper for its final form. By this process, the editor would be able to judge the importance of the reported variation and categorize it as follows: A. unreported or rare entity and with the variant frequently involved in invasive procedures, B. unreported or rare entity with the variant occasionally involved in invasive procedures, C. unreported or rare entity with the variant infrequently involved in invasive procedures, D. an academically well-known variation. Class A, B and C reports would potentially merit publication. We hope this proposed approach might expand an anatomical variation data bank and expedite the publication of important anatomical variations that have clinical application.

MOHAJEL SHOJA^{1*}, Mohammadali, R. Shane TUBBS², Abolhassan B. SHAKERI^{1*} and W. Jerry OAKES^{2*}. ¹Department of Neurosurgery, Anatomy and Radiology. Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology

and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. Gonadal Arteries Originating from the Renal Arteries: A Possible Common Origin of Accessory Renal and Gonadal Arteries.

The gonadal arteries are paired vessels that usually originate from the abdominal aorta at the level of second lumbar vertebra. In 20% of cases, the gonadal artery has a higher origin and in 5-6% of cases it originates from the main or accessory renal artery. In this study, we defined the latter arteries as aberrant gonadal arteries. Ninety-eight kidneys of 50 healthy potential renal transplant donors were studied by conventional angiography. The renal artery, either main or accessory, was detected and individually injected to highlight their perihilar divisions and possible extrarenal branches. The gonadal arteries were recorded if they originated from the renal arteries. Statistical analysis was performed by Chi-square test (Phi and Cramer's V) using SPSS for windows version 10.0. A P-value less than 0.05 was considered statistically significant. We found that 49% (n=38) of kidneys had at least one accessory renal artery. In 14 sides (14% of kidneys), the gonadal artery (11 right and 3 left) originated from the renal artery either main (n=4) or accessory (n=10). Ten out of 14 patients with an aberrant gonadal artery were found to also have an associated accessory renal artery (P = 0.007). The results of this study show that aberrant gonadal arteries tended to originate from a kidney that possessed an accessory arterial supply. Hence, we hypothesize that aberrancies of the gonadal artery are a part of a common embryologic error resulting in the persistence of the metanephric arteries (the future accessory arteries) - that is the aberrant gonadal and accessory renal arteries share a common embryology.

MOHAJEL SHOJA^{1*}, Mohammadali, R. Shane TUBBS², Ghaffar SHOKOUHI^{1*}, and W. Jerry OAKES². ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. The lateral perforating substance of diencephalon.

Diencephalon and other basal brain structures are mainly supplied by the penetrating branches of cerebral arteries at two anterior and posterior perforating substances. We examined six adult fresh brain specimens (aged 20-80 years). After placing the brain over its superior surface, Lilliequist's membrane was

carefully removed to uncover the retrochiasmatic space between the superior border of pons and posterior rim of the optic chiasm. The hypophyseal stalk, mamillary bodies and posterior perforating substance were located forward to backward. Just lateral (or anterolateral) to the mamillary bodies, two small quadrangular spaces (2.5 × 3.5 mm) were found that were laterally bounded by the junction of optic tract and crus cerebri. These spaces were pierced on each side by 1-3 small penetrating branches of the posterior communicating artery (PCOM). A single and obliquely oriented penetrating branch of PCOM was found to pierce this area in all specimens. Taking the location of the above-mentioned perforating substance into account, we hypothesized that this area specifically serves to supply the hypothalamic nuclei. Hence, special attentions should be made during the brain base surgeries to preserve this area.

Mokhtarzadeh*, Ali, Terry K. Schiefer*, Nicholas M. Desy*, Kimberly K. Amrami*, Robert J. Spinner. Mayo Medical School, Mayo Clinic, Departments of Radiology and Neurologic Surgery, Rochester, MN. A clinicoanatomic explanation for tibial intraneural ganglion cysts arising from the superior tibiofibular joint. Tibial intraneural ganglion cysts about the knee region are rare and poorly understood, and as a result, operative treatment of them has resulted in recurrences and neurologic deficits. Based on new information regarding the prototype example of intraneural ganglion, i.e., the fibular intraneural ganglion cyst arising from the superior tibiofibular joint, we postulated that a similar mechanism would underlie the formation of tibial intraneural ganglion cysts arising from the same joint. For the fibular nerve, cyst fluid dissects from the anterior portion of the superior tibiofibular joint within the epineurium of the articular branch into the common fibular nerve in a reproducible pattern. The clinical records and MRIs of 3 patients with surgically and histologically confirmed recurrent tibial intraneural ganglion cysts were analyzed and compared with 2 patients with tibial extraneural ganglion cysts. Seven cadaveric specimens were dissected to define the articular anatomy of the posterior aspect of the posterior tibiofibular joint. The tibial intraneural ganglion cysts had stereotypic features which allowed distinction from the extraneural cases. The intraneural cysts had a tubular (rather than a globular) appearance. They derived from the postero-inferior portion of the superior tibiofibular joint and followed along the expected course of the articular branch on the posterior surface of the popliteus muscle. The cysts then extended

intraepineurially into the parent tibial nerves where they contained displaced nerve fascicles. All cadaveric specimens demonstrated a small single articular branch which derived from the tibial nerve to the popliteus. The branch coursed obliquely across the posterior surface of the popliteus muscle before innervating the posteroinferior aspect of the superior tibiofibular joint. The clinical, radiographic and anatomic features of tibial intraneural ganglion cysts are the posterior counterpart of the fibular intraneural ganglion cysts at the superior tibiofibular joint. These predictable features can be exploited and have implications for the pathogenesis of these cysts and treatment outcomes. These ganglion cysts are joint-related and provide further evidence to support the unifying articular theory. The articular branch and the superior tibiofibular joint need to be addressed operatively to prevent cyst recurrence.

NAGASHIMA, Masabumi, Tohru MATSUI *, Osamu SHIRADO*, and Hiromi ODA*. Departments of Anatomy, Neurosurgery, and Orthopedic Surgery, Saitama Medical University, Saitama, JAPAN. Seminar for clinical anatomy, simulation surgery, and feasibility study.

Saitama Medical University offers annual program entitled "Seminar for Clinical Anatomy" for five days as a summer session. Medical students who are learning in the course of "Structure and Function of the Human Body" and their senior attend. Instructors are anatomists and expert surgeons, emphasizing the importance of embryology and clinical significance of topographic anatomy. Simulation surgery is demonstrated with formalin-fixed or non-formalin fixed cadavers. Simulation is also utilized as a rehearsal for challenging surgery, development or feasibility of operative techniques. We will present practical procedures of simulation surgery for the skull base using operative microscope, and pedicle screw placement in the cervical instrumentation surgery with radiological assessment of technical feasibility. Educational effectiveness of this seminar and expectation for research collaboration between anatomists and clinicians will be discussed.

NORTON, Neil S, Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, Creighton University, NE. Experiences with using Blackboard in a traditional head and neck anatomy course for dental students.

Traditional courses in head and neck anatomy for dental students have been affected by such constraints as time

limitations, ageing faculty, and diminished use of cadavers. While most courses have relied upon cadavers, kodachrome slides, or chalk and blackboard, the advent of computers has led to PowerPoint presentations, CDs, DVDs, and Flash animations. This year, we placed our head and neck anatomy course on Blackboard. This allowed the students to access all course information and materials and communicate with faculty. Our goal was to assess student performance and receive feedback on the course using the Blackboard program. Students (n=67) were taught, over the course of three lecture hours and six lab hours a week using PowerPoint lectures. Our mode of examinations remained the same as the past: four written tests, two lab quizzes on cadaver material, two lab practicals, and five pop lab quizzes. Their results were compared to the performance of the previous class (n=67) which had equivalent incoming GPA and DAT scores. We found that students liked the ability to go online, review content, and view their grades confidentially. There was no difference on performance between the class using Blackboard and the class that did not use Blackboard.

OLSON, Todd R. and Sherry A. DOWNIE. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Surface anatomy and physical examination of the donor: valuing the perception of the cadaver as a patient.

Of the topics covered in anatomy courses, the most clinically relevant and least effectively taught is surface anatomy. Reasons for this educational dilemma include: reduced course time, students are naïve about underlying structures when it is presented, cadaveric palpation lacks authenticity, dissection destroys surface and inter-regional continuity, and relevant exam questions are elusive. The 2nd generation of Anatomy Reports on the Internet (ARI) addresses this dilemma by engaging students in a comprehensive physical exam of their donor during the first lab. This exam utilizes the entire body and emphasizes observation, reflection and reporting. Devoting Day-1 to this activity has four objectives: to value surface anatomy, to observe donors' unique characteristics and conditions, to document evidence of potential medical conditions and procedures, and to create donor-centered psychosocial narratives. On Day-1, students meet the nude prone donor. They observe and record, using the language available to them, their donor's unusual or interesting features. Each team completes an "ARI Day-1

Report" that includes physical exam findings with plausible explanatory hypotheses and a first-impression narrative about their donor. At the start of each dissection unit, students review surface anatomy after they have acquired a conceptual understanding of the region and terminology. As they dissect and discover underlying as well as new conditions, students amend their "Day-1 Reports" to include new findings, hypotheses and updated donor-centered narratives. Thus, these new "Revised Reports" are both anatomical learning exercises and vehicles to engage students in thinking about their donor in medical, psychological, and cultural contexts. Faculty, including clinicians, review and comment on these reports. Beginning anatomy with a complete physical examination of the donor replicates a fundamental first step in patient evaluation: taking a history and completing a thorough physical exam. The 2nd generation of ARI creates a unique opportunity in the dissection lab for faculty to teach clinically relevant anatomy and for students to reflect and report upon the remains of a human being who had a personal as well as medical history.

ONA, Mel^{1*}, Christopher WARTMANN^{1*}, William MERBS^{1*}, Brian CURRY¹, Gene L. COLBORN², Marios LOUKAS^{1,3}.

¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Center of Surgical Anatomy and Technique, Department of Surgery, Emory University, ³Harvard Medical School, Department of Education and Development, Boston MA, USA. [The surgical anatomy of the posterior gastric artery](#)

Recent endoscopic advancements in gastrectomy procedures have led to an increasing need for knowledge of the detailed surgical anatomy of the stomach. Although the surgical anatomy of the stomach has been well described, little is known regarding the posterior gastric artery. The aim of our study, therefore, was to explore the origin, the morphology and the territory supplied by the posterior gastric artery. The study was conducted on 120 cadavers with no discernable abdominal pathologies. We defined the posterior gastric artery as the artery that supplied the posterior gastric body near the cardia and posterior fundus. The posterior gastric artery was identified in 98 (81.6%) cadavers and took origin from the left gastric (41, 41.8%), the celiac trunk (10, 10.2%) the splenic artery (25, 25.5%) and both the left gastric and splenic arteries as double posterior gastric arteries (22, 22.4%). The posterior gastric artery appeared to be variably tortuous in 75% of the cases and in 21 (21.4%) of the cases sent

a small polar branch to the spleen. The posterior gastric artery coursed behind the parietal peritoneum of the omental bursa and produced a peritoneal fold before reaching the posterior wall. In all cases we were able to identify a group of lymphatics surrounding this vessel. The high incidence and its tortuous course necessitate its recognition during abdominal surgery. Even though it is a small vessel, inadvertent transection during a gastrectomy, a pancreaticoduodenectomy or transabdominal surgery for reflux esophagitis may result in occult iatrogenic hemorrhage.

OXORN*, Valerie M., Anne M. R. AGUR, Anca STEFAN, Cristian STEFAN and Arthur F. DALLEY. Division of Anatomy, Department of Surgery, University of Toronto, ON, Department of Cell Biology, University of Massachusetts Medical School, MA, and Department of Cell and Developmental Biology, Vanderbilt University School of Medicine, TN. Female internal genital organs: A review of selected illustrations from the 16th to 20th century.

A review of illustrations of the anatomy of the female internal genital organs was conducted, using images from Anatomia 1522-1867, a digital collection of anatomical plates from the Thomas Fisher Rare Book Library at the University of Toronto. Illustrations from books published after 1867 were scanned directly from their respective publications. The selections are from the works of such anatomists as Vesalius (1543), Fabricius (1624), Bidloo (1685), Cloquet (1825), Quain (1840), Ellis (1867), Sobotta (1906) and Grant (1943). Two groups of illustrations were included in this overview: isolated dissections and median/sagittal sections. The illustrations were chosen in order to provide a chronologically representative sample as well as to highlight images that were visually interesting or unusual. The authors made independent observations of each image, and their remarks were edited and summarized. In general, comments were made about anatomical content and accuracy, effectiveness of illustrative techniques, and artistic approach and style. This historical survey demonstrated the increased level of understanding over time. The earlier anatomists and their illustrators made less of a distinction between the male and female internal genital organs, awareness of the morphology of one system influencing the rendering of the other. Those from the later periods, in which dissected specimens were more accessible, provide a more differentiated and accurate representation of the reproductive organs.

OXORN*, Valerie M., Anne M. R. AGUR, Anca STEFAN, Cristian STEFAN and Arthur F. DALLEY. Division of Anatomy, Department of Surgery, University of Toronto, ON, Department of Cell Biology, University of Massachusetts Medical School, MA, and Department of Cell and Developmental Biology, Vanderbilt University School of Medicine, TN. Male internal genital organs: A review of selected illustrations from the 17th to 21st century.

A review of illustrations of the anatomy of the male internal genital organs was conducted, using images from Anatomia 1522-1867, a digital collection of anatomical plates from the Thomas Fisher Rare Book Library at the University of Toronto. Illustrations from books published after 1867 were scanned directly from their respective publications. This overview includes images from the works of anatomists such as Bauhin (1605), Spiegel (1631), Bidloo (1685), Lizars (1825), Bourguery (1831-54), Spalteholz (1923) and Grant (1943). The selected illustrations were divided into two groups: 1) isolated dissections and 2) median/sagittal sections. The illustrations were chosen to create a historically representative range. Unusual or especially captivating images were also included. Anatomical content and accuracy, effectiveness of illustrative techniques, and artistic approach and style were analyzed and summarized in table format. This historical survey demonstrated the increased level of understanding over time, as access to dissected specimens improved. Early depictions were generally more diagrammatic and often resembled, in style and presentation, the illustrations from botanical or zoological literature. Later works demonstrate a more accurate and realistic representation of the male internal genital organs.

PATTERSON, Jennifer J.*, Lindsay M. HARMON*, Susan B. TATE*, Robert D. ACLAND. Department of Obstetrics and Gynecology, Department of Surgery, University of Louisville School of Medicine, Louisville, KY. Is the dorsal nerve of the clitoris endangered in performing a trans-obturator sling procedure?

The dorsal nerve of the clitoris (DNC) is believed to be endangered in a new, effective procedure for female urinary incontinence, the Trans-Obturator Sling (TOS). This belief discourages widespread acceptance of the procedure. We present a study to determine the distance between the DNC, and the path of the instrument used in performing the TOS. In ten lightly embalmed female cadavers, the pelvis was hemisected.

On each side, the DNC was identified by dissection. The location of the inferior border of the obturator foramen was determined. The distance between the nerve and the border of the foramen at their closest apposition was measured. The mean distance between the DNC and the inferior border of the obturator foramen was 9.9 mm (n=10) on the left, and 8.6 mm (n=8) on the right, with standard deviations of 2.9 and 4.3 respectively. The instrument used to perform the TOS can pass no lower than the inferior border of the obturator foramen. The distance between the nerve and this bony landmark represents the distance by which the DNC lies out of harm's way. Our study demonstrates that the dorsal nerve of the clitoris is not endangered in performing the Trans-Obturator Sling procedure.

PINYARD, Jeremy^{1*}, Christopher KINSELLA^{1*}, Afreen TARIQ^{1*}, Sumreen VAID^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The anatomical basis of celiac artery compression syndrome.

Anatomical variations are often responsible for a variety of clinical conditions. Compression of the celiac trunk, as well as the superior mesenteric artery, due to anatomical variations of the surrounding structures such as the diaphragmatic crura or celiac ganglia is known as celiac artery compression syndrome (CACS). We examined photographic records of 772 cadavers from 2000-2006. Of these, 172 (22.2%) specimens exhibited anatomical signs that could lead to CACS. The anatomic variations range from a "high take off origin" of the celiac trunk compressed by normal diaphragmatic crura and median arcuate ligament (54, 31.3%), normal origin of the celiac trunk but long diaphragmatic crura and median arcuate ligament (54, 31.3%), large bilateral fused celiac ganglia, with or without involvement of superior mesenteric ganglia, compressing the celiac trunk (31, 18%), celiacomesenteric trunk compression by diaphragmatic crura and median arcuate ligament (23, 13.3%), and a combination of all of the above (10, 5.8%). There was no observed relationship with regards to gender, age or race. Typically, CACS presents mostly in young females with chronic recurrent acute abdominal pain associated with a typical epigastric arterial bruit, weight loss, nausea, vomiting and negative results of gastroenterologic investigations. The diagnosis of CACS depends upon elimination of other common etiologies for abdominal pain. Treatment of CACS involves open or endoscopic surgical relief of the compression. Considering the possible implications of this data, with

regards to the etiology and pathogenesis of CACS, it could be possible for the clinician to identify a series of structures that could potentially cause CACS and adequately treat this condition.

POGGENBURG Colleen*, David L. BOLENDER, Michael A. SCHELLPFEFFER*, Gary L. KOLESARI Department of Cell Biology, Neurobiology, and Anatomy Department Family and Community Medicine Medical College of Wisconsin, WI. Clinical correlations in the anatomy lab.

Over the past several years we have incorporated six clinical correlations into our regional taught clinical anatomy course for first year medical students. The correlations include central line placement, oral examination, tracheostomy, chest tube placement, laparoscopic anatomy, and pelvis and lower extremity trauma. These sessions are taught in small groups in the body donor lab. The laparoscopic anatomy correlation spans several labs, and is taught in an inter-lab area. We have a group of dedicated specialists who assist with these correlations. We have successfully added these correlations without an increase in class time. The students have repeatedly ranked this experience very positively. In the end of year course evaluation we ask: "to what degree do you perceive this course to be relevant to your future life as a physician?" The 2005 score was 8.62/9.0 n=201. These formal correlations provide a valuable link between human anatomy and clinical medicine.

POLEPALLI, Srikant^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The surgical anatomy of the arterial supply of the rectus abdominis musculoepitoneal flap.

This study was designed to clarify the vascularization of the inner anterior abdominal wall with respect to the transversus and rectus abdominis musculoepitoneal (TRAMP) flap. The vascular territories of the superior and deep inferior epigastric arteries were investigated by red latex injection for dissection, and barium sulfate for radiographic studies in 80 adult formalin fixed cadavers. It was established that the deep inferior epigastric artery was more significant than the superior epigastric artery in supplying the skin of the anterior abdominal wall. Segmental branches of the deep epigastric system passed upward and outward into the neurovascular plane of the lateral abdominal wall to anastomose with the terminal branches of the lower six

intercostal arteries and the ascending branch of the deep circumflex iliac artery. The anastomoses consisted of multiple narrow "choke" vessels. Similar connections were seen between superior and deep inferior epigastric arteries within the rectus abdominis well above the level of the umbilicus. Many perforating arteries emerged through the anterior rectus sheath but the highest concentration of perforating vessels was in the paraumbilical area. These vessels were terminal branches of the deep inferior epigastric artery. Similarly, "choke" connections existed with adjacent territories; inferiorly with the superficial inferior epigastric artery, inferolaterally with the superficial circumflex iliac artery, and superiorly with the superficial superior epigastric artery. The dominant connections, however, were superolaterally with the lateral cutaneous branches of the intercostal arteries. Through a more detailed understanding of the collateral vasculature, the surgeon performing a TRAMP flap may better be able to ensure adequate vascular supply to the mobilized muscular segments.

PORTA, David J., Tyler A. KRESS*, and Anne M. KROMAN*. Department of Biology, Bellarmine University, Louisville, KY and University of Tennessee, Knoxville, TN. A experimental study on the anatomy of trauma induced by 2 different boat motor propellers.

Numerous swimmers are injured by longitudinally-oriented propeller strikes from boats traveling at relatively low speeds. Recent developments in propeller design appear promising in terms of injury mitigation without significant performance loss. In one design, the tips of the blades are joined to each other by an aluminum ring. We present a controlled study of the interaction of 4 human cadavers with the ring-style prop versus a standard open blade prop. Each cadaver was floated into the impact zone of an indoor toroidal pool. An outboard motor was suspended from the platform of a large centrifuge arm that extended over the pool. The motor was run at typical rpm and the centrifuge towed it at 5.0 or 7.4 mph toward one side of a cadaver. The specimen was repositioned and the prop was switched. The motor was then towed at the same speed toward the other side of the body. Testing was recorded on standard and high speed digital video (1,000 f/s). Post-test dissection showed classic multiple parallel lacerations and numerous vertebral, rib and skull fractures for the standard prop tests. The ring-style prop tests showed some large cavitation-type superficial lacerations but no involvement of deeper muscular tissues and no fractures.

RAOOF, Ameer, D. Lowell FISHER*, Sabine HILDEBRANDT*, John STRIBLEY*, Carla BRYANT*, Aaron ESKRIDGE*, Jared VANDERLEEST*, Shreya SINHA*, Ahlam SULTAN*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, Michigan. Advancing the Effectiveness of Undergraduate Anatomy Education: Our

Experience in implementing innovative teaching methods. General issues of concern related to undergraduate anatomy education include the diversity of students' backgrounds and motives that are reflected often unfavorably on their course performance. At the University of Michigan Medical School, undergraduate anatomy has been taught as required lecture-based course offered during the fall with an average annual enrollment size of about 150. Students represented five academic areas: Kinesiology (35%), Literature Science and Arts (25%), Dental Hygiene (20%), Biomedical Engineering (10%), and other disciplines (10%). A wide array of new measures intended to improve students' awareness and comprehension was implemented during the past four years. Measures included: lecture objectives and outlines were distributed to students at the beginning of the semester; quizzes were more regular with a greater share in the course's final grade; lab visits were graded, more frequent, and offered during selected sessions to ensure maximum turnout; and review sessions were introduced at the end of each sections. Analysis of students' performance showed a significant improvement compared to previous years. We conclude that the implementation of the new measures has been effective in improving students' performance in anatomy. Their increased interest reflects an enhanced awareness of the usefulness of anatomical knowledge.

RAOOF, Ameer, Longping, LIU*, Heping, ZHAO*, Katherine, FALK*, Tim BODNAR*, Eric DUEWEKE*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, Michigan. Plastinated specimens as an adjunct to dissection: Are they really helpful? At the University of Michigan Medical School, plastinated specimens are becoming an essential component of undergraduate, medical, and dental anatomy education particularly during the past few years. The aim has been to provide suitable specimens that reflect the essential concepts in anatomy in order to promote students' independent learning. In

the traditional, lecture-based undergraduate anatomy course, visits to the anatomy lab have been introduced where pertinent plastinated specimens displayed. Members of faculty explain the anatomical and clinical material using plastinated specimens. A practical quiz will follow where students are asked to identify essential anatomical landmarks on those specimens. Innovative approaches to enhance the quality of plastinated specimens have been implemented, such as coloring neurovascular pathways and casting hollow viscera to facilitate learning. The validity of these specimens in facilitating anatomy learning has been assessed through surveys administered both to medical and undergraduate students. Results showed an overall acceptance of the plastinated specimens as a valuable adjunct to dissection. These specimens are planned for a wider use in the future to assist faculty and students in the effective utilization of the time allocated to anatomy.

RICHARDS Alan T., Division of Head and Neck Surgical Oncology, University of Nebraska, Medical Center, Omaha, NE; T.H. QUINN, Departments of Biomedical Sciences and Surgery, Creighton University School of Medicine, Omaha, NE; Neil S. NORTON, Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE. The crucial role of anatomy in the management of malignant neck nodes.

The nodal metastases from head and neck cancer follow a predictable pattern. This is the reason that the radical neck dissection of Crile has been modified according to location of the primary tumor. Neck dissections are currently divided into comprehensive and selective. Under special circumstances, extended neck dissection is performed in which additional nodes outside of the conventional area are removed, e.g., intraparotid nodes. The current approach gives effective cancer control coupled with an improved cosmetic and functional result. Despite this increased emphasis on selected lymph node removal, the anatomy of the neck is most often taught and dissected in the traditional manner described in most dissectors. Little emphasis of lymphatic anatomy and surrounding anatomical landmarks is made. We have begun to provide case histories of patients who have undergone surgical treatment for neck cancer. One series of short case descriptions, e.g., guides the students through nodes affected by tumors that have metastasized from the scalp, oral cavity, lip, etc. Another series guides students through radical and modified radical neck dissections. We have

incorporated a practical and methodical dissection experiences and introduced the concepts of advanced surgical procedures.

RISSING*, David C., Mark F. SEIFERT and Ronald L. SHEW. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN. A Pre-matriculation Course in Anatomy Predicts Student Success in Medical Gross Anatomy.

Currently, Indiana University School of Medicine (IUSM), like most medical schools, does not require incoming medical students to have had a course in anatomy. A graduate level anatomy course (D501-Functionally Oriented Human Gross Anatomy) is taught each spring semester at our institution as part of a master of science in medical science (MSMS) degree program designed to prepare students to successfully matriculate into medical school. Many of the students in this graduate course are accepted into our medical school and take Medical Gross Anatomy (D503) during fall semester of their first year. We have compiled data on 49 students who took the graduate gross anatomy course between the years 2000-2005 and who continued onto medical school at IU. We found that a student's performance in D501 is a good predictor of how he or she will perform in D503. Students that took D501 and were admitted to IUSM scored an average of $89.0 \pm 4.1\%$. They averaged $83.4 \pm 5.7\%$ in D503. Regardless of how the students did in D501, 59% who had taken the course earned a grade of either Honors or High Pass in D503 (IUSM uses a grading system of Honors, High Pass, Pass, and Fail). Our institution recommends that no more than 40% of students receive High Pass or above. Furthermore, no student who had taken D501 failed in D503. In a survey, students thought that taking D501 prior to medical school was very beneficial. On a 5-point Likert scale, 100% of respondents either agree or strongly agreed that taking D501 enhanced their opportunity to succeed in D503. Our findings suggest that, while not required, taking an anatomy course prior to medical school greatly increases the likelihood of student success in medical gross anatomy.

ROSENTHAL, Julie^{1*}, Robert G LOUIS JR^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The medial papillary muscle complex: An endoscopic cadaveric approach

The medial papillary muscle complex (MPMC) has been described and recognized by gross anatomic studies. In the clinical setting, during adult and pediatric cardiac operations the MPMC serves as a very important landmark for identification of the right bundle branch. Unfortunately, all anatomic descriptions of MPMC have been performed in dissected hearts through the right ventricle and not through the right atrium as occurs in any cardiac operation. The aim of our study was to describe the MPMC endoscopically through the right atrium, simulating a realistic and accurate observation identical to that seen operating room. We examined the MPMC endoscopically and with gross dissections in 200 formalin fixed adult hearts. The position of the MPMC was differentiated in terms of a root, belly and accessory septal papillary muscles. The location of the root of the MPMC was found to be, when viewed from the right ventricular inflow tract, 3-9 mm inferior to the junction of the septal and anterior leaflets of the tricuspid valve. When viewed from the right ventricular outflow tract during gross dissection, the anteroseptal border of the MPMC was located in 146 (73%) specimens at the junction between the subpulmonary infundibulum and the septal band (basal bifurcation of the septomarginal trabeculation), and in 54 (27%) specimens it was located at the area occupied by the superior border of the septal band. The belly of the MPMC showed considerable positional variation when viewed from the inflow tract and outflow tract. We were able to identify single (44, 22%), double (38, 19%), triple (8, 4%) and quadruple (4, 2%) accessory septal papillary muscles. The difficulty of identifying the anteroseptal border of MPMC through the tricuspid valve is crucial during patching large conoventricular septal defects, especially in Tetralogy of Fallot (with absent subpulmonary infundibulum) in order to avoid iatrogenic injuries to the right bundle branch.

SANDERS*, Michelle K., Carlos F. SONEIRA. Pikeville College School of Osteopathic Medicine, Pikeville, KY. Anatomical study of the pterygomandibular raphe.

In order to determine the anatomical variations of the pterygomandibular raphe, a study of 16 Caucasian adult cadavers was performed (8 males and 8 females, mean age = 78.1 years). Both sides were studied in each cadaver for a total of 32 sides. Five types of the pterygomandibular raphe were recognized: Type A – only the upper one-third of the raphe could be identified. Type B – the raphe was a broader, membranous structure throughout. Type C – the raphe was absent, with continuity of the buccinator and superior pharyngeal constrictor

muscles. Type D – the raphe was present in the upper and lower one-thirds, but interrupted in the middle by bundles of muscle fibers connecting the buccinator and superior pharyngeal constrictor muscles. Type E – only the lower one-third of the raphe could be identified. The raphe was absent (type C) in 10 specimens (31.2%). The remaining 22 specimens (68.8%) exhibited some form of the raphe with the following distribution: type A – 4 specimens (12.5%), type B – 5 specimens (15.6%), type D – 9 specimens (28.1%), and type E – 4 specimens (12.5%). Our observations do not support current anatomy textbook depictions of the pterygomandibular raphe.

SAXTON, Ernestina H., James D. COLLINS, Theodore Q. MILLER, Hugh GELABERT and Alfred CARNES
Departments of Neurology, Radiological Sciences and Vascular Surgery, UCLA. Occupational hazards predispose patients to thoracic outlet syndrome (TOS) and Paget-Schroetter's syndrome.

Occupations predispose patients to laxity of the sling/erector muscles and rounding of the shoulders (costoclavicular compression). Monitored bilateral multiplanar magnetic resonance imaging (MRI), angiography (MRA) and venography (MRV) of the brachial plexus display landmark anatomy and pathologic alteration of fascial planes. The clavicles and subclavius muscles compress the draining veins and lymphatics within the supraclavicular fossa. The coracoid processes with attached muscles compress the draining veins at the axilla. Abduction external rotation enhances the compression and triggers complaints of pain and paresthesias of the upper extremity; headache with or without visual changes; tinnitus; facial, back and leg pain; muscle spasms, and tremors; intrinsic hand muscle weakness, and syncope. Firemen, police, football players, weight lifters and body builders, musicians, dentists and radiologists are some of the representative patients imaged on the 1.5 Tesla GE Signa LX (Clin.Anat. 1995; 8:1-16), with the field of view modified to include the dural sinuses. This presentation displays costoclavicular compression in a police officer, guitarist and a fireman with Paget-Schroetter's syndrome. The selected cases best display muscle laxity and atrophy; fibrosis and scarring and sites of venous and neurovascular compression.

SEVERSON, Arlen R. Department of Anatomy, Microbiology and Pathology, Division of Anatomy and Cell Biology, University

of Minnesota Medical School, Duluth, MN. Use of team-based learning as an educational tool for learning developmental anatomy.

Team-Based Learning (TBL) is a form of collaborative learning that motivates and guides students to apply previously learned material, either from class preparation or previous courses, in group discussions in a single lecture hall. Prior to each TBL session, students are given a reading assignment and asked to prepare for a multiple choice test on the assigned reading. At the beginning of the class period, each student takes an Individual Readiness Assurance Test (IRAT) on the assigned reading material. Designated student groups are then given the same test, now referred to as the Group Readiness Assurance Test (GRAT). During the GRAT testing time, each student discusses with their group their answer to the questions and defends their reasoning. Each group chooses their correct answer, and when all groups have completed the GRAT, all groups present their answer for each question to the class. Groups with different answers defend their answer choice to the class. Upon completion of each assigned developmental anatomy topic, each student completed a brief questionnaire and was encouraged to submit comments or suggestions that may facilitate class learning of the material. Eighty percent of the students favored TBL over having a lecture on the topic under discussion.

SANSALONE, C.*, B. LIEBGOTT*, G. SANDOR*, C. CLOKIE*, and A. AGUR. Division of Anatomy, Department of Surgery, Faculty of Medicine and Faculty of Dentistry, University of Toronto, Toronto, Canada. Relationship of Retrodiscal Tissue to the Temporomandibular Disc and Lateral Pterygoid Muscle.

The lateral pterygoid muscle (LP), associated temporomandibular joint disc and retrodiscal tissues have been implicated in Temporomandibular disorders (TMD) and disc displacements. Despite previous studies, little is known of the architecture of the retrodiscal fibres. The purpose of this study is to visualize and document the architecture of the lateral pterygoid (LP), TMJ disc and retrodiscal fibres. Ten formalin embalmed cadaveric specimens were used to digitize the LP fibre bundles, TMJ disc, retrodiscal tissue and bony landmarks. The data was then reconstituted and modeled in 3-D using MAYATM. The most medial and superior fibre bundles of the superior head of LP attached to the TM disc, the latter in a sweeping fashion. On average 99 percent of the inferior head of

the LP muscle fibre bundles inserted into the pterygoid fovea of the condylar neck and no bundles inserted directly into the disc. The inferior head fibre bundles made up the majority of the LP and were on average longer than the superior head. Anteriorly positioned TMJ discs were found in 30% of the specimens. The retrodiscal volumes ranged from 0.555 to 2.072 cm³ with a mean of 1.072 cm³. Retrodiscal volumes were significantly larger in specimens with discs that were anteriorly positioned ($p < 0.05$). No association between retrodiscal volume and lateral pterygoid fibre bundle characteristics was observed. Utilizing 3D modeling, an increased appreciation of the relationship of the retrodiscal area and TMJ disc may aid in future clinical treatment of patients with TMD.

SANTORO, Pete^{1*}, Robert G LOUIS JR^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The surgical anatomy of the axillary nerve branches within the deltoid muscle.

Surgery on the anterior and posterior aspects of the shoulder has become accepted practice for a number of pathological conditions. Despite this trend, the anatomy of the anterior and posterior branches of the axillary nerve within the deltoid muscle has not been well characterized. The purpose of the present study was to determine the innervation pattern and surgical relationships of the branches of the axillary nerve. We examined 92 adult human formalin-fixed upper limbs. The axillary nerve divided into anterior and posterior branches prior to its entrance to the deltoid muscle in 62 (67.3%) specimens. The posterior branch separated from the main anterior branch immediately anterior to the origin of the long head of triceps, inferior to the glenoid. It coursed posteriorly, adjacent to the inferior aspect of the glenoid, for an average distance of 10 mm (range, 2-17) before dividing into the superior-lateral brachial cutaneous nerve and the nerve to teres minor. In 22 (23.9%) of the specimens the nerve divided within deltoid and in the remaining 8 (8.6%) specimens the axillary nerve was undivided within deltoid. The anterior branch of the nerve gave rise to branches to the posterior part of the deltoid that ran parallel with the posterior branches in 12 (13%) of the specimens. The posterior branch of the nerve had an intimate association with the inferior aspects of the glenoid and shoulder joint capsule, which may place it at particular risk during capsular plication or thermal shrinkage

procedures. The posterior aspect of the deltoid had a more consistent supply from the anterior branch of the axillary nerve, necessitating caution when performing a posterior deltoid-splitting approach to the shoulder.

SATO Tatsuo, H. SAKAMOTO*, S. HEIMA*, Y. TSUBOI*, S. MAEJIMA*, and K. AKITA*. Professor Emeritus, Unit of Clinical Anatomy, Graduate School, Tokyo Medical and Dental University, Tokyo, Japan. Characteristic features of the detailed branching of the pelvic plexus (inferior hypogastric plexus), as demonstrated by dissection photographs and video.

The complicated network, the pelvic plexus, is mainly composed of the pelvic splanchnic nerves (parasympathetic) and the hypogastric nerve (sympathetic), with a minor component from the sacral splanchnic nerves. Branches from the pelvic plexus tend to converge to transitional organ areas: the ureterovesical junction and the vesicoprostatic junction in males and the vesicourethral junction in females. The branches which descend between the prostate and rectum not only send twigs to these two organs but also give collateral twigs to the anteromedial edge of the levator ani and the sphincter urethrae, and finally continue to the cavernous nerve to reach the dorsum of the penis (clitoris). Interestingly however, there are a few branches which originate from the hypogastric nerve and the pelvic splanchnic nerves and run directly to the organs. The branches to the ureterovesical junction form a loop around the lower end of the ureter, and some of these branches originate from the hypogastric nerve and directly reach the ureter without joining the pelvic plexus. The lowermost branches of the pelvic splanchnic nerves tend to run directly and reach the groove between the prostate and rectum without entering the pelvic plexus. The detailed courses of these autonomic nerves and their topographical relationships will be demonstrated by actual dissection photographs as well as video.

SHAH*, Rajnil, Quentin A. FOGG. American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES. Morphometry of the relationship between pelvic vasculature and anatomically/radiologically significant landmarks.

The branches of the internal iliac artery have been well documented. Few studies, however, have related these vessels to their surrounding structure, particularly those clearly visible radiologically and endoscopically. This study attempts to document relationships between the vasculature and key

landmarks within the pelvis. Cadaveric hemi-pelves (n = 40) were dissected. Vessels were documented following the criteria of Adachi (types IV), and appropriate subgroups as suggested by others. The variable branching points were then measured to appropriate planes to either the arcus tendineus levator ani (for coronal or transverse interpretation), to the nearest point on the pubis (sagittal interpretation), or to the tip of the coccyx. The mean branching point for type I (n = 23; 57.5%) was closest to the arcus tendineus levator ani, type II (n = 5; 12.5%) to the coccyx, and type III (n = 12; 20%) to the pubis anteriorly. There were no type IV patterns observed. These values have enabled an accurate graphic representation of the true position of these vessels in each type. The information gained in this pilot study may enable clearer and more accurate interpretation of radiologic images, or more precise planning of surgical procedures (particularly endoscopic).

SHARP*, Ian C., Mari KUROYAMA*, and Scott LOZANOFF. Department of Anatomy, Biochemistry and Physiology. University of Hawaii School of Medicine, HI. Willed Body Donation Discrepancies between Asian and Caucasian Populations in the State of Hawaii between 1967 and 2004.

Recent studies have shown that a disproportionately low percentage of ethnic Asians donate for organ transplant. The purpose of this study was to determine whether this pattern also occurs for anatomical body donation within Hawaii since the state has an Asian majority (41.6%) compared to the next highest percentage (24.3%) for Caucasians based on the US Census report of 2002. A retrospective study was conducted using the Willed Body donation data from the University of Hawaii School of Medicine comparing Asian and Caucasian groups between the 1967 and 2004. Data revealed that donations from Asians are significantly less compared to Caucasians (411 compared to 2026, $p < .01$). However, the percentage difference between the groups has decreased from 92.7% to 57.4% between 1967 and 2004. A gender discrepancy also occurred with a greater number of overall female donations than male regardless of ethnicity (1423 to 1014; $p < .01$). When ethnicity and gender was considered together, Caucasian female donations were most prevalent (1179) followed by Caucasian males (874), Asian females (244) and finally Asian males (167). However, the gap between all groups has narrowed with the overall percent difference decreasing over the time interval (from 35.7% to 20.7%).

Donor age at the time of matriculation has increased by over a decade during the time interval. These data suggest that body donation by the Asian community is significantly less than the Caucasian group while females donate more readily than males for both groups. Results suggest that educational strategies must be developed to increase the number of Asian donations.

SHEEDLO, Harold J., Rustin E. REEVES., Armando A. ROSALES, Department of Cell Biology and Genetics, University of North Texas Health Science Center (UNTHSC), Fort Worth, TX. Impact of a post-baccalaureate program on performance of first-year medical students in anatomical sciences.

This program has been successful in having students gain admittance to medical schools in Texas for 5 years. Thirty-one former post-bacc students have completed or are currently enrolled at UNTHSC. The program has graduated students who are currently enrolled or will be attending other medical schools. The intent of the post-bacc program is to provide a means by which students who were unable to be admitted to medical school a chance to demonstrate that they can succeed at this level. Former post-bacc students have consistently achieved higher course averages than their classmates (CM) at UNTHSC. Former post-bacc students scored 6.5% (2008) and 1.5% (2009) higher in all course work than their fellow students. Further, no former post-bacc student attending UNTHSC has failed a medical course or been on academic probation. Over the past two years, 3 of the top 10 students in the anatomical sciences were former post-bacc students, of whom one received the 2005 outstanding achievement award. The post-baccalaureate program has been very successful in preparing students for the rigors of medical school. This program clearly demonstrates that if given a chance, students who may have academic deficiencies, but with drive and motivation will succeed in medical school.

SHOKOUHI^{1*}, Ghaffar, R. Shane TUBBS², Mohammadali MOHAJEL SHOJA^{1*}, W. Jerry OAKES². ¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. Type I Split Cord Malformation with an unusual bony morphology.

Split cord malformation (SCM), the current term used to describe the entities known as diastematomyelia and dplomyelia, is of

interest to both clinicians and embryologists. Although thought to be secondary to a single embryologic error, the molecular aspects of this malformation remain to be determined. Apparently, the development of the spinal column and cord is a final consequence of a complex mesenchymal, ectodermal and endodermal interaction. Variations in the configuration of the bony septum found in patients with split cord malformations are rare. We report the seemingly rare occurrence of a midline bony septum in a patient with Type I SCM that originated from the posterior surface of the L1 vertebral body and extended backward, beyond the neural arch, to become the spinous process. We speculate that this variation is due to misplaced mesodermal cells associated with the primitive endomesenchymal tract during approximately the third week of fetal life. The clinician that manages these patients may wish to consider this rare morphology and avoid excessive palpation of such a process that could potentially injure an underlying hemicord.

SHOKOUHI^{1*}, Ghaffar, R. Shane TUBBS², Mohammadali MOHAJEL SHOJA^{1*}, A. ASHRAFIAN^{1*}, W. Jerry OAKES².
¹Department of Neurosurgery and Anatomy, Tabriz University of Medical Sciences, Tabriz, IRAN. ²Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. Unusual origins of pericallosal arteries: the first report of an association.

Pericallosal arteries are paired vessels that usually originate from the ipsilateral anterior cerebral artery (ACA). We describe an extremely rare brain arterial variation encountered upon dissection of a 73-year-old male fresh cadaver. After removing the brain and detaching the arachnoid membrane off its underside, the Circle of Willis and vertebrobasilar arterial complex was fully uncovered. The right and left pericallosal arteries were found to be originated far back from the ipsilateral posterior inferior cerebellar and posterior cerebral (PCA) arteries, respectively. The right pericallosal artery coursed in an anterosuperior and medial direction and after passing within a loop of superior cerebellar artery crossed the ipsilateral right PCA and posterior communicating artery (PCOM), superiorly, and crus cerebri and optic tract, inferiorly. Coursing lateral to the optic chiasm, the variant artery turned medially to enter the anteroinferior (frontal) part of the interhemispheric fissure deep to the anterior cerebral-communicating arterial complex (ACAC) and ended as a pericallosal artery. Likewise, the left variant

artery originated from ipsilateral PCA and after crossing the optic tract and PCOM, passed lateral to the optic tract and deep to the ACAC to end as a pericallosal artery. Both ACAs continued as the callosomarginal arteries. The other variations seen in this specimen were a duplicated anterior communicating artery, a left Manelfe type 1 accessory MCA, and duplicated falx cerebelli (32 x 2.5 mm) associated with an accessory (rudimentary) left falx cerebelli. We believe that such an association of the brain arterial and dural variations is first to be reported, although it is worth considering by neurosurgeons and radiologists.

SMITH, Gregory R. Department of Biology, Saint Mary's College of California, Moraga, CA. Portable anatomy: anatomic QuickTime VR movies on the Apple iPod. Learning the three dimensional relationships of anatomic structures usually requires hands-on exposure in the laboratory. But once students leave this setting, they revert to more traditional learning materials such as two dimensional texts and atlases. Some institutions have resource centers complete with computer simulations or models for study but lack of access is commonly an issue. This project demonstrates that our library of high quality QuickTime Virtual Reality (QT VR) movies can be ported to the Apple iPod Video, thus giving our students access to three dimensional movies of anatomic structures at any time. Students are more apt to carry an iPod than a laptop computer where ever they go. The movies can be displayed with surprisingly high detail and the students even have some control of rotational manipulation. For larger views, the movies can also be shown on any television that includes a S-video port using an inexpensive cable and an iPod dock. Initial student feedback has been positive. Next fall every student will have access to the entire QT VR movie library and the technical support to transfer the movies to their iPods. This will give us the opportunity to test the effectiveness of our project.

SONPAL Niket¹, Jerzy St. GIELECKI^{1,2}, Anna ZURADA¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide², Australia. Digital-image Analysis of Suprarenal Gland Development Trends.

Throughout the development of the human fetus, many internal structures grow in tandem and display coinciding growth rates and dynamic. None being so true of such fact, as the suprarenal

glands in relation to the growth of the kidney. They play a critical role in fetal development and have been cited to play a role in lung maturation among other functions. The suprarenal gland in its growth shows many significant parameters that when analyzed can prove useful when attempting to comprehend the etiology of several congenital and acquired diseases. A new program based on Bezier curves called "Curve-counter" (CC) was developed to measure and accurately describe the curvatures of 100 suprarenal gland domes that are in contact with the apex of the kidney. The glands were obtained from 50 spontaneously aborted fetuses. Statistical analysis of CC data revealed significant correlations ($p < 0.05$) between the age and base diameter, curvature of the dome, and area of the inner dome. The usage of digital image analysis allows for the creation of base index to compare growth patterns, and deviation from such figures, could indicate the presence of a pathology whether immanent or in the future.

SONPAL¹ Niket, Jerzy St. GIELECKI^{1,2}, Anna ZURADA¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia². Digital-image Analysis – A Laproscopic Nephrectomy's New Best Friend.

Donating a kidney in literature has metaphorically been the truest sign of friendship. However, what authors and friends alike don't realize, is that the occurrence of multiple renal arteries (MRA) can complicate the procedure. MRA hold an occurrence rate between 25%-29% of the population, which includes the occurrence of accessory renal arteries. This calls for the clinicians to be aware of whether the patient is a carrier of such a normally benign condition. Through digital image analysis, the clinicians can simply measure and compare to a baseline table of values, and see whether the MRA are accessory or hilar. The difference through seemingly trivial is quite significant considering perfusion and reanastomoses can be complicated by the existence of these MRA. During a recent study of MRA, a prevalence of superior polar and inferior polar were found to be 1.1% of the 29% of multiplicity found among 78 (59 male and 84 female) spontaneously aborted, latex injected fetuses aging between 14 and 30 weeks giving a grand total of 143 kidneys. Clinically the use digital-image analysis can aid a clinician in, surgical, radiological, and in diagnostic determination of the difference between the hilar and accessory renal arteries.

SPENTZOURIS, Georgios^{1*}, Jeremy PINYARD^{1*}, Brian CURRY¹, Robert JORDAN¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the mastoid emissary veins.

Despite advances in anatomy and neurosurgery, certain structures of the head still remain ill defined. We performed this study to investigate the morphologic and topographic anatomy of the mastoid (MF) and occipital foramina (OF). This study was carried out on 200 dry human skulls and 200 cadaveric heads. The MF and OF varied from being absent to having as many as four small openings. For practical reasons we have classified each of these foramina as type I (MF, 221, 55.2%; OF, 21, 5.2%), type II (MF, 52, 13%; OF, 3, 0.7 %), type III (MF, 85, 21.2%; OF, 2, 0.05 %), type IV (MF, 35, 8.7%; OF, -, - %) and type V (MF, 7, 1.7%; OF, 374, 93.5 %) for single, double, triple, quadruple, and absent foramina, respectively for the right side. For the left side the results showed type I (MF, 182, 46.2%; OF, 15, 3.7 %), type II (MF, 31, 7.7%; OF, 1, 0.02 %), type III (MF, 55, 13.7%; OF, -, - %), type IV (MF, 20, 5%; OF, -, -%) and type V (MF, 112, 28%; OF, 384, 96%). A detailed knowledge of the anatomic morphometry and topography of the MF and OF is necessary for a surgeon placing cochlear implants and performing suboccipital craniotomies. Anatomic variations on this area may occur and a surgeon must take this into consideration to increase the surgical success.

STEFAN, Anca M^{1*}, Armando FRAIRE^{2*}, Thomas J. FITZGERALD^{3*}, and Cristian STEFAN¹. ¹Department of Cell Biology, ²Department of Pathology, and ³Department of Radiation Oncology, University of Massachusetts Medical School, Worcester, MA. Histology lab exercises that correlate microscopic images with macroscopic pathological specimens, radiological imaging, and principles of physical diagnosis.

These novel exercises were designed to complement the traditional format of our Histology lab activities by: a) enhancing student's active learning and lab participation; b) adding clinical relevance to basic science concepts; and c) increasing student's exposure to radiological imaging during preclinical years. This pilot intervention was implemented as a component of the Respiratory Histology lab in the Spring semester of 2006. A separate demo room was arranged as stations related to selected pathological processes. The stations consisted of

preserved pathological specimens surrounded by laptops loaded with short PowerPoint presentations, some of which contained histological and histopathological digital images while others comprised radiological images related to the same macroscopic specimen. The presentations included brief annotations, thought-stimulating questions, and concise explanations. Students had the opportunity of rotating among stations at their own pace. In addition to interpreting and correlating microscopic, macroscopic, and radiological features, they were encouraged to relate these features to expected findings revealed by history and physical examination. The same clinical principles were further discussed and reinforced in class during subsequent clinical correlations. The response received from students was positive and this contributed to obtaining funding for further curricular development for this project.

STEFAN, Cristian. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA
Reviving the art and science of observation as part of the teaching objectives associated with clinical case discussions.

Clinical problem solving relies on knowledge but especially on the ability of applying knowledge to concrete situations. A successful differential diagnosis implies first of all conducting a good anamnesis, carefully examining the patient, and skillfully interpreting the data actively obtained from both. Although inspection is listed as the first step in the examination of a patient in general and of each and every of his/her systems in particular, the art and science of this essential clinical skill tend sometimes to fade out during the training of further physicians, due to the powerful impact of modern technologies. The present paper is based on a real case used by the author as one of the clinical problem solving exercises in the Neuroscience course. It represents an illustration of the differential diagnosis based entirely on the interpretation of details revealed by the careful observation of a patient who is concerned of suffering from Parkinson's disease. The information gathered by observing the patient during a casual visit at his home is deconstructed and linked step-by-step with the functional anatomy of the nervous system, demonstrating the importance of emphasizing the invaluable role of inspection in discussing clinical cases in anatomical sciences courses.

STEFAN, Cristian and Anca M. Stefan*. Department of Cell Biology, University of Massachusetts Medical School, Worcester,

MA. Combining the benefits of PowerPoint and markers/chalk by teaching with tablet computers in anatomical sciences courses.

Convenient and increasingly versatile, PowerPoint presentations almost eliminated the need for 35 mm. slides from the array of teaching tools. By contrast, the projector, transparencies, and markers or the old-fashioned board and chalk are still present in the modern classroom not merely as a nostalgic vestige but as a powerful way to convey information. In our experience, drawing/writing on tablet computers has proved to be an invaluable tool in developing, presenting, and testing educational material. It eliminates the inconvenience of switching back and forth between computers and transparency projectors, while allowing the full benefits of both methods. Drawing/writing directly on PowerPoint slides (or Windows Journal) keeps the audience more engaged. The original file could remain intact while versions of annotated slides could be saved under different names and preserved or modified later. Other useful features include: easily choosing writing/erasing tools and colors; pressure sensitivity; easily positioning text/drawings on page; and rapid handwrite conversion into text if so desired. At a time when students are exposed to hundreds of PowerPoint slides per week, the skilful use of tablet PCs could add a more personalized and effective touch to presentations that actively engage the students and therefore facilitate the retention of information.

SULEMAN, Shazeen*, Piroska L. SZABO, and Anne M.R. AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto ON, Canada and Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, NY. Innervation of the articular muscle of the elbow: a novel three- dimensional representation.

The articular muscle of the elbow (AME), previously described as articularis cubiti, attaches to the capsule of the elbow joint (Suleman et. al, 2005). This deep part of the triceps brachii may act in a similar manner to the articular muscle of the knee, by retracting the capsule of the elbow joint during extension to prevent its impingement (Williams et. al, 1989). Neuromuscular control is related to both muscle architecture and innervation pattern (Segal et. al, 1991). The innervation of the AME has not been previously studied. The purpose of this study was to document the innervation of the AME throughout the volume of the muscle. The radial nerve was exposed in the radial groove and branches that entered the distal portion of the medial head

of triceps were identified and traced to the AME in four formalin-embalmed human cadaveric specimens. Through serial dissection and digitization, nerve distribution and muscle volume of the AME were documented and modeled in 3D. In all specimens, only one branch of the radial nerve innervated the AME. It traversed the muscle from superomedial to inferolateral and terminated in the capsule of the elbow. Therefore, the AME does have independent innervation from the radial nerve and will be denervated when the radial nerve is lesioned.

SUMREEN, Vaid^{1*}, Robert G LOUIS Jr^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the moderator band: An endoscopic and cadaveric approach

Apical ventricular septal defects (AVSD) are difficult to visualize and even more difficult to treat. This is due to the fact that the moderator band (MB) obstructs the view of the right ventricular apex. We examined the morphology and location of the MB in order to identify potential entrance pathways to the right ventricular apex, inferior to the MB. We examined 200 adults formalin fixed hearts endoscopically and with gross dissection. The MB was identified in all the hearts and took origin from ventricular septum in variable locations; zone A (22, 11%) were <45% of the distance from the tricuspid annulus to the apex, zone B (104, 52%) were 45-55% of the distance from the tricuspid annulus to the apex, and zone C (74, 37%) were >55% of the distance from the tricuspid annulus to the apex. In addition, the MB showed variable morphology which we classified as follows: type Ia (39, 19.5%) was short and thick, type Ib (52, 26%) was long and thick, type IIa (34, 17%) was short and thin and type IIb (75, 37.5%) was long and thin. The angle at which the MB ran from the septum to the anterior papillary muscle did not influence the results. We were able to view the ventricular apex in MBs located at zones A and B in association with MB morphology of type IIb in 51 (25.5%) specimens. In these cases, spaces anterior and posterior to the MBs were large enough to introduce an endoscope and patch an apical ventricular septal defect. This new understanding of the existence of spaces in certain types of MB may change, in select cases, the traditional approach to the closure of apical ventricular septal defects from left ventricle to right atrium.

SVOBODA, Kathy K. H., Baylor College of Dentistry, Texas A & M Health Science Center, Dallas, TX. CASA: united we stand. Anatomical science professionals face many challenges including: loss of home departments in medical/dental schools, decreased teaching hours, increased public scrutiny of body donor programs, increased pressure to supply human specimens to unsanctioned programs, increased regulation of donor programs. The Coalition of American Societies for Anatomy (CASA) was formed in 2003 by representatives from the American Association of Anatomists (AAA), American Association of Clinical Anatomists (AACA), Association of Anatomy, Cell Biology, and Neurobiology Chairpersons (AACBNC), and the Human Anatomy and Physiology Society (HAPS). A key outcome of this coalition was the publication of a position paper titled "The importance of anatomy in health professions education and the shortage of qualified educators" (R.S. McCuskey, S.W. Carmichael, D.G. Kirch, Academic Medicine. 80(4):349-51, 2005). CASA representatives agreed that developing guidelines governing the use of human materials is a top priority. Since the 2003 meeting, several events have highlighted this issue, including the Body Worlds exhibit, a Primetime presentation featuring Todd Olsen, and establishment of the Minnesota Commission of the Procurement and Use of Anatomical Donations. It is time for CASA to produce the guidelines on the use of human materials we all agree are needed.

SWARTZ, William J., and Louaine L. SPRIGGS, Peter D. OLIVER*, Judith M. VENUTI, Greg P. CASEY and Richard H. WHITWORTH, JR. Department of Cell Biology and Anatomy, LSU Health Sciences Center, New Orleans, LA Survival of a gross anatomy course in the wake of Hurricane Katrina.

Hurricane Katrina forced an evacuation of medical students from the LSU Health Sciences Center in New Orleans to temporary facilities in Baton Rouge in the fall of 2005. Faced with resuming the semester following a four week hiatus, sharing lecture facilities with the 2nd year class and having no dissection facilities, faculty had a daunting task to formulate a revised schedule. Initially it was proposed to have lectures only, but students petitioned for some cadaver experience. Five cadavers were obtained from the LSU School of Medicine in Shreveport and arrangements were made with the LSU School of Veterinary Medicine in Baton Rouge to provide a laboratory venue. Faculty performed prosections which were then demonstrated via the

"SKY-EYE" camera in three 23 hour sessions. After each of these sessions students were encouraged to view the dissections up-close with faculty available for questions. Because of all of the trauma that the students had undergone in their personal lives from the storm and since the students had no hands-on dissection experience, the faculty spent extra time counseling the students and tutoring them at every available opportunity. What effect this will have on their future performance in medical school is yet to be determined.

TABAK, Russel^{1*}, Rodion HUNTE^{1*}, Robert G LOUIS Jr^{1*}, Brandie BLACK^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. 'High takeoff coronary arteries': an endoscopic, angiographic and cadaveric approach. Coronary arterial orifices (CAO) have been described and recognized by gross anatomic studies. However, in the clinical setting the recognition of CAO is limited to the use of coronary angiography. We examined 200 formalin fixed adult hearts with gross dissection. In addition, 100 of these specimens were also examined with angiographic and endoscopic techniques. Gross examination was able to identify the CAO in all specimens. The left coronary artery arose within the left posterior aortic sinus (of Valsava) in 132 (66%) specimens, above the sinutubular junction in 52 (26%) and at the level of the junction in 16 (8%). The right coronary artery arose within the anterior aortic sinus in 146 (73%) specimens, above the junction in 42 (21%) and at the level of the junction 12 (6%). An accessory coronary orifice was found in the anterior aortic sinus in 92 (46%) specimens, whereas a third orifice in this sinus was found in 22 (11) hearts. When using all three techniques ($n=100$), gross dissection and endoscopy were able to identify the position of the CAO in all the specimens, while angiographic imaging was only able to identify the position of the CAO in 25% of specimens. Of the 94 CAO arising above the sinutubular junction, detected grossly and endoscopically, angiography was only able to identify 12 (12.7%). Therefore, the overall sensitivity of angiography for detecting CAO was very low compared with endoscopy. We also determined the position of the zones of apposition between leaflets, the size of the leaflets, the number, position and shape of the coronary arterial orifices, and their relation to the sinutubular junction. The above results may play

an important role in the diagnoses of “high takeoff coronary arteries” and treatment of their possible complications.

TANIGUCHI*, Keigo, Masaki KATAYOSE*, and Seiji NORIYASU*. Department of Physical Therapy, School of Health Sciences, Sapporo Medical University, Sapporo, JAPAN (sponsored by MURAKAMI, Gen). Architectural evidence of anatomical partitioning in human peroneus longus muscle.

The purpose of this study was to determine whether there was architectural evidence of neuromuscular compartments within the human peroneus longus muscle identified by nerve innervation pattern. Eight legs from human donated cadavers were dissected. The architectural characteristics of fiber direction, fiber pennation angle, and tendinous tissue were examined. The peroneus longus muscle was found to have four distinct partitions: anterior superficial (AS), posterior superficial (PS), anterior deep (AD) and posterior deep (PD) portions. The superficial portion and deep portion within the muscle were separated by an aponeurosis that is continuous with the distal tendon. Furthermore, each of these both portions was partitioned into the anterior and posterior portions by fiber direction. Although comparisons among mean pennation angles in portions AS, PS, and AD were not statistically significant (AS 9.6degrees; PS 8.8degrees; AD 8.3degrees), the angle magnitude of the PD portion (PD 20.4degrees) was significantly greater than the other three portions. In future, this architectural muscle’s partitioning will not only lead to an anatomical foundation for physiological studies to elucidate the functional multiplicity of the peroneus longus, but also provide a scientific rationale for establishment of specific protocols for rehabilitation of patients with the muscle dysfunction and atrophy.

TARIQ, Afreen^{1*}, Jeremy PINYARD^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George’s University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. An endoscopic cadaveric approach to anatomic barriers of the cardiac venous system.

Coronary sinus (CS) catheterization is often used in cardiac resynchronization therapy.

Failure to enter the CS is the most common reason for left ventricular pacing lead implant failure. The aim of our study, therefore, was to explore the anatomy of the cardiac venous system and categorize the anatomic barriers that prevent

clinicians from performing procedures in the cardiac venous system. We examined, grossly and endoscopically, the cardiac venous system of 200 adult formalin-fixed hearts. The mean diameter of CS ostia was 10.72 mm. A Thebesian valve (valve of the coronary sinus) was present in 164 (82%) of the hearts. Of these, the valve covered the ostium of the sinus entirely in 55 specimens. Another 28 hearts exhibited a cribriform type of Thebesian valve. In 52 hearts a Vieussens valve was observed. Twenty one of these had a well developed double leaflet and 33 a single leaflet. The anatomic barrier that Thebesian and Vieussens valves presented were evaluated as optimal, suboptimal and worst for catheterization in 110, 51 and 39 Thebesian valves and 152, 38, and 10 Vieussens valves respectively. The coronary sinus tributaries between great and middle cardiac veins were found to be optimal, suboptimal and worst for catheterization in 121, 40 and 39 veins respectively. Careful evaluation of anatomic barriers is important for treatment success. Thus, knowledge of these functional anatomic features and barriers allows for better utilization of the human coronary sinus for diagnostic and therapeutic purposes.

TERRELL, Mark A. Division of Anatomy, College of Medicine and Public Health, The Ohio State University, Columbus, Ohio. Impacts of structured collaborative assessment on student learning, retention, and motivation in large anatomy courses.

A social constructivist model of learning was used to develop structured peer group lecture exams to test the hypothesis that lecture exams can be used as a formative learning tool during assessment practices. After completing a unit exam using individual efforts, students immediately retook the same unit exam using small group discussions. Performance on the collaborative exams was higher ($P < 0.001$) than on the individual-effort exams. Final comprehensive exam scores, completed using individual efforts only, increased ($P < 0.01$) during semesters that coupled a collaborative testing approach with traditional lecture assessment. Students rated collaborative testing as positive and helpful toward their mastery of course content. These results suggest that traditional summative assessment (measuring learning after instruction) can be improved to include a formative learning component, which allows students to actually learn from the assessment event itself. This research demonstrated that human cognition research can help build an autonomous classroom community that 1) engages students in active learning, 2) motivates

students to overcome inhibitory feelings of isolation and anxiety, and 3) promotes good lifelong learning skills, including self-discovery and reasoning strategies for problem solving, collaborating with and articulating concepts to peers, and conflict resolution.

THORSELL, Ashley^{1*}, Robert G LOUIS JR^{1*}, Brian CURRY¹, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the ansa cervicalis.

Recurrent laryngeal nerve paralysis represents one of the major complications in esophageal cancer surgery. Recently, nerve-muscle transplantation to the paraglottic space after resection of the recurrent laryngeal nerve with ansa cervicalis (AC) has become the procedure of choice. The aim of this study was to investigate the anatomic variations of the AC in order to avoid iatrogenic injuries and facilitate surgical procedures. We examined 200 adult human formalin-fixed cadaveric necks. The AC showed a great degree of variation regarding origin and distribution. The origin of the superior root of the AC was found to be superior to the digastric muscle in 92% of the cases. Its vertical descent was found to be on the external carotid artery in 72%, and on the internal carotid artery in 28%, of the specimens. The inferior root of the AC was derived from the primary rami of C2 and C3 in 38%, from C2, C3 and C4 in 10%, from C3 in 40% and from C2 in 12%, of the cases. The inferior root passed posterolaterally to the internal jugular vein in 74%, and anteromedially in 26%, of the cases. The roots of the AC were long (70%) or short (30%), and the union between the two roots was situated inferior to omohyoid or superior to omohyoid. It is very important for the surgeon to identify the AC due to the dangers of inadvertent injury to the great vessels during surgical procedures of the neck.

TRELEASE, Robert B. Department of Pathology and Laboratory Medicine, David Geffen School of Medicine at UCLA, CA. Anatomical Education Applications for the iPod.

Personal media players are a newer kind of wearable computing device that can be used for educational purposes. The widespread popularity of these players, with over 40 million units sold of the market-dominating Apple iPod, means that many students are already carrying them. Some schools, such as Duke, have recognized their usefulness for instructional support

by providing "podcastable" class materials and distributing players to entering students. Over the past two years, we have developed and assessed a variety of anatomical learning resources for the iPod. A text-based flashcard application for limb muscle information was globally distributed via "viral advertising" and open Web sites. Lecture slides, QuickTime VR anatomical models, and medical imaging were readily repurposed for playback on iPod photo and video models. Slides and digital audio of lectures were post-produced as MPEG4 media for video players. With the appropriate use of standardized data formats, anatomical information can thus be readily mobilized for learning via new generations of self-adopted, wearable computing devices.

TUBBS, R. Shane, Mohammadali M. SHOJA*, E. George SALTER, W. Jerry OAKES*. Departments of Cell Biology and Anatomy and Neurosurgery, University of Alabama at Birmingham, Birmingham, AL, and University of Tabriz, Tabriz, Iran. The tectorial membrane: anatomical, biomechanical, and histological analysis.

There is minimal information in the literature regarding the tectorial membrane (TM) and such information is often contradictory. We performed the current study to elucidate further the anatomy, function, and histology of the TM. Thirteen cadavers underwent dissection of their TM. Observations, ranges of motion, and histological analyses were performed on all membranes. This structure attached more superiorly than previously described and was firmly adherent to the cranial base and body of the axis but not the odontoid process. No "deep" portions of this structure were found. The TM became fully taut with means of 15 and 20 degrees of flexion and extension, respectively. A buckling effect of the TM at the level of the odontoid process was seen in cervical flexion. Histologically, the membrane was found to harbor collagen fibers with spindle shaped fibrocytes. In contrast, the part of the TM posterior to the odontoid process was found to have larger non spindle shaped fibrocytes and an increase in Type III collagen. We propose that the TM acts as reinforcement (second line of defense) in preventing the odontoid process from compressing the anterior cervical dura mater and no so much as a "ligament" that restricts craniocervical motion.

UDANI, Ankeet^{1*}, Christopher WARTMANN^{1*}, William MERBS^{1*}, Robert JORDAN¹, Brian CURRY¹, Marios LOUKAS^{1,2}.

¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The surgical anatomy of the right renal vein: extension for kidney transplantation.

Considering the fact that anatomical variations can influence technical feasibility of an operation, structural morphology carries particular significance for the transplant surgeon. The right renal vein (RRV) may be difficult to anastomose in right kidney transplantation, especially for obese recipients in whom the iliac vessels are deep. We examined the renal vasculature in 325 cadaveric formalin-fixed specimens with intact IVCs. The variations found were multiple veins (right, 17, 4.8%; left 11, 3.8%), a retroaortic left (8, 2.4%), a renal collar (24, 7.3%), and multiple arteries (right, 123, 37.8%; left, 85, 26.1%). The RRV length varied from 17 to 65 mm, and the right renal artery (RRA) length varied from 40 and 123 mm. The RRA/RRV length ratios ranged between 3.2 and 1.1. In addition, we performed three common techniques of renal vein augmentation in 100 specimens; clamshell (CS), transverse closure of the inferior vena cava (TC), and cava conduit (CC). We were able to measure gains of length: 114% with CS (possible in 70%), 162% with TC (possible in 70%), and 230% with CC (possible in 75%). The median RRV length was one half that of the RRA so that length augmentation could be an advantage. Anatomic variations are clinically silent but may become a limiting factor in the choice of a technique for mobilization of the renal vein.

WARTMANN, Christopher^{1*}, Robert G LOUIS JR^{1*}, Marios LOUKAS^{1,2}. ¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. T2 contributions to the brachial plexus

Recent advancements in neurotization and nerve grafting procedures have led to an increasing need for knowledge of the detailed anatomy of communicating branches between peripheral nerves. Although the surgical anatomy of the axilla has been well described, little is known regarding the degree or frequency of potential contributions to, or communications with, the brachial plexus. The aim of our study, therefore, was to explore extrathoracic, as well as potential intrathoracic, contributions from T2 to the brachial plexus. The anatomy of the ventral primary ramus of T2 and the 2nd intercostal nerve, including its lateral cutaneous contribution as the

intercostobrachial nerve (ICBN) was examined in 75 adult human cadavers (150 axillae), with particular emphasis on the communications with the brachial plexus. Extrathoracically, communications were observed to occur in 86% of specimens. These contributions arose variably from either the ICBN or one of its branches and communicated with the medial cord (35.6%), medial antebrachial cutaneous nerve (25.5%) or posterior antebrachial cutaneous nerve (24%). While the majority of specimens (68.2%) were observed to have only one extrathoracic communication, 31.7% of specimens exhibited two. Intrathoracically, communications were observed to occur in 17.3% of specimens. These communications always arose from the ventral primary ramus of T2. When combining and comparing data within individual specimens, it was observed that those axillae without an extrathoracic contribution from the ICBN always contained an intrathoracic communication. Based on our findings, we conclude that 100% of specimens had a communication branch between T2 and the brachial plexus. Considering the possible implications of this data, with regards to sensory innervation of the arm and axilla, further studies in this area of research could prove extremely beneficial.

WARTMANN, Christopher^{1*}, Robert G LOUIS JR^{1*}, Ehsan ESMAEILI^{1*}, Allyson C BAGENHOLM^{1*}, Marios LOUKAS^{1,2}.
¹Department of Anatomical Sciences, St George's University, Grenada, West Indies, ²Harvard Medical School, Department of Education and Development, Boston MA, USA. The clinical anatomy of the superior phrenic artery

The majority of textbooks of gross anatomy offer very little information concerning the anatomy and distribution of the superior phrenic artery (SPA). However, in the last decade increased numbers of reports have appeared with reference to the transcatheter arterial chemoembolization of the collateral arterial supply of hepatic carcinoma (HC). It is unknown whether the SPA is a source of collateral arterial supply to HC. The aim of this study was to identify the origin and distribution of the SPAs (right and left) and to explore the possibility of this artery contributing as a collateral supply to liver. We have examined 100 formalin-fixed adult cadavers lacking abdominal pathology. Dissections in normal cadavers revealed that the right SPA originated from the aorta in 42% (R1) of the specimens, as a branch of the proximal segment of the 10th intercostal artery in 33% (R2) of the specimens, and as a branch of the distal segment of the 10th intercostal artery in 25% (R3) of the

specimens. The left SPA originated from the aorta in 51% (L1) of the specimens, from proximal segment of the left 10th intercostal artery in 40% (L2) of the specimens and from the distal segment of the 10th intercostal artery in 9% (L3) of the cases. Regardless of the origin, the SPA gave rise to three small terminal branches in 65% of cases, ascending, middle and descending, which supplied the medial and posterosuperior surfaces of the diaphragm, as well as the medial surfaces of the diaphragmatic crura, respectively. These branches were often located within the superior musculature of the diaphragm. These findings could provide a better understanding of the anatomy and distribution of the arterial supply of the diaphragm and the potential involvement of the right SPA as an extrahepatic collateral artery developed in HC.

WEBER, Daniel, Michelle DORAN, FITZSIMMONS, John. Department of Radiology, Michigan State University, MI.

Extensor Pollicis et Indicis revisited.

A previously reported anomalous extensor tendon was discovered during a Human Gross Anatomy course at Michigan State University. The anomalous muscle arises between the extensor indicis (EI) and extensor pollicis longus (EPL). Its tendon passes through the fourth extensor compartment with the tendon of the EI. Once on the dorsum of the hand the tendon then bifurcates to send slips to both the thumb and index finger. This was the only incidence of this tendon found following dissection and study of 122 specimens (.82%). This is a slightly lower occurrence of the extensor pollicis et indicis than previously reported (range 1.4% - 5%). The anatomy of the extensor pollicis et indicis is such that it may work synergistically with both the EI and the EPL. This information should assist the physician in the diagnosis of tendon ruptures, specifically rupture of the EPL.

WELLS*, Michael T. Neda MIRAFZALI*, Dorothy GOTLIB*, Amed RAOOF. Virtual anatomy atlas. The integration of new technology, especially the use of computers has become one of the great challenges to improving medical education curricula, more specifically anatomy, for the last decade. Anatomy students benefit from innovative ways to learn and manipulate subject materials as the diagrams in books only provide a two dimensional view and understanding of the human body. The three dimensional virtual anatomy atlas has been developed with the hopes that students will be able to manipulate a given

anatomical specimen to better understand physical relationships. The anatomy of the hand was selected for the initial module of this atlas due to the relative ease in which the anatomy could be separated into logical layers. The 3-D model was produced on the hand using a basic setup which involved a turntable and camera. The specimen was photographed at small (2-5°) increments and using simple iMovie and QuickTime programs the photographs were integrated into a 360° image that can be manipulated both in space and between layers. Based on early feedback from students and faculty, this seems to be a plausible resource for student use in anatomy education, and another dimension in the teaching and learning of anatomy.

WINESKI, Lawrence E., Perry RIGGINS*, Christopher MAY*, Rebecca SEALAND*. Department of Anatomy & Neurobiology, and Division of Information Technology Services, Morehouse School of Medicine, Atlanta, GA. [Introduction to dissection.](#)

Many health science students do not enroll in undergraduate dissection-based anatomy courses during their pre-professional education. As a result, they are not familiar with dissection instruments and the mechanics of dissection, and are poorly prepared for medical, dental, and allied health science anatomy courses. This CD-ROM is designed to help overcome those deficits. It serves as an introduction to dissection in a human gross anatomy course for first-year medical and other health science students. It can be used either as a component of a structured classroom session, or, independently by individual students. The content is presented in a series of video clips arranged in two sections, each containing multiple chapters. Section #1 is a guide to the selection of proper dissection instruments. Section #2 is an overview of how to begin the first dissection in the course, including the use of dissection tools. The program is menu-driven, allowing viewing of the entire content in sequence, or, selected chapters in any order. This CD has been reviewed by MedEdPORTAL (www.aamc.org/mededportal). Supported in part by NIH P03 1B040107-05 and G12-RR03034.

WIJDICKS*, Coen A., James M. WILLIAMS. Department of Anatomy and Cell Biology, Rush Medical College, Rush University, Chicago, IL. [Arachnoid Ossifications: hidden in the shadows.](#)

Pathologists and anatomists have reported light calcifications associated with the arachnoid membrane. Such plaques are

rarely visible on radiographs due to obstruction of lamina and vertebral bodies. These often-asymptomatic findings have been imaged on MRI and are now known as Arachnoid Ossifications. This study describes calcified arachnoid plaques in an 86-year-old male cadaver in the dorsal thoracic level. A laminectomy from C4 to the lumbo-sacral junction was performed and the dura mater was transected and pinned aside. Three different regions were identified where white calcifications were attached to the arachnoid layer. Three plaques which varied in size were identified between T2-T3, T3 at T7, T2 at T9. Plaques were 1mm in thickness and ranged from .5cm to 1cm in diameter. The spinal cord or nerve roots were not displaced. The material stained positively for Alizarin Red S suggesting calcified material. Arachnoid Ossifications are an incidental finding in cadavers. Such plaques may be precursors to spinal Arachnoid Ossifications, a potentially serious condition that may cause spinal cord or radicular compression. Although there was no evidence of prior spinal trauma in this specimen, such calcifications have been attributed to trauma, myelography (particularly use of oil-based contrast), subarachnoid hemorrhage, and spinal anesthesia.

WIJDICKS*, Coen A., Daniel A. ROSEMAN*, James M. WILLIAMS. Department of Anatomy and Cell Biology, Rush Medical College, Rush University Medical Center, Chicago, IL. Unusual circumaortic left renal vein variant and potential implications.

Embryogenesis of the left renal vein (LRV) involves development of ventral and dorsal limbs around the aorta, with the eventual regression of the dorsal limb. Persistence of the dorsal limb results in a circumaortic LRV. Such a variance was found in a 68 year old male cadaver. The left renal vein entered the inferior vena cava by traversing posteriorly to the aorta and left renal artery. A small remnant of the ventral limb was observed. The testicular vein was unexpectedly attached to both the larger dorsal division and smaller ventral branch. The left kidney was normal. Compression of a retroaortic vein between the aorta and lumbar vertebral body may lead to a posterior nutcracker syndrome presenting clinically with hematuria, orthostatic proteinuria, flank pain and hypertension. For transplant surgeons, the recognition of a left sided anomaly is important to prevent accidental avulsion of the retroaortic renal vein. This observation is also unusual because small communicating branches, that may represent the anterior branch remnant, have rarely been noted in posterior nutcracker phenomenon. These

branches may compensate for a compressed LRV and thus may explain how this variant could be clinically inconsequential.

WONG*, Brian, Lillia Y. FUNG*, Anne AGUR, and Amr ELMARAGHY*. Divisions of Anatomy and Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, Canada. A three-dimensional study of pectoralis major muscle architecture.

The architectural parameters of the human pectoralis major muscle belly have not been defined (Yamaguchi et al., 1990). The purpose of this study was to examine the pectoralis major architecture throughout its volume, quantify fiber bundle length (FBL) and determine pennation angles (PA). Fiber bundles of four formalin embalmed pectoralis major specimens (1M/3F) were serially dissected from superficial to deep and digitized using a Microscribe 3D-X digitizer. The muscles were reconstructed in 3-D using MAYATM and FBL and PA were quantified. The pectoralis major was found to have two heads: clavicular and sternal. The clavicular head has 1 part and lies superficial to the sternal head. The sternal head splits into 57 parts and converges to its lateral attachment in a fan-like arrangement. Average fiber bundle length is greatest in the midportion of the sternal head (19.4cm±0.8) and shortest in the clavicular head (15.1cm±1.6). Both average medial and lateral pennation angles were significantly greater in the clavicular head than in the sternal head (P<0.05). Findings indicate that the clavicular and sternal heads of pectoralis major have distinct architectures. The detailed mapping of pectoralis major architecture will provide better insight into its function in normal and pathological states.

Wu-Chul Song, Sang-Hyun Kim, Ki-Seok Koh. Department of Anatomy, College of Medicine, Konkuk University, 322, Danwol-dong, Chunju, 380-701, Korea. Location of the infraorbital and mental foramina with reference to the soft-tissue landmarks.

The purpose of the present study was to determine the locations of the infraorbital foramina (IOF) and mental foramina (MF) based on soft-tissue landmarks, which would facilitate prediction of the locations of these structures during facial surgery. Fifty embalmed cadavers (100 sides) of Koreans were dissected to expose the IOF and MF. The distances between the bilateral IOF, MF, alae nasi (AL), and mouth corners (CH) were measured directly on the cadavers, and the vertical and horizontal distances between the IOF and MF and the AL and

CH were measured indirectly on photographs. The distance between the bilateral IOF (54.9 ± 3.4 mm, mean \pm SD) was greater than that between the bilateral MF (47.2 ± 5.5 mm). The IOF were located 1.6 ± 2.7 mm lateral and 14.1 ± 2.8 mm superior to the AL. The distance between the AL and IOF was 15.9 ± 2.8 mm, and the horizontal angle between these structures was 64.1 ± 9.9 degrees laterosuperiorly. The MF were located 20.4 ± 3.9 mm inferior and 3.3 ± 2.9 mm medial to the CH. The distance between the CH and MF was 20.9 ± 3.8 mm, and the vertical angle between these structures was 9.2 ± 8.1 degrees inferomedially. This study provides data that will be useful in predicting the locations of the IOF and MF when used together with hard-tissue landmarks. These data may be particularly helpful for facial surgery in patients with missing teeth.

Wu-Chul Song, Ki-Seok Koh. Department of Anatomy, College of Medicine, Konkuk University, 322, Danwol-dong, Chunju, 380-701, Korea. Morphological Relationship between Sebaceous Gland and Arrector Pili Muscle focused on their Function in the Follicular Unit.

The follicular unit (FU) is a well-defined structure consisted of two to four terminal follicles, and one, or rarely, two vellus follicle, the associated sebaceous gland (SG), and the insertions of the arrector pili (AP) muscle of the terminal follicles. Recently, some investigators suggested new models about the structural relationship using cross-sectioned images. The purpose of the present study was to investigate the morphological relationship between SG and AP muscle focusing on their function in the FU using the three-dimensional reconstruction. The scalp skins were obtained around the parietal region and processed with routine histological procedure. The serially sectioned slides were stained with Masson's trichrome to distinguish the SG, AP muscle fiber, and hair follicles from dermal connective tissue fibers. The "Reconstruct" software was used to align, line up and reconstruct. We mainly reconstructed the 2-hair or 3-hair FU which was a frequent type. The reconstructed images were showed morphological relationship between SG and AP muscle supporting that AP muscle aids the secretion of the SG.

YALÇIN*, Bülent and Hasan OZAN*. Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson). Relationship Between the Zuckerkandl's

Tubercle and Entrance Point of the Inferior Laryngeal Nerve Including Laryngeal Branches.

We aimed to investigate relationship between the Zuckerkandl's tubercle (ZT) and entrance points (EP) of the inferior laryngeal nerve (ILN) and its laryngeal branches, because most ILN injuries occurred at this point. Forty-five specimens (90 sides) were examined for this project. In first group, the ZT located at the upper third of the lateral lobe of the thyroid gland in 3 sides (5,1%). In second group, the ZT situated at the middle third of the lateral lobe of the thyroid gland in 48 sides (%82). Relationships between the ZT and EP of the nerve including the laryngeal branches also divided into three sub-groups: (I): The tubercle indicated EP of the nerve and anterior laryngeal branch. (II): The tubercle covered EP of the nerve, laryngeal branches and the anterior laryngeal branch. (III): The tubercle was below and above the EP of the laryngeal branches. In third group, the ZT positioned at the lower third of the lateral lobe of the thyroid gland in 7 sides. In conclusion, we suggest that surgeon should use the ZT as a landmark to find the EP of the ILN or its laryngeal branches despite the ZT has not indicated they in all specimens.

YALÇIN*, Bülent and Hasan OZAN*. Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson). Variations of the levator palpebrae superioris muscle.

The aim of this study was to investigate variations of the levator palpebrae superioris muscle in human adults, and to add its new anomalies, if present, to the literature. This study was undertaken in 60 intact orbits of 30 (17 males and 13 females) embalmed adult cadavers. The cause of death was unrelated to the ophthalmic region and organs of head and neck. The levator palpebrae superioris was normal in 28 right and in 29 left sides. Of 3 eyes, one right eye had an accessory muscle belly, arising from the beginning of the levator palpebrae superioris muscle. After a short distance, it divided into two parts, superior and inferior. Second left eye had a fibro-muscular accessory muscle. It also arose from the origin of the levator palpebrae superioris muscle, and had lost its muscular character after a short course, becoming an aponeurosis. Third right eye had an accessory muscle. It arose from the origin of the levator palpebrae superioris muscle as a thin flat muscle. At the distal part of the orbit the muscle spread out to form a wide aponeurosis that continued anteriorly to the trochlear region, passing deep to the

tendon of the superior oblique muscle. In conclusion, we found 3 variations of the levator palpebrae superioris muscle in 60 adult eyes. Two of them were extreme in adult humans and were not reported in the literature, to our knowledge.

YALÇIN*, Bülent, Selçuk TUNALI*, Hasan OZAN*, Department of Anatomy, Gülhane Military Medical Academy, Ankara, Turkey (Sponsored by B.R. MacPherson). A New Description for the Inferior Laryngeal Nerve: Detailed Investigation of the Terminal Portion of the Recurrent Laryngeal Nerve.

Because the term “inferior laryngeal nerve” is controversial, we feel that it is necessary to reassess the nerve and to propose a new description. Sixty specimens (120 sides) were examined for this project, including 41 males and 19 female cadavers between the ages of 40 and 89 years at death. We classified branching pattern of the nerve as follows; (1), ILN had no extralaryngeal division. (2), The nerve gave off two laryngeal and one to three extralaryngeal branches. We classified this group into two types. In type I, laryngeal and extralaryngeal branches arose from at its same point of the ILN. In type II, the laryngeal branches of the nerve arose from just above the extralaryngeal branches. (3), The nerve divided into three laryngeal branches and one or two extralaryngeal branches. (4), The nerve divided into many branches surrounding the inferior thyroid artery. (5), Finally, we observed a nonrecurrent inferior laryngeal nerve that gave off laryngeal and extralaryngeal branches. We concluded that the description of the ILN is not suitable. We suggest that the term “inferior laryngeal nerve” should be accepted and evaluated in three parts; “descending, recurrent and ascending” while the term “recurrent laryngeal nerve” should be removed international anatomical nomenclature.

YU*, Wei Ning, MACKAY*, Margot B., WOOLRIDGE*, Nicolas HERSCHORN, Sender, and AGUR, Anne. Biomedical Communications, Institute of Communication and Culture, University of Toronto at Mississauga, Institute of Medical Science, Divisions of Urology and Anatomy, Department of Surgery, University of Toronto, Canada. Female pelvic floor anatomy: A special focus on stress urinary incontinence.

The purpose of creating this anatomical animation is to provide health care professionals with a didactic three-dimensional visual reference, to enhance their spatial knowledge of the female pelvic floor in the context of stress urinary incontinence. The “fly-through” approach enables the viewer to enter the constantly

changing environment of the pelvic floor and to observe how the compacted anatomical structures interrelate to each other. Through this short animation the viewer can appreciate how these integrated tissues can affect one another when certain elements become dysfunctional. The 3-dimensional anatomical structures were modeled and animated using Autodesk Maya®; the 2-dimensional characters were designed in Adobe Illustrator®. Editing and compositing of the animation were done in Adobe After Effects® and Final Cut Pro HD®, and published in DVD Studio Pro®. This resource is not available for purchase from national publishers/resellers.

ZUMWALT, Ann C., Alexander VAN NIEVELT*, Lawrence MARKS*, Elizabeth LIVINGSTON*, Edward C. HALPERIN*. Duke University School of Medicine, Durham, NC. Beyond the first year: Focused anatomy instruction during the clinical years of medical school.

To supplement first-year medical gross anatomy education, we recently initiated two specialized anatomy courses to medical students during their clinical years. These courses are offered to students rotating through Radiation Oncology and Obstetrics & Gynecology, two specialties requiring detailed anatomical knowledge. The courses are a combination of lectures, discussions and demonstrations of cadaver prosections. The results of two surveys demonstrate that these courses are successful in teaching and reinforcing anatomy in a focused and relevant manner to an interested audience. In survey #1, radiation oncology participants (N=19) ranked their interest in and the quality and relevance of all parts of the course 9.0 on a scale of 1-10. The prosection component was consistently ranked the most interesting, highest quality and most educational part. In survey #2, 85% of the OB/GYN course participants (N=26) ranked the difficulty level of the presented material “just right” and provided extensive positive qualitative feedback. We discuss the logistics of running such clinical courses and propose that they are a useful means by which anatomists may supplement first year gross anatomy education, establish positive relationships with clinical departments, and utilize gross anatomy lab space and cadaveric material extensively throughout the year.

ZURADA¹, Anna, Jerzy St. GIELECKI^{1,2}, Zachary PUTHOFF^{1*}, Niket SONPAL¹. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences,

Medical School, The University of Adelaide, Australia². (Sponsored by Jerzy St. Gielecki) An Assessment of the Usage of Computer Based and Electronic Study Aids Among Medical Students in an International MD Program.

Much attention has recently been paid to the implementation of computer based and electronic study aids (CBESA) in medical education. The study of anatomy in standard MD programs is particularly well suited for CBESA utilization, since this course requires a great deal of general understanding, memorization, and review. The purpose of this investigation is to assess student's personal usage of CBESA in anatomy and physiology in an international MD program. We offered a 26 question survey to 317 students (age range 19-28, various countries of origin) at the international MD program at the Medical University of Silesia. Demographic information, usage, effectiveness, and preferences for the various types of CBESA were assessed, as well as the reasons for nonuse. We identified a strong tendency towards one or more types of CBESA in personal study (73% +/- 4.89) and in class lectures (93% +/- 2.81). Trends were seen in the types of CBESA used for different learning activities as well, while no statistically significant differences were found between gender, ethnicity, or those students with previous CBESA training ($p > 0.05$). Medical students and course instructors can utilize these results as a basis for modifying the learning tools used and offered in medical education.

ZURADA¹, Anna, Jerzy St. GIELECKI^{1,2}, Grzegorz GAJDA^{1*}. Department of Anatomy, Medical University of Silesia, Katowice, Poland¹. Department of Anatomical Sciences, Medical School, The University of Adelaide, Australia². New method of the cerebral arteries evaluation. A solution for description of the variations in three-dimensional space.

Rapid development of new techniques of 3D visualization in medical diagnostic equipment based on CT, MRI and ultrasound clinical investigations is connected with increase of possibilities of morphological description of anatomical structures. Good examples of changes in exploration of the anatomical structures are the cerebral arteries. Angio-CT, angio-MRI, 3D transcranial color-coded sonography gives us new vision of the morphological description of vessels. Anatomical and clinical descriptions of the variations of arteries is still based on the anatomical terminology. Anterior, posterior, superior, inferior, medial, lateral localization of arteries or its branches or bifurcations, trifurcations, and fenestrations are too antiquated

and too pure a concept when requiring precise morphological and morphometrical description; critical in neuronavigation surgery. Due to anatomical description in the 3D plane and images being 2D, a new method for description is necessary. Authors proposed using a new system of accurate localizations and the structure variations based on the alpha, beta and gamma direction cosines function. Summation of the 3D-vectors represent the course of vessels in the body. The algorithm can be summarized in the following steps: acquisition of the point coordinates in 3D, interpolation, recovery of the 3D point coordinates, calculation of the interpolated trajectory.

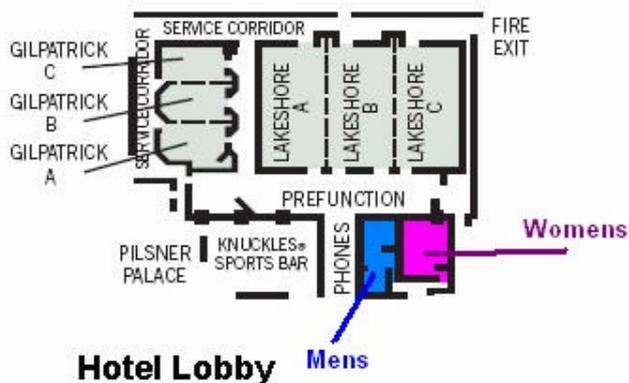
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* not a member of the AACA.

Floorplan/Directory Map



First Floor



Hotel Lobby

& ALL MEETING ROOMS, PHONES AND RESTROOMS ARE WHEELCHAIR ACCESSIBLE, PHONES ARE EQUIPPED FOR HEARING IMPAIRED

The Ralph Ger Student Platform Presentation Award:

The AACA Student Platform Presentation Award. The best of these presentations are judged by a panel set up by the Program Secretary. The winner receives a cash award of \$600 U.S. and a certificate suitable for framing.

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The AACA Student Poster Presentation Award. The best of these presentations are judged by a panel set up by the Program Secretary. The winner receives a cash award of \$600 U.S. and a certificate suitable for framing.

Presidential Travel Award:

To be eligible in the competition for this award, the platform presenter must submit a publication-ready manuscript to the Editor-in-Chief of Clinical Anatomy - Dr. Stephen Carmichael and have electronic confirmation of that submission. The best of these presentations are judged by a panel set up by the Program Secretary and the winner is entitled to up to \$1500 in reimbursable travel to the AACA meeting the following year. The winner will submit travel receipts after return from the meeting and the Treasurer will mail the individual a check.